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SURVEY OF CURRENT BUSINESS

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MAY 1972 / VOLUME 52 NUMBER 5 PART I

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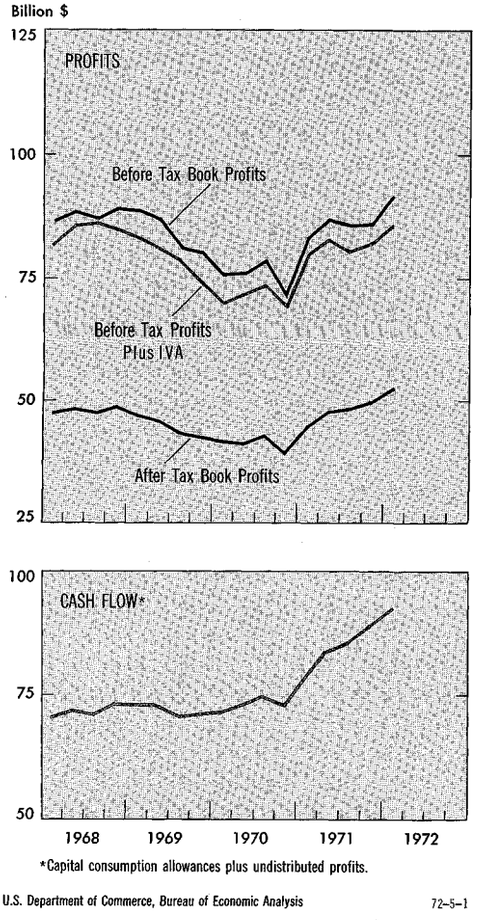
This month's issue of the SURVEY OF CURRENT BUSINESS appears in two parts. This volume is Part I. Part II, which will be released at a later date, will contain articles on economic growth by Edward F. Denison and by Dale W. Jorgenson and Zvi Griliches.

the BUSINESS SITUATION

THERE was little change in the overall employment situation in April. The civilian labor force, at 86.3 million persons, and total civilian employment, at 81.2 million, were both unchanged from March (seasonally adjusted); agricultural employment fell and nonagricultural employment increased. The overall unemployment rate was unchanged at 5.9 percent.

CHART 1

Profits and Cash Flow



*Capital consumption allowances plus undistributed profits.

U.S. Department of Commerce, Bureau of Economic Analysis 72-5-1

The numbers of workers on nonfarm payrolls rose about 180,000 in April, following a stronger gain in March. The largest April gains were in the service-producing sector, where trade employment rose about 95,000, mostly in retail establishments, and State and local governments added 30,000 workers. In the goods-producing sector, manufacturing employment rose 80,000, a bit less than in March. The April gain was fairly widely distributed through both durable and nondurable goods industries, but especially marked in the metal-producing and metal-using industries.

The average workweek in the private nonfarm economy increased 0.2 hour in April to the highest figure since March 1970. The April increase was due mainly to a 0.4 hour increase in the manufacturing workweek. Factory overtime increased slightly, reaching 3.4 hours, the highest level since December 1969 but still well below the peaks of 1966.

Personal income

The preliminary estimate of personal income for April shows an increase of $4 billion (seasonally adjusted annual rate) from the previous month. That gain was about equal to the upward-revised estimate of the March increase. The nonwage income components were about unchanged in the aggregate in April. Thus, higher wages and salaries accounted for the entire net gain in personal income, with payrolls up in all major industry divisions.

Since the start of the year, the monthly personal income figures have included the estimated amounts of retroactive wages paid as lump sums following Pay Board approval. As was pointed out in the April SURVEY, these lump-sum payments have had a significant impact on the size of the month-to-month movement in the wage and salary components of personal income. The amount of lump-sum payments, after rising in both January and February, declined in both March and April. To sort out some of the factors at work in recent months, table 1 shows monthly changes in the wage and salary component of personal income, separated into lump-sum payments (which have occurred only in 1972), pay raises for Federal employees (civilian and military), and all other payments.

Table 1.—Change in Wages and Salaries

[Billions of dollars, seasonally adjusted annual rates]

	Total	Retroactive payments	Government pay raises	All other
1971:				
Oct.	1.5			1.5
Nov.	3.5		1.1	2.4
Dec.	10.0		1.2	8.8
1972:				
Jan.	8.2	.8	2.0	5.4
Feb.	7.6	3.7		3.9
Mar.	2.6	−2.0		4.6
Apr.	4.0	−1.2		5.2

Retail sales

The advance estimate of April retail sales indicates a decline of about 1½ percent, following strong gains in February and March. Easter was very early this year—the first Sunday in April—and although the seasonal adjustments are adjusted for the changing date of Easter, this factor may have had an influence on the estimate of a sales decline in April. Estimated sales declines last month were widespread, however, and probably related in many cases to abnormally cold weather.

Sales of nondurables outlets were off 1 percent in April, according to the advance figures. Total durables sales declined 2¾ percent in April; excluding the auto group, durables sales fell 4 percent.

The most recent evidence on consumer attitudes shows a strengthening in sentiment and willingness to spend, following a prolonged period of caution. The consumer sentiment index prepared by the University of Michigan Survey Research Center jumped sharply in the first quarter of 1972 after a half year of stability at a level not far above the 1970 recession low. The increase reflected a broadly based strengthening of consumer opinion about economic conditions. Other evidence was provided by the latest Census Bureau quarterly survey of consumer buying intentions, taken early in April. It showed increases in the strength of intentions to buy appliances, home furnishings, and automobiles, as well as houses.

National Accounts in the First Quarter

The preliminary BEA estimate shows a sizable gain in corporate profits in the first quarter (chart 1). The book value of profits, before taxes, increased about $5½ billion to a new high of $91½ billion (seasonally adjusted annual rate). The previous high was a rate of about $89 billion in late 1968 and early 1969. Profits tax liability increased $3 billion in the quarter, leaving a gain of $2½ billion in book profits after tax. Corporations' cash flow—undistributed profits plus capital consumption allowances—continued to expand strongly (chart 1).

The book profits figure includes inventory profits or losses which arise because of differences between the replacement cost of goods taken out of inventory and the cost at which they are charged to production. These inventory profits or losses are excluded from the profits component of national income, because they are not income arising from current production. Inventory profits, as measured by the inventory valuation adjustment (IVA), increased about $1½ billion (annual rate) in the first quarter and pretax profits on the national income basis increased $4 billion to a seasonally adjusted annual rate of $86 billion (chart 1). This figure matches the high established in the third quarter of 1968.

The gain in profits in the first quarter was heavily concentrated in manufacturing, especially in the durable goods industries. Profits improvement was particularly striking in automobile and primary metals manufacturing. Outside manufacturing, profits were generally little changed in the first quarter.

GNP revised

The estimates of first quarter gross national product and related items have been somewhat revised from the preliminary figures published in April. On the basis of more complete source data, BEA has made various changes in GNP components, but these are largely offsetting and total GNP is essentially unchanged.

There were also small revisions in the implicit price deflators for various of the GNP components. The implicit price deflator for total GNP—the figure that results when total GNP in constant 1958 prices is divided into total current dollar GNP—was shaved slightly and the estimated growth rate of constant dollar GNP was boosted very slightly to about 5½ percent (annual rate).

The retail sales estimates for both February and March have been revised up substantially from the figures available at mid-April. These revisions were responsible for upward revisions in the GNP estimates of personal consumption expenditures for both durable and nondurable goods. The GNP estimate of business fixed investment has been raised slightly, mainly in spending for nonresidential structures. Although estimated business investment in producers' durable equipment is essentially unrevised, it now appears that investment in trucks did not loom as large in the first quarter as seemed to be the case when the preliminary estimates were prepared. Although the contribution of trucks to the first quarter increase has been revised down, the availability of more complete data has resulted in upward revisions in other segments of investment in producers' durables, leaving the aggregate little changed.

The estimate of government spending was revised down slightly, reflecting small reductions in both Federal and State-local purchases. Also, estimated exports of goods and services were shaved a bit, while the imports figure was raised; these two changes raised the net deficit on goods and services by about $1 billion from the preliminary figure. As now estimated, the goods and services deficit was $1½ billion larger (annual rate) in the first quarter than in the fourth.

It was pointed out in the April SURVEY that the large size of the first quarter increase in personal tax payments to the Federal Government was in good part the result of overwithholding. On the basis of more complete source data, BEA has added another $1½ billion to estimated first quarter Federal tax payments, but the revision reflects the flow of final payments on 1971 tax labilities, not more overwithholding in 1972. Final payments so far this calendar year are running ahead of the figure implied in the January budget document, mainly because capital gains in 1971 were evidently larger than was estimated.

The $1½ billion upward revision of first quarter taxes carried through to a

Public and Private Debt

The data on gross and net public and private debt that usually appear in the May SURVEY will be published this year in June. Pending release of the June issue, the data are available on request from the BEA National Income and Wealth Division.

reduction of about the same amount in disposable income. With consumption spending revised up about $1½ billion, the saving rate has been reduced to 7.0 percent from the preliminary figure of 7.4 percent.

Federal budget deficit shrinks

Federal receipts and expenditures, as measured in the national income accounts, showed a deficit of $13¼ billion (seasonally adjusted annual rate) in the first quarter. This was only a little more than half as large as the deficit for the fourth quarter of 1971. The reduction in the deficit reflected increased personal tax payments—much of the increase consisting of overwithholding—and increased contributions to social insurance funds.

The first quarter data strongly suggest that the Federal deficit on the NIA basis for fiscal 1972 will be well below the $35 billion estimate published in the budget document last January. Receipts, especially personal tax receipts, are running well above the January estimates and expenditures are running lower.

Federal receipts increased $19.1 billion in the first quarter to $222 billion (seasonally adjusted annual rate). About two-thirds of the increase was in personal taxes. Corporate tax liabilities increased $2½ billion, while indirect business taxes fell $½ billion, partly reflecting the mid-December elimination of the import surcharge.

Social insurance contributions rose $4½ billion (seasonally adjusted annual rate), of which about $3 billion resulted from the January 1 increase in the maximum earnings base for social security. Without seasonal adjustment, the increase in the base will have its sharpest effect in the second half of 1972, for workers will reach the maximum later in the year than they formerly did.

Expenditures increased $6¾ billion in the first quarter to $235½ billion. This relatively large advance was centered in defense purchases, which rose $4½ billion. Pay raises accounted for well over half of the defense increase; the remaining increase in defense purchases marks a shift from the downtrend of the past 2 years or more. Transfer payments to persons increased $1 billion, bolstered by a speedup in insurance dividend payments to veterans. Subsidies increased $1 billion, reflecting higher payments to farmers.

Balance of payments

The widening of the goods and services deficit—which is estimated to have increased $1½ billion (seasonally adjusted annual rate) in the first quarter—was a factor contributing unfavorably to the change in the U.S. external position during the quarter. Another unfavorable shift was an increase in U.S. purchases of foreign securities. However, these changes were largely offset by an increase in foreign purchases of U.S. securities and a reduction in reported outflows of nonliquid capital.

Although these shifts about offset one another, the available data indicate that the net liquidity balance and the balance on official reserve transactions both improved—i.e., showed reduced deficits—in the first quarter. The improvements reflected a net reduction in outflows associated with transactions for which first quarter data are not available—flows not covered by the reporting system as well as flows related to direct investment, for which data will become available subsequently. In the case of the official reserve balance, the first quarter improvement also reflected a large decline in net outflows of private liquid capital.

As now estimated, the net liquidity balance registered a deficit of $3.2 billion (seasonally adjusted, not annual rate), down $1.1 billion from the fourth quarter deficit. The balance on official reserve transactions, which benefited from the improvement in outflows of private liquid capital, was in deficit by $3.5 billion, down $2.8 billion from the fourth quarter. Sufficient data are not yet available to calculate the whole spectrum of measures of the U.S external position in the first quarter. Preliminary estimates of these figures—including the balance on current account and the balance on current account and long term capital—will be published in June.

Construction Outlays

The boom in construction spending that began in mid-1970 continued strongly in the opening months of 1972. The value of public and private construction put in place surged $6 billion in the first quarter to a seasonally adjusted annual rate of $121¾ billion. At that level, outlays stood nearly $30 billion—or about one-third—above the recent low recorded in the second quarter of 1970. The recovery since then has been moderate in public construction but very strong in private construction (chart 2).

Private construction

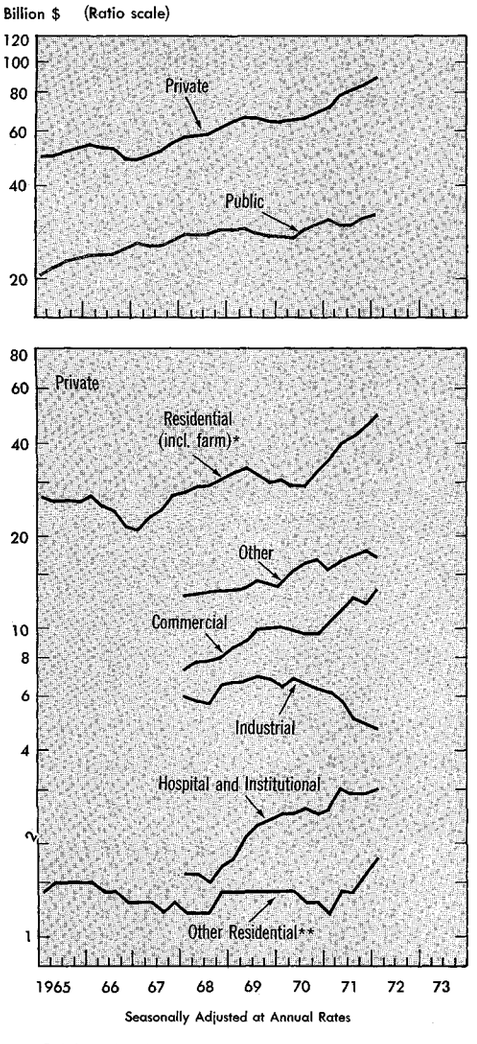
The boom in homebuilding activity has been by far the most important factor in the recovery of private construction. Homebuilding accounts for about one-half of total private construction put in place—though the share has averaged a little more than this (53 percent) in the past year—and swings in spending for residential construction account for most of the swings in aggregate private outlays. (The magnitudes of all the major components of construction are shown in table 2.) The rate of residential spending fell from a peak of $33¼ billion in the spring of 1969 to a low of about $29¼ billion in the spring and summer of 1970; it has risen steeply since then and in the first quarter reached $49¾ billion, 70 percent above mid-1970.

The recovery of residential outlays reflects, with a lag, the very strong increase in housing starts. Starts fell from an average of 1.7 million units (seasonally adjusted annual rate) in the first quarter of 1969 to less than 1.3 million units in the first quarter of 1970. Since then, the rate has been rising without interruption and reached an average 2.5 million units in the first quarter of this year. However, as pointed out in last month's SURVEY, the general expectation seems to be that the starts rate will decline on balance during the rest of this year. The rate hit 2.7 million units in February but fell to 2.4 million in March and 2.1 million in April.

The acceleration of residential outlays has also been due in part to increases in unit construction costs. Average cost, for all units taken together, declined in late 1969 and in 1970 but rose fairly sharply during 1971 and early 1972. These changes in unit cost were not due to changes in the starts mix between single family homes and the much less costly multifamily units, for starts in both categories were affected similarly by the recent decline and recovery in homebuilding. Rather, the 1969–70 reduction in unit cost reflected construction of smaller units and units with fewer amenities, which more than offset increases in the prices of labor and materials. In large part, the shift toward smaller units reflected the introduction of major subsidy programs aimed at stimulating the production of low cost housing. The biggest impact of the subsidy programs, in terms of shifting the new housing mix toward less "house" per unit, was in 1970. Since 1970, subsidy programs have had a proportionately smaller share in the total housing market and the trend has been toward more "house" per unit.

CHART 2

Construction Outlays



*Excludes nonhousekeeping

**Nonhousekeeping (motels, hotels, dormitories, etc)

U.S. Department of Commerce, Bureau of Economic Analysis

Data: Census 72-5-2

"Other residential" construction, as shown on chart 2, consists mainly of the nonhousekeeping category (hotels, motels, dormitories, nurses' homes, and other group housing). Outlays have been fairly stable for some time, but accelerated rather sharply in the past half year or so.

Nonresidential outlays

Aggregate expenditures for private nonresidential construction have also been accelerating since early 1970. They showed little change from the summer of 1969 to early 1970, the period during which residential outlays were shrinking, but have since increased $5½ billion—or 17 percent—to a seasonally adjusted annual rate of $38¼ billion in the first quarter of 1972. Spending for commercial buildings—office, warehouse, stores and service industry buildings—has contributed importantly to that increase. Commercial outlays declined somewhat during the 1970 recession, but increased nearly $4 billion—40 percent—from the third quarter of 1970 to the first quarter of 1972 (chart 2; disaggregated data for nonresidential buildings are not available for the years 1965–67).

On the other hand, the value of industrial construction, mainly factory buildings, has been in a steady downtrend since the summer of 1969 (chart 2). Though it is difficult to make reliable estimates of the magnitude of this decline in real terms, the sharp rise in construction costs in recent years implies that the decline in the physical volume of industrial construction has been very steep. Data are available from the F. W. Dodge Division of McGraw Hill on the square footage of floor space involved in contracts for industrial construction. These data show a precipitious drop (more than 45 percent) from the summer of 1969 to the summer of 1971; since then, however, there appears to have been some reversal. In the case of commercial buildings, by contrast, floor space involved in contracts declined moderately in 1970 and has been increasing for more than a year.

It may well be that the decline in spending for industrial buildings has about run its course. Not only has there been an upturn in the floor space involved in new contracts; in addition, recent surveys of plant and equipment spending expectations show businessmen planning a sharp stepup in outlays in 1972, with manufacturing firms accounting for a very substantial part of the increase.

The past few years have witnessed strong growth in outlays for hospital and institutional construction (including mental hospitals, convalescent and rest homes, nursing homes, and other long term care institutions as well as conventional hospitals). This growth slowed in 1970 but picked up again in the first half of 1971. Outlays have stabilized in the past three quarters at a relatively high annual rate of about $3 billion (chart 2).

Spending for all other private nonresidential construction, which includes public utilities, nonresidential farm construction, religious, educational, and a miscellaneous group, has moved unevenly higher since early 1970. Most of the expansion here has been due to increased outlays by telephone and telegraph companies and other public utility firms. Spending by telephone and telegraph companies increased very sharply in 1970, as some areas of the country experienced severe capacity shortages, but outlays have since leveled off at an annual rate of about $3 billion. Spending by other public util-

ities accelerated fairly sharply in 1970 and 1971. On the basis of the regular BEA surveys of plant and equipment spending, it appears that the electric utilities accounted for the bulk of this acceleration.

Outlays for religious and private educational construction trended steadily downward from early 1968 into 1971. In the spring of 1971, educational construction began a modest recovery that continued in the opening quarter of this year. Religious construction outlays continued to shrink through last summer but picked up somewhat late last year and early this year.

Public construction

Public spending for construction was dampened in 1969 and early 1970 by restrictive monetary and fiscal policies, and the recovery since mid-1970 has been quite modest. Outlays for publicly owned construction increased only $5 billion from the spring of 1970 to the opening quarter of this year, when they were at an annual rate of $32 billion. The sluggish growth of public spending contrasts with the boom in the private sector, and the public share, which in the past decade has typically been 30 percent, has declined steadily to average about 26 percent in the first quarter of 1972.

Table 2.—New Construction Put in Place

[Billions of dollars]

	1970	1971	First quarter 1972 [1]
Total	**94.3**	**109.0**	**121.7**
Private	**66.1**	**79.1**	**89.7**
Residential structures	31.7	42.4	51.5
Other residential (nonhousekeeping)	1.4	1.4	1.8
Commercial	9.8	11.6	13.4
Industrial	6.5	5.4	4.7
Hospital and institutional	2.5	2.9	3.0
Religious	.9	.8	.9
Educational	.9	.8	1.0
Public utilities	11.2	12.3	n.a.
Telephone and telegraph	3.0	3.0	3.1
Other private	2.6	2.8	n.a.
Public	**28.1**	**29.9**	**32.0**
Buildings	10.7	11.4	11.9
Highways and streets	10.0	10.6	11.3
Military	.7	.9	1.0
Conservation and development	1.9	2.1	2.3
Other public	4.8	4.9	5.4

N.a. Not available.
1. Average for the first quarter, seasonally adjusted annual rate; categories of public construction are averages of January and February, seasonally adjusted annual rate.

Source: Bureau of the Census.

State and local governments, which account for 85 to 90 percent of total public construction outlays (though a large part is financed with Federal grants in aid) were severely squeezed by the tight credit conditions of 1969 and early 1970. State-local borrowing was drastically curtailed during that period and a substantial amount of construction was postponed and in some cases canceled. With the return of easy credit availability after mid-1970, borrowing by these governments accelerated very sharply. Construction outlays, however, were slow to reflect the increase in borrowing. In view of the considerable construction needs facing these governments, this development was somewhat surprising. It probably reflected the high priority given to increasing liquidity, which had been severely reduced in 1969–70. In the fourth quarter of 1971 and the first quarter of this year, however, State and local construction outlays were increasing sharply.

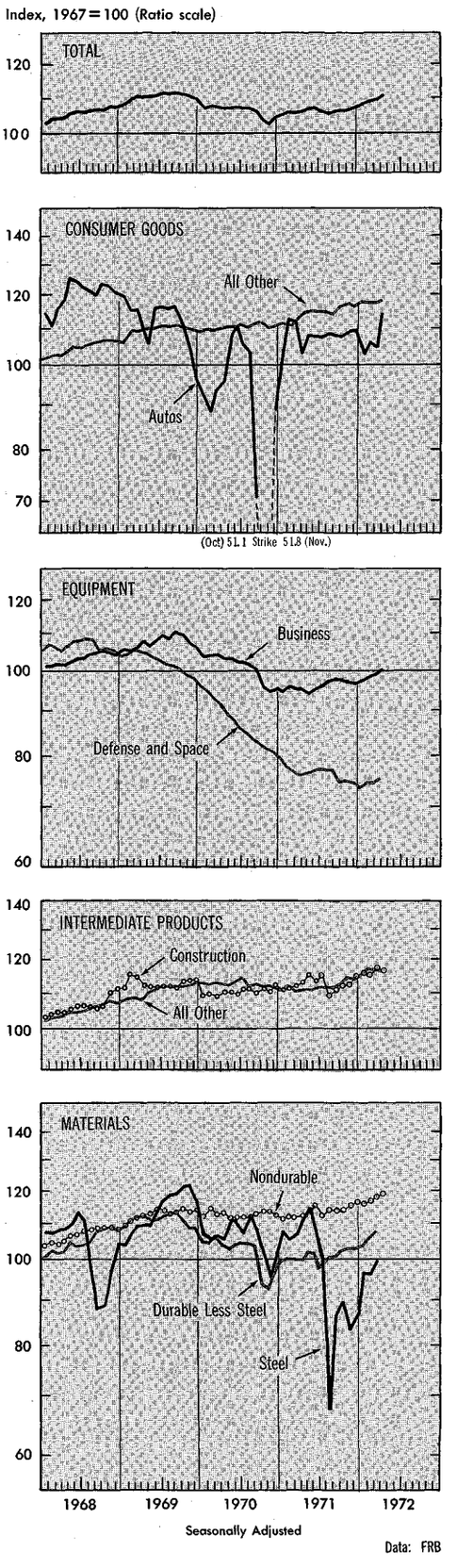
Most of the recent acceleration was in spending for highways and streets and public buildings; together these two categories account for nearly three-fourths of total public construction outlays. Outlays for conservation and development have also been in a moderate, but fairly steady, uptrend since early 1970. Spending for other public construction—sewer systems, water supply facilities, and a miscellaneous group—has been generally holding in a narrow range between $4¾ billion and $5 billion since early 1970, though there was some stepup in the early months of this year. Federal military construction spending, which declined steadily from mid-1969 through 1970, was rising in 1971 and early this year.

Industrial Production

Industrial production increased sharply in April, continuing the acceleration that has been evident since late last year (chart 3). The Federal Reserve index rose one percent—the strongest increase since December 1970, when production rebounded following settlement of the auto strike. Output in virtually all market categories recorded substantial gains in April. The

CHART 3

Industrial Production



Data: FRB

U.S. Department of Commerce, Bureau of Economic Analysis 72-5-3

increase brought the production index to a level less than one percent below the peak reached in the summer of 1969. Following that peak, output declined 8¼ percent to its cyclical low in November 1970.

Materials and intermediate products

About half the weight in the industrial production index is assigned to the output of materials and intermediate products, i.e., output to be further processed in the industrial sector (e.g., chemicals, parts for equipment and consumer goods, most steel) or for use outside the sector (e.g., aviation fuels, construction materials). The other half of the index measures "final products," i.e., business and defense equipment and output destined for consumer markets.

Materials production increased in the first half of last year, declined sharply in the summer and early fall, and has been rising sharply since then. The production pattern of durable materials was significantly distorted by strikes, threatened or actual, in 1971. The threat of a steel strike led users to build strike-hedge inventories, which boosted production in the first half of the year and depressed production in the second half when the inventory excess was being run off. Output of durable materials other than steel was rising slowly in the first half of 1971 but fell somewhat in the summer. In part, the summer cutback reflected a railroad strike which reduced the availability of freight cars and adversely affected coal production; a strike in the copper industry was also a factor.

Aggregate production of durable materials was essentially stable in the fall of last year, but increased nearly 8 percent during the first four months of 1972. Steel output increased sharply early this year but has since leveled off, while the rise in durable materials other than steel has been steady and strong. The growth of output of nondurable materials accelerated in recent months, primarily because of a stepup in chemicals production.

The production of intermediate products was also rising strongly in the early months of this year, though the figures for April show a slight decline in construction products. The output of intermediate products was only moderately affected by the 1969–70 recession. Production was rising in the first half of 1971 but the uptrend was interrupted last summer due to a decline in construction materials output. That decline, however, was not due to any real cutback in construction demands but rather reflected the drop in steel output subsequent to the steel labor settlement.

Final products

A strengthening in business equipment production has also been evident since late 1971. Output declined 15 percent from its peak in late summer 1969 to its trough in late 1970—the most severe contraction since the 1957–58 recession—and was little changed during most of 1971. Since December, however, business equipment output has been rising steadily, if not steeply, seeming to confirm that an upturn in capital investment is underway. New orders for producers' capital goods have been expanding steadily during the past year and the capital appropriations of manufacturing firms, which declined steeply from late 1969 to mid-1971, rose last summer and showed little change in the fourth quarter—the latest period for which data are available.

Output of defense-related equipment declined steeply from the summer of 1968 to January of this year, but has been rising since then. The Federal budget program published in January implies that defense equipment production is likely to accelerate well into fiscal year 1973. The budget proposes an acceleration of new weapons programs under new obligational authority—particularly an undersea long-range missile system and a new addition to the nuclear carrier fleet.

Consumer goods

After virtual stability since last November, consumer goods production rose about 1 percent in April. Much but by no means all of that increase reflected a surge in auto production. Auto output rose 10 percent in April (about one million units at an annual rate) the biggest advance in 2½ years.

Consumer goods production was affected only moderately by the 1969–70 recession. Output fell in late 1969 and early 1970, but regained most of that loss by midyear. The recovery was interrupted in the latter part of 1970 by the auto strike, but resumed in 1971. Although auto production accounts for only 6½ percent of the consumer markets production index, the sharp movements in auto output have a strong influence on the movement of the total consumer goods index. Other output for the consumer market shows considerably milder cyclical swings, with a general uptrend over time.

Hourly Earnings Indexes

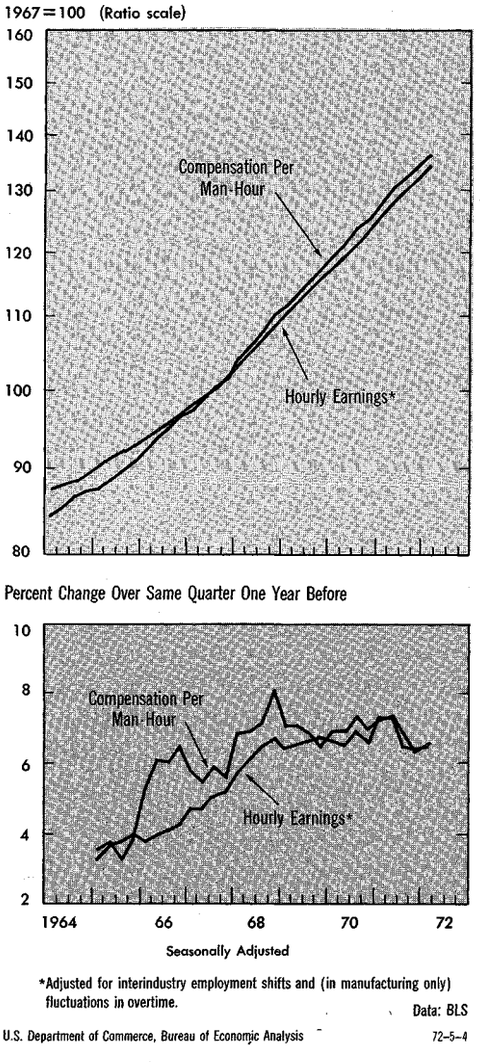
The Bureau of Labor Statistics now publishes indexes of average hourly earnings in the private nonfarm economy adjusted to exclude the effects of interindustry employment shifts and of fluctuations in the amount of manufacturing overtime. As a result of these adjustments, the new indexes give a closer approximation to the movement of hourly wage rates than do other published series relating to employee compensation. The new indexes cover production and nonsupervisory workers. They are published monthly, seasonally adjusted, for the total private nonfarm economy and for seven major industry divisions—manufacturing, mining, contract construction, transportation and public utilities, trade, finance-insurance-real estate, and services. Monthly data are available back to January 1964.

The adjusted earnings indexes are derived from data gathered in the monthly BLS survey of nonfarm establishments' payrolls. Average hourly earnings are calculated for industries at the three-digit level in the Standard Industrial Classification; examples of three-digit industries are roofing and sheetmetal work (part of contract construction), office and computing machinery manufacturing, gas companies (part of transportation and utilities), and life insurance companies (part of finance-insurance-real estate). In manufacturing industries, average hourly earnings are calculated excluding

overtime; in other industries, however, separate data on overtime are not available and overtime pay is therefore included in average hourly earnings. The industry hourly earnings figures are aggregated to industry divisions (manufacturing, mining, etc.) and to the private nonfarm total using 1967 manhour weights; that is, the overall averages are calculated as though the industry composition of manhours always remained as it was in 1967. The resulting hourly earnings figures, for industry divisions and the private nonfarm economy, are published as indexes with the base 1967=100.

CHART 4

Private Nonfarm Sector: Compensation Per Man-Hour and Adjusted Hourly Earnings



*Adjusted for interindustry employment shifts and (in manufacturing only) fluctuations in overtime.

Data: BLS

U.S. Department of Commerce, Bureau of Economic Analysis 72-5-4

Although the indexes are adjusted for interindustry employment shifts at the three-digit level, they are not adjusted for intraindustry shifts, e.g., between typewriter manufacturing and scale and balance manufacturing, both of which are components of office and computing machinery manufacturing, a three-digit industry.

Relationship to compensation per man-hour

The adjusted index of average hourly earnings in the private nonfarm economy is shown on chart 4 with the index of private nonfarm compensation per man-hour. The two measures differ in both scope and coverage. The hourly compensation series includes both wages and salaries and supplements to wages and salaries as defined in national income, i.e., employer contributions to social insurance funds and to private pension and welfare funds, compensation for injuries paid by employers, and miscellaneous other items. Also, the compensation series refers to all workers, including supervisory personnel and the self-employed; it is calculated quarterly in conjunction with the estimate of output per man-hour in the private nonfarm economy. Despite these differences, the two series have shown roughly similar movements in the period for which both are available. Chart 4 shows that their rates of increase (calculated over four-quarter spans to reduce random fluctuations) diverged significantly only in 1966 and 1968. In both those years, there were major increases in social security taxes paid by employers, which are included in compensation per man-hour but not in the hourly earnings figure.

Relationship to average hourly earnings

The index of average hourly earnings adjusted for interindustry shifts and for manufacturing overtime has generally moved very similarly to average hourly earnings not adjusted for these factors. The noticeable divergences occurred in 1966 and in 1970–71, and appeared to be related to cyclical developments in the economy.

In 1966, the adjusted index increased much less rapidly than actual hourly earnings. This is presumably because in 1966, the peak year of a capital goods boom, manhours were more heavily concentrated in industries with high wage levels and/or above-average rates of wage change than they were in 1967—the base year for the earnings index. Also, there was more manufacturing overtime in 1966 than in 1967. In 1970–71, the opposite was true. Reflecting the effects of the 1970 recession and the rather sluggish pace of recovery in 1971, actual hourly earnings increased less rapidly than the adjusted earnings index.

Indexes for major industry divisions

Adjusted indexes of hourly earnings are calculated for seven broad industry divisions. Though these indexes are far from pure measures of hourly wage rates, they nevertheless do shed some light on the differences among industry divisions in the behavior of wage rates.

Table 3 splits the period for which data are available—beginning 1964—into 3 segments. The first runs from the first quarter of 1964 through the fourth quarter of 1968, a period during which the adjusted hourly earnings index for the total private nonfarm economy was rising at an accelerating rate, as shown by chart 4. The second time segment runs through the fourth quarter of 1970, and the third segment runs from the fourth quarter of 1970 through the first quarter of 1972. Although the adjusted index for the total private nonfarm economy has been advancing at a fairly uniform rate since the end of 1968, the indexes for some of the major divisions behaved very differently after the fourth quarter of 1970 as compared with the period from the fourth quarter of 1968 to the fourth quarter of 1970.

Table 3.—Percent Change in Adjusted Average Hourly Earnings

[Compound annual rate, seasonally adjusted]

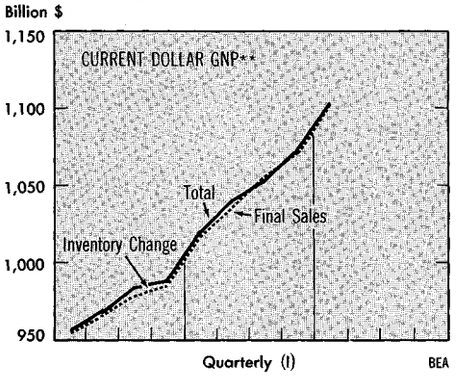
	1964–I to 1968–IV	1968–IV to 1970–IV	1970–IV to 1972–I
Private nonfarm	4.7	6.6	6.9
Mining	4.8	6.4	7.6
Manufacturing	4.2	6.1	6.8
Construction	5.2	9.5	7.9
Transportation and public utilities	4.4	6.3	10.4
Wholesale and retail trade	5.1	6.2	6.0
Finance, insurance and real estate	4.4	6.1	5.6
Services	5.4	7.3	5.7

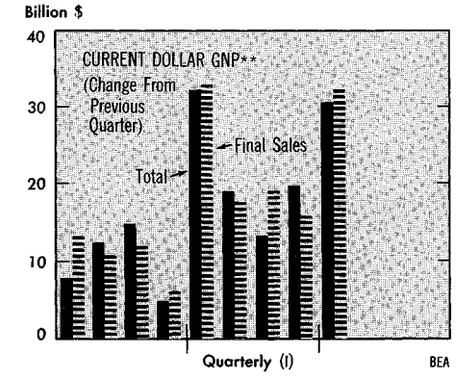
Source: Bureau or Labor Statistics.

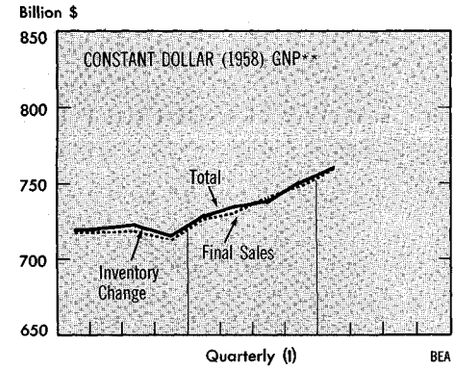
CHART 5

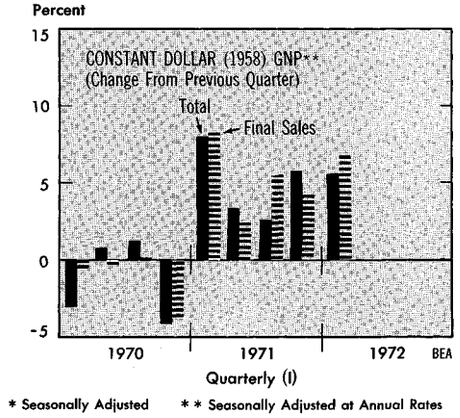
- **More complete data show GNP up $30¾ billion in first quarter**
- **In April: The jobless rate remained at 5.9 percent; nonagricultural payroll employment rose 182,000**
- **Wholesale prices increased 0.1 percent; industrial prices rose 0.3 percent**

TOTAL PRODUCTION

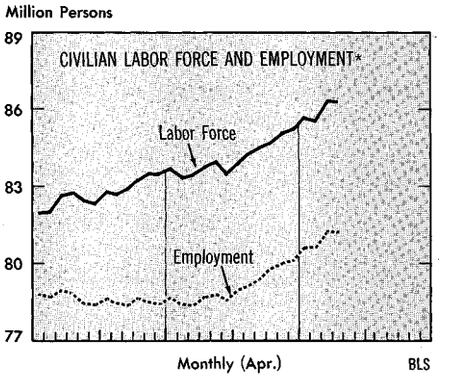


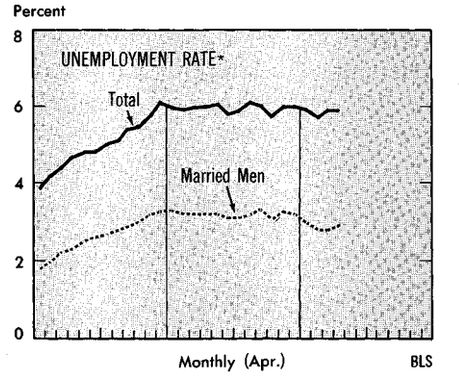


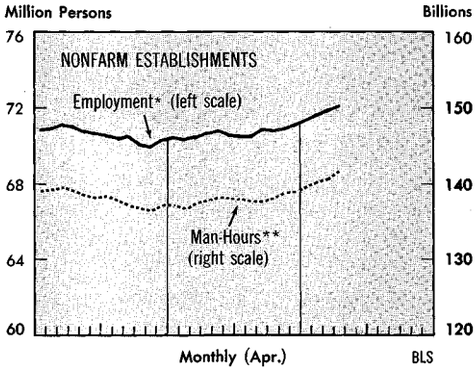


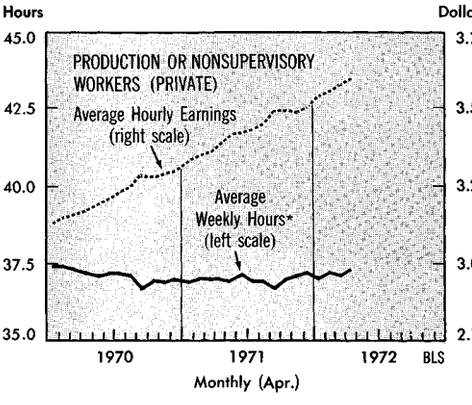


THE LABOR MARKET

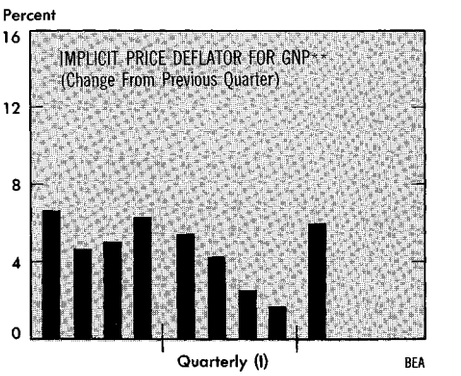


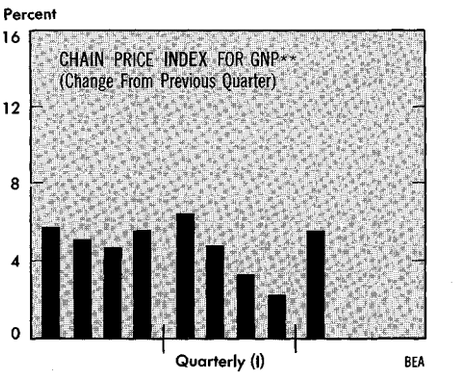


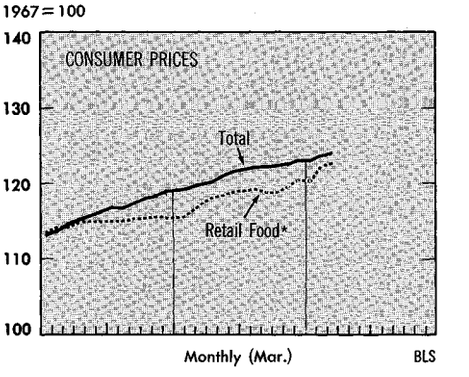


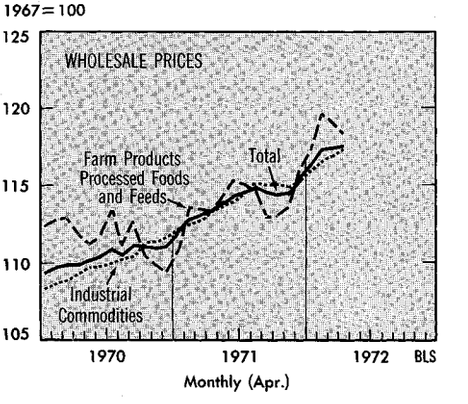


PRICES









* Seasonally Adjusted ** Seasonally Adjusted at Annual Rates

U.S. Department of Commerce, Bureau of Economic Analysis

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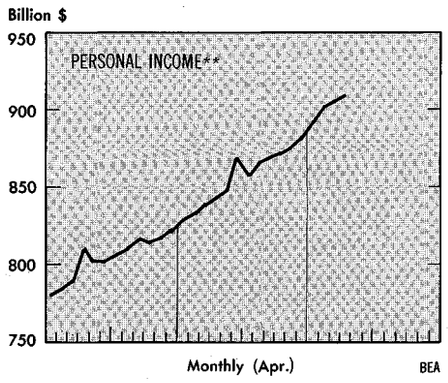
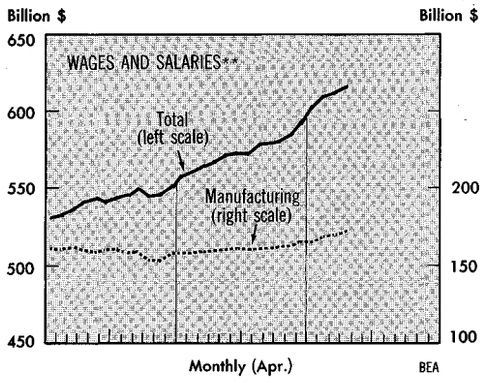
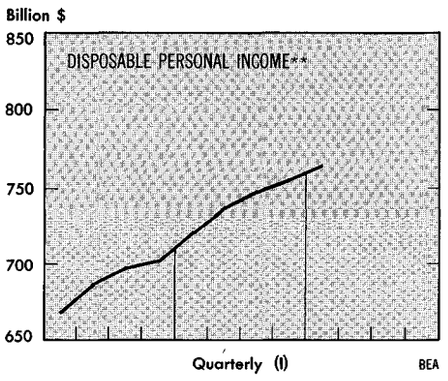
CHART 6

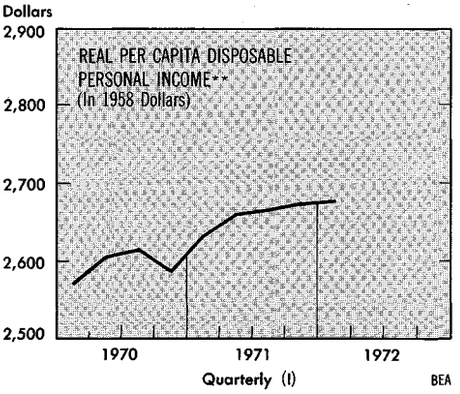
- **In April: Higher wages and salaries accounted for a $4 billion increase in personal income**
- **Domestic-model auto sales edged up; imports were down slightly**
- **Housing starts declined 10 percent; permits increased 3 percent**

INCOME OF PERSONS

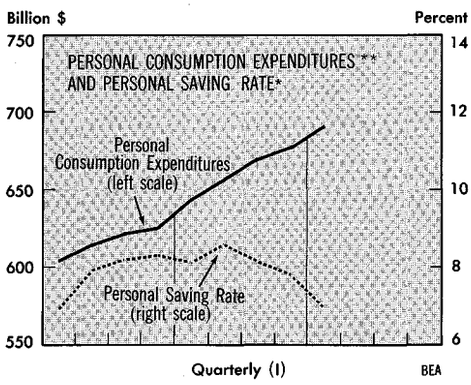


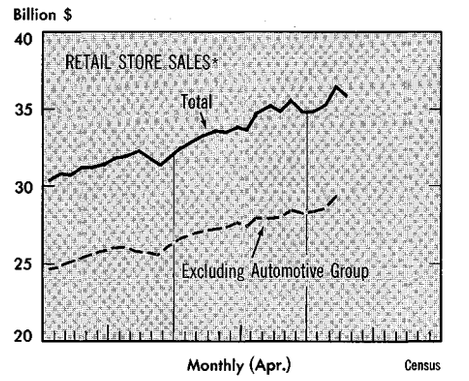


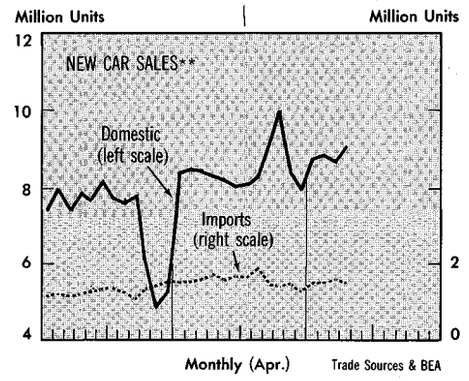


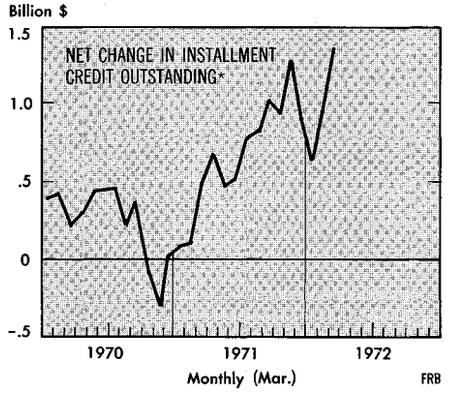


CONSUMPTION AND SAVING

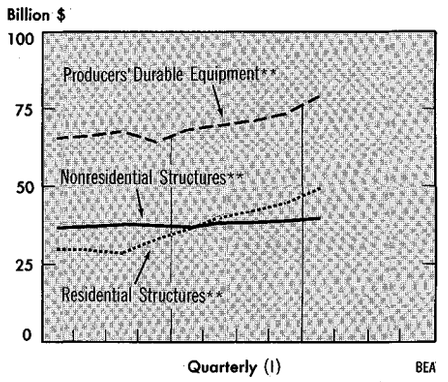


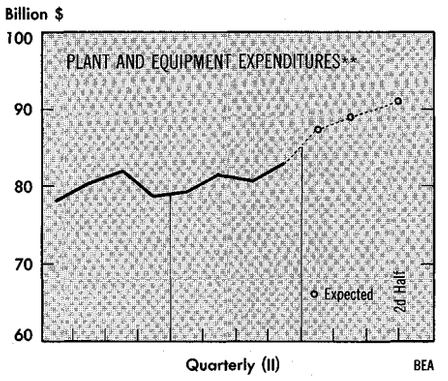


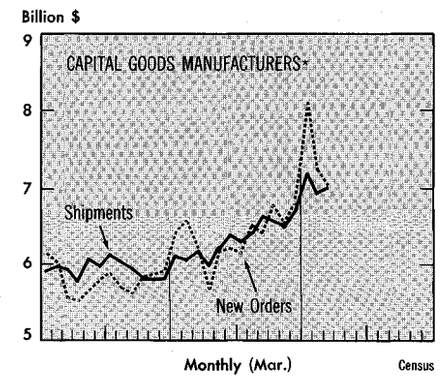


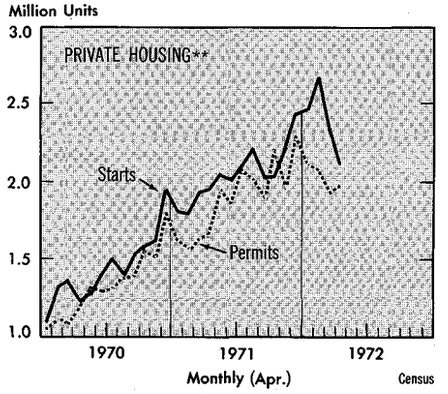


FIXED INVESTMENT









* Seasonally Adjusted ** Seasonally Adjusted at Annual Rates

U.S. Department of Commerce, Bureau of Economic Analysis

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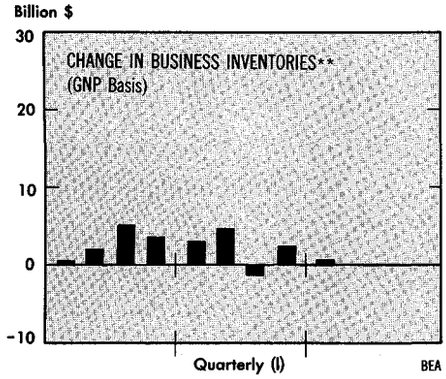
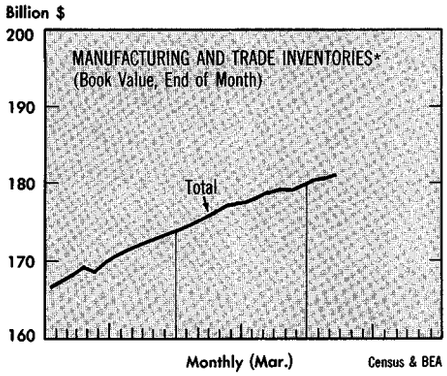
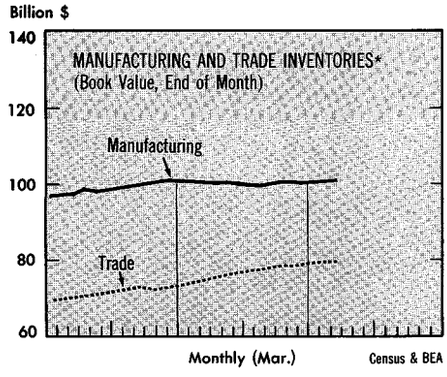
CHART 7

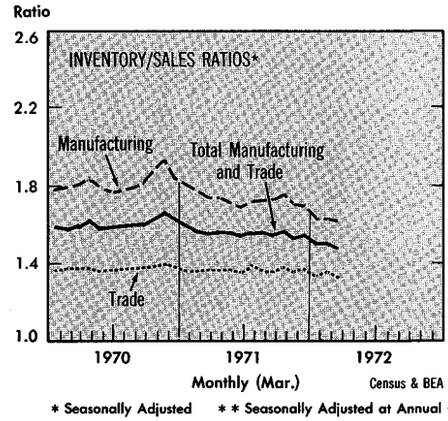
- **Exports increased a little more than imports in March and the trade deficit narrowed slightly**
- **In first quarter: Balance of payments deficit lower on both the net liquidity and official reserve bases**
- **Federal budget (NIA basis) registered a deficit of $13¼ billion**

INVENTORIES

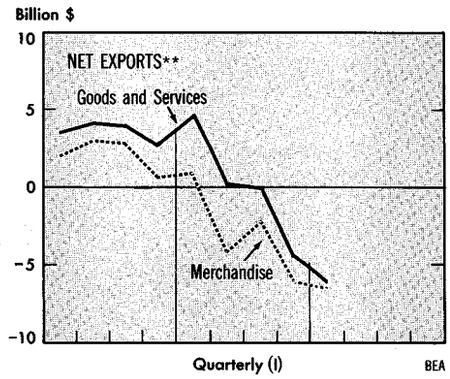


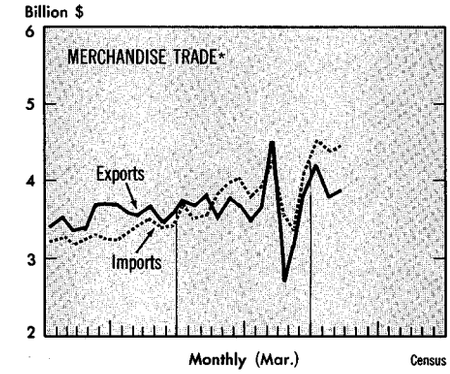


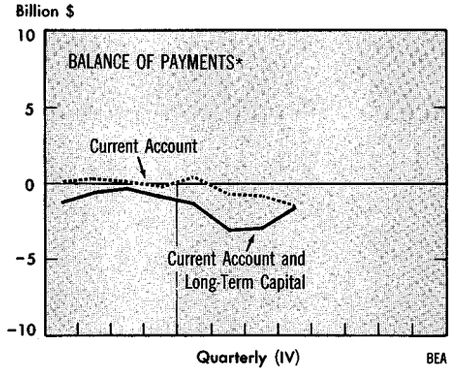


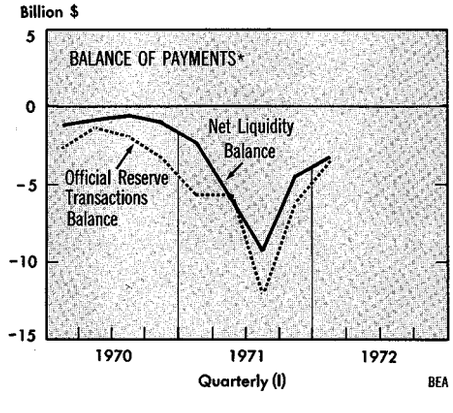


FOREIGN TRANSACTIONS

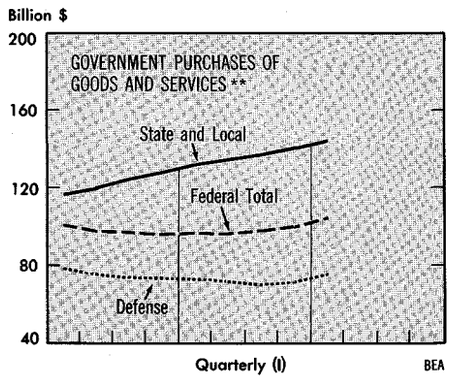


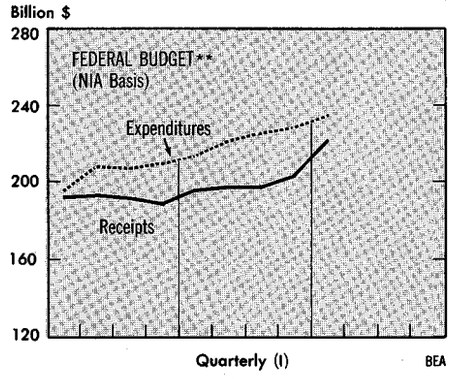


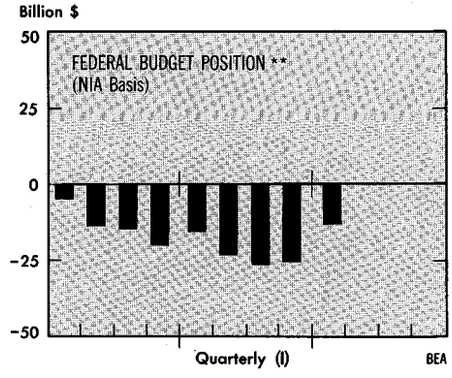


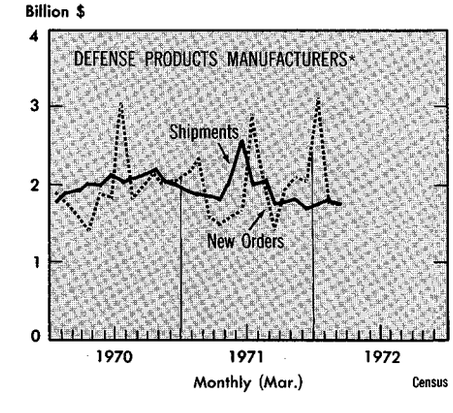


GOVERNMENT









* Seasonally Adjusted * * Seasonally Adjusted at Annual Rates

U.S. Department of Commerce, Bureau of Economic Analysis

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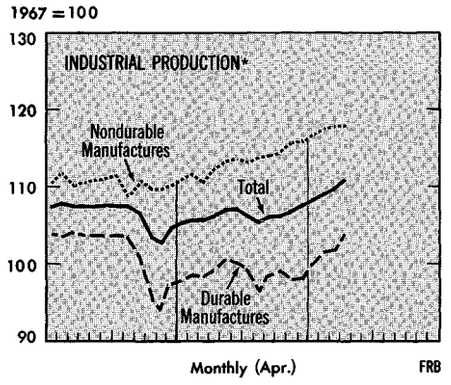
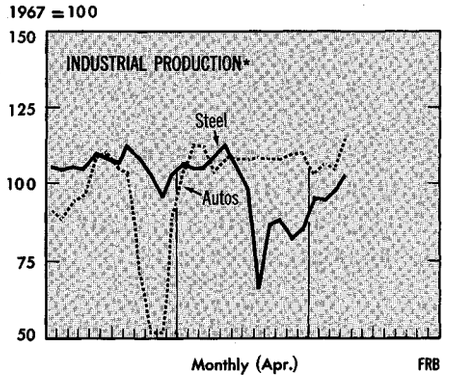
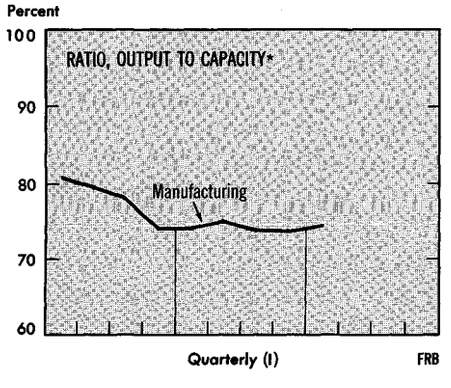
CHART 8

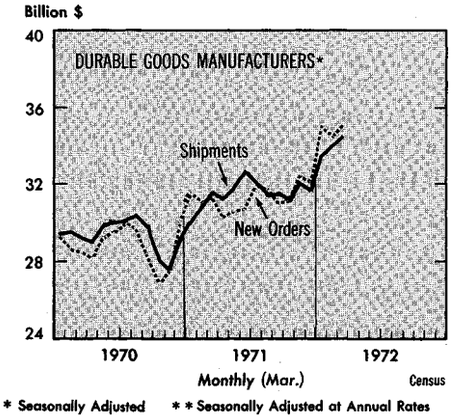
- **In April: Industrial production advanced 1 percent**
- **Money supply and bank credit increased further**
- **In first quarter: Corporate profits before tax (including IVA) rose $4 billion**

INDUSTRIAL PRODUCTION

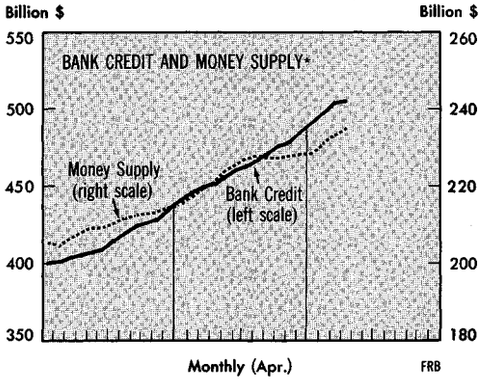


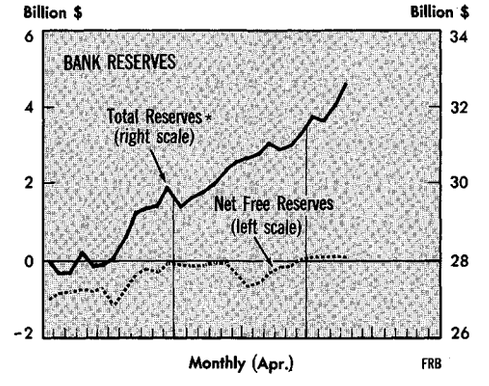


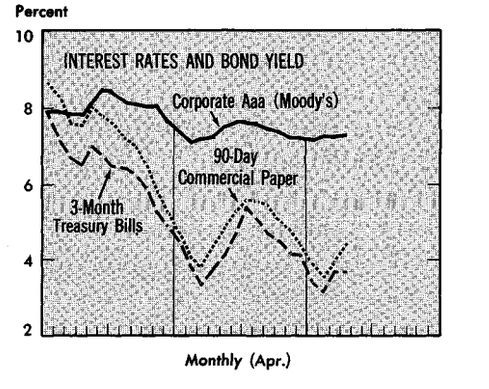


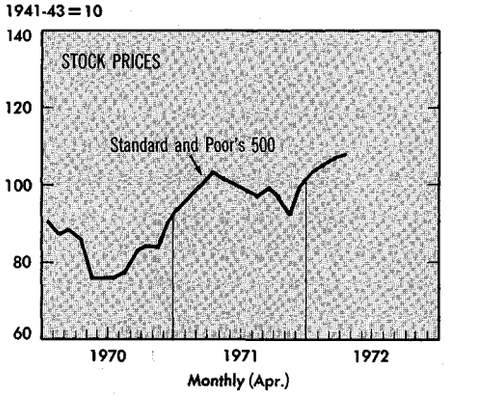


MONEY, CREDIT, AND SECURITIES MARKETS

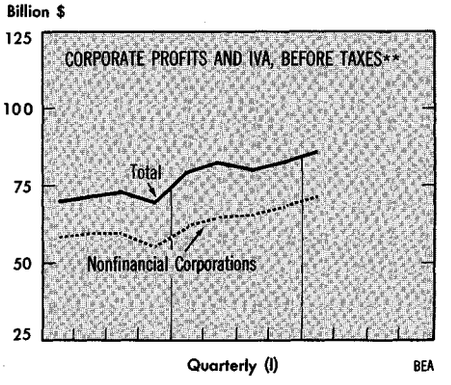


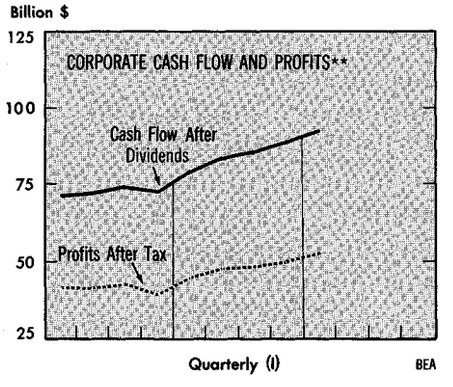


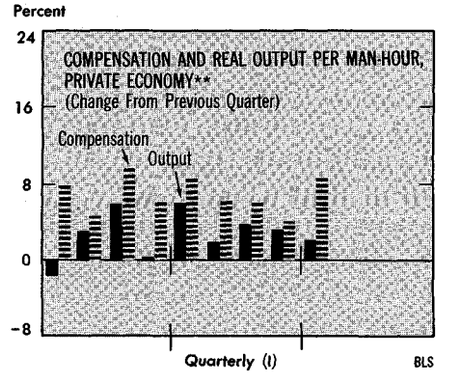


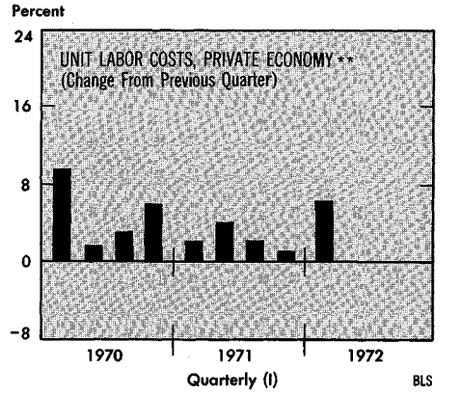


PROFITS AND COSTS









* Seasonally Adjusted ** Seasonally Adjusted at Annual Rates

U.S. Department of Commerce, Bureau of Economic Analysis

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NATIONAL INCOME AND PRODUCT TABLES

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I
			Seasonally adjusted at annual rates								Seasonally adjusted at annual rates					
	Billions of current dollars								Billions of 1958 dollars							

Table 1.—Gross National Product in Current and Constant Dollars (1.1, 1.2)

Gross national product	974.1	1,046.8	988.4	1,020.8	1,040.0	1,053.4	1,072.9	1103.6	720.0	739.4	715.9	729.7	735.8	740.7	751.3	761.6
Personal consumption expenditures	615.8	662.1	624.7	644.9	657.4	668.8	677.2	691.8	475.9	491.8	474.2	484.8	489.4	494.3	498.9	505.1
Durable goods	88.6	100.5	84.9	96.6	99.1	102.8	103.6	107.6	81.4	89.5	76.6	85.9	87.8	91.2	93.0	95.5
Nondurable goods	264.7	278.6	270.9	273.2	277.8	280.2	283.3	288.0	207.3	211.4	209.7	210.0	211.5	211.6	212.7	214.3
Services	262.5	282.9	268.9	275.0	280.5	285.8	290.3	296.2	187.2	190.9	187.9	188.9	190.1	191.4	193.2	195.3
Gross private domestic investment	135.3	151.6	137.3	143.3	152.9	150.8	159.4	168.3	102.2	108.5	101.2	104.3	110.0	106.7	112.9	116.5
Fixed investment	132.5	149.3	133.6	140.2	148.3	152.0	157.0	167.7	99.9	106.3	98.1	101.8	105.9	107.2	110.5	116.2
Nonresidential	102.1	108.7	100.8	104.7	108.3	109.3	112.6	118.7	78.6	79.3	75.5	77.7	79.1	78.9	81.5	84.8
Structures	36.8	38.2	37.1	36.7	38.5	38.7	39.0	39.8	24.2	22.4	23.5	22.6	22.9	22.1	22.1	21.9
Producers' durable equipment	65.4	70.5	63.7	68.1	69.8	70.6	73.6	78.9	54.4	56.9	52.0	55.0	56.2	56.8	59.3	62.9
Residential structures	30.4	40.6	32.8	35.4	40.0	42.7	44.4	49.0	21.3	27.0	22.6	24.1	26.7	28.3	29.0	31.4
Nonfarm	29.7	40.1	32.2	35.0	39.5	42.1	43.8	48.4	20.9	26.7	22.2	23.8	26.4	27.9	28.6	31.0
Farm	.6	.5	.6	.4	.5	.6	.6	.6	.4	.4	.4	.3	.3	.4	.4	.4
Change in business inventories	2.8	2.2	3.7	3.1	4.6	−1.2	2.4	.6	2.3	2.1	3.1	2.5	4.1	−.5	2.4	.3
Nonfarm	2.5	1.7	3.3	2.9	4.1	−2.0	2.0	.1	2.0	1.7	2.8	2.3	3.6	−1.2	1.9	−.1
Farm	.3	.5	.4	.2	.5	.8	.5	.4	.3	.5	.4	.2	.5	.7	.5	.4
Net exports of goods and services	3.6	.0	2.7	4.7	.1	.0	−4.6	−6.2	2.4	−.1	2.1	3.0	−.5	.1	−3.0	−4.1
Exports	62.9	65.3	63.2	66.2	66.5	68.2	60.4	69.2	52.2	52.1	51.9	52.9	53.1	54.5	47.7	54.0
Imports	59.3	65.3	60.5	61.5	66.4	68.2	65.0	75.4	49.8	52.2	49.8	49.8	53.7	54.4	50.8	58.0
Government purchases of goods and services	219.4	233.0	223.7	227.9	229.6	233.8	240.8	249.6	139.4	139.2	138.3	137.6	137.0	139.6	142.6	144.1
Federal	97.2	97.6	95.9	96.4	96.0	97.6	100.3	104.9	65.4	62.2	63.2	61.3	60.7	62.7	64.0	64.2
National defense	75.4	71.4	73.2	72.6	71.4	70.2	71.4	75.8	-------	-------	-------	-------	-------	-------	-------	-------
Other	21.9	26.2	22.7	23.7	24.6	27.4	28.9	29.0	-------	-------	-------	-------	-------	-------	-------	-------
State and local	122.2	135.5	127.9	131.6	133.6	136.2	140.5	144.8	74.0	77.0	75.2	76.3	76.3	76.8	78.6	79.9

Table 2.—Gross National Product by Major Type of Product in Current and Constant Dollars (1.3, 1.5)

Gross national product	974.1	1,046.8	988.4	1,020.8	1,040.0	1,053.4	1,072.9	1103.6	720.0	739.4	715.9	729.7	735.8	740.7	751.3	761.6
Final sales	971.3	1,044.5	984.7	1,017.7	1,035.4	1,054.6	1,070.4	1103.0	717.7	737.3	712.8	727.2	731.7	741.2	748.9	761.3
Change in business inventories	2.8	2.2	3.7	3.1	4.6	−1.2	2.4	.6	2.3	2.1	3.1	2.5	4.1	−.5	2.4	.3
Goods output	468.3	494.3	467.7	485.5	490.8	496.2	504.5	517.3	383.0	393.6	376.7	388.1	390.2	394.4	401.6	407.0
Final sales	465.5	492.0	464.0	482.4	486.2	497.4	502.0	516.8	380.7	391.5	373.6	385.6	386.1	394.9	399.3	406.7
Change in business inventories	2.8	2.2	3.7	3.1	4.6	−1.2	2.4	.6	2.3	2.1	3.1	2.5	4.1	−.5	2.4	.3
Durable goods	180.2	194.1	169.7	192.8	193.0	193.9	196.6	208.1	156.1	163.9	144.4	162.4	162.3	163.7	167.1	174.5
Final sales	180.8	193.7	173.1	189.4	190.6	196.4	198.4	207.9	156.8	163.4	147.5	159.6	160.2	165.3	168.4	174.4
Change in business inventories	−.6	.4	−3.4	3.5	2.3	−2.5	−1.8	.2	−.6	.5	−3.1	2.8	2.2	−1.6	−1.4	.1
Nondurable goods	288.1	300.2	297.9	292.7	297.8	302.3	307.9	309.2	226.9	229.7	232.3	225.7	227.8	230.7	234.6	232.5
Final sales	284.7	298.3	290.9	293.1	295.5	301.0	303.6	308.8	223.9	228.1	226.1	226.0	225.9	229.6	230.8	232.2
Change in business inventories	3.4	1.9	7.1	−.4	2.3	1.3	4.3	.3	3.0	1.6	6.2	−.3	2.0	1.1	3.7	.2
Services	410.3	443.3	420.6	432.3	441.0	446.3	453.6	465.0	273.4	278.6	274.5	276.2	278.4	278.9	280.8	283.3
Structures	95.5	109.2	100.1	102.9	108.2	110.8	114.7	121.3	63.6	67.2	64.7	65.4	67.2	67.3	68.8	71.4

Table 3.—Gross National Product by Sector in Current and Constant Dollars (1.7, 1.8)

Gross national product	974.1	1,046.8	988.4	1,020.8	1,040.0	1,053.4	1,072.9	1103.6	720.0	739.4	715.9	729.7	735.8	740.7	751.3	761.6
Private	859.8	922.7	871.6	899.2	916.9	928.9	945.9	971.6	659.4	678.3	655.4	668.9	674.9	679.4	689.8	699.8
Business	823.4	880.7	833.5	859.2	874.6	886.9	902.1	927.4	638.5	655.3	634.1	646.6	651.4	656.9	666.3	676.6
Nonfarm	795.2	850.7	806.4	831.1	845.7	856.1	870.0	895.3	614.6	629.7	609.2	621.7	626.4	630.1	640.7	653.0
Farm	28.2	30.0	27.1	28.1	28.9	30.8	32.0	32.1	23.9	25.6	24.9	24.9	25.0	26.8	25.6	23.6
Households and institutions	31.7	35.5	33.0	34.2	35.0	35.9	36.8	38.0	17.0	17.8	17.1	17.6	17.7	17.8	18.1	18.5
Rest of the world	4.6	6.5	5.1	5.8	7.3	6.0	7.0	6.2	4.0	5.2	4.2	4.7	5.8	4.7	5.4	4.7
General government	114.4	124.0	116.8	121.5	123.1	124.5	127.0	132.0	60.6	61.1	60.5	60.8	60.9	61.3	61.5	61.8

HISTORICAL STATISTICS

National income and product data for 1929–63 are in *The National Income and Product Accounts of the United States, 1929–1965, Statistical Tables* (available at $1 from Commerce Department Field Offices or the Superintendent of Documents; see addresses inside front cover). Each July SURVEY contains preliminary data for the latest 2 years and final data for the preceding 2. The July 1971 issue has data for 1967–70. Prior July issues have final data as follows: 1964–65, July 1968; 1965–66, July 1969; 1966–67, July 1970. BEA will provide on request a reprint of final data for the years 1964–67.

Table 4.—Relation of Gross National Product, National Income, and Personal Income (1.9)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I*
	Billions of dollars, seasonally adjusted at annual rates							
Gross national product	974.1	1,046.8	988.4	1,020.8	1,040.0	1,053.4	1,072.9	1,103.6
Less: Capital consumption allowances	87.6	95.2	89.8	92.0	93.9	96.2	98.7	101.2
Equals: Net national product	886.5	951.6	898.6	928.8	946.1	957.2	974.2	1,002.4
Less: Indirect business tax and nontax liability	92.9	102.1	95.8	99.0	100.2	103.0	106.2	107.9
Business transfer payments	3.9	4.3	4.1	4.2	4.2	4.3	4.4	4.5
Statistical discrepancy	−4.5	−4.9	−1.6	−4.3	−4.9	−4.7	−5.8	−7.2
Plus: Subsidies less current surplus government enterprises	1.7	1.0	1.7	1.8	.7	.7	.7	1.5
Equals: National income	795.9	851.1	802.1	831.7	847.3	855.2	870.1	898.7
Less: Corporate profits and inventory valuation adjustment	70.8	81.0	69.0	79.5	82.5	80.0	82.0	86.0
Contributions for social insurance	57.6	65.2	58.5	64.0	64.6	65.4	66.6	71.5
Wage accruals less disbursements	.0	.0	.0	.0	.0	.0	.0	−1.7
Plus: Government transfer payments to persons	75.6	90.4	80.7	83.7	92.2	92.5	93.3	95.0
Interest paid by government (net) and by consumers	31.7	31.9	32.4	31.8	31.4	32.2	32.2	31.9
Dividends	25.0	25.5	25.0	25.6	25.4	25.7	25.3	25.8
Business transfer payments	3.9	4.3	4.1	4.2	4.2	4.3	4.4	4.5
Equals: Personal income	803.6	857.0	816.7	833.5	853.4	864.6	876.7	900.1

Table 5.—Gross Auto Product in Current and Constant Dollars (1.15, 1.16)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I*
	Billions of current dollars							
Gross auto product [1]	30.6	40.6	22.0	42.1	39.8	42.1	38.4	39.3
Personal consumption expenditures	28.0	35.3	23.5	33.9	34.4	36.8	36.1	36.1
Producers' durable equipment	4.9	6.2	4.1	6.0	6.1	6.5	6.4	6.4
Change in dealers' auto inventories	−.9	1.3	−3.6	4.1	1.3	1.4	−1.6	−.6
Net exports	−1.8	−2.6	−2.3	−2.2	−2.3	−3.0	−2.9	−3.0
Exports	2.0	2.6	1.4	2.6	2.7	2.9	2.2	2.7
Imports	3.7	5.2	3.7	4.8	5.0	5.8	5.1	5.7
Addenda:								
New cars, domestic [2]	26.0	35.4	17.1	36.7	34.1	37.6	33.4	34.0
New cars, foreign	6.3	7.8	6.5	7.9	8.2	7.8	7.4	8.4
	Billions of 1958 dollars							
Gross auto product [1]	28.3	36.1	19.6	36.8	34.7	37.5	35.2	35.1
Personal consumption expenditures	25.9	31.3	21.1	29.5	29.9	32.7	33.1	32.3
Producers' durable equipment	4.6	5.6	3.7	5.3	5.3	5.8	5.9	5.8
Change in dealers' auto inventories	−.9	1.2	−3.4	3.8	1.2	1.4	−1.5	−.5
Net exports	−1.7	−2.4	−2.2	−2.0	−2.1	−2.7	−2.6	−2.7
Exports	1.9	2.4	1.3	2.4	2.4	2.6	2.0	2.4
Imports	3.6	4.7	3.5	4.4	4.6	5.3	4.6	5.0
Addenda:								
New cars, domestic [2]	24.7	32.3	15.8	32.9	30.5	34.4	31.4	31.0
New cars, foreign	6.0	7.1	6.0	7.1	7.3	7.0	7.0	7.3

1. The gross auto product total includes government purchases.
2. Differs from the gross auto product total by the markup on both used cars and foreign cars.

*First quarter corporate profits (and related components and totals) are preliminary and subject to revision next month.

Table 6.—National Income by Type of Income (1.10)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I*
	Billions of dollars, seasonally adjusted at annual rates							
National income	795.9	851.1	802.1	831.7	847.3	855.2	870.1	898.7
Compensation of employees	601.9	641.9	609.3	627.3	638.0	645.6	656.6	679.9
Wages and salaries	541.4	574.2	547.2	561.4	571.0	577.3	587.0	607.3
Private	426.6	450.4	429.9	440.3	448.4	452.3	460.3	475.6
Military	19.4	18.6	18.6	19.2	18.6	18.0	18.6	19.9
Government civilian	95.5	105.2	98.6	101.8	104.0	106.9	108.1	111.8
Supplements to wages and salaries	60.5	67.7	62.1	65.9	67.0	68.3	69.6	72.6
Employer contributions for social insurance	29.6	34.0	30.1	33.3	33.6	34.2	35.0	37.4
Other labor income	30.8	33.7	32.0	32.6	33.4	34.1	34.6	35.2
Proprietors' income	66.9	68.3	65.9	66.4	67.2	69.2	70.5	71.2
Business and professional	51.0	52.1	51.5	51.6	51.9	52.3	52.5	52.6
Farm	15.8	16.3	14.4	14.8	15.2	17.0	18.1	18.7
Rental income of persons	23.3	24.3	23.7	23.8	24.2	24.5	24.6	24.8
Corporate profits and inventory valuation adjustment	70.8	81.0	69.0	79.5	82.5	80.0	82.0	86.0
Profits before tax	75.4	85.4	71.6	83.0	86.9	85.8	86.0	91.6
Profits tax liability	34.1	37.8	32.3	38.3	39.1	37.5	36.4	39.3
Profits after tax	41.2	47.6	39.2	44.8	47.8	48.2	49.7	52.3
Dividends	25.0	25.5	25.0	25.6	25.4	25.7	25.3	25.8
Undistributed profits	16.2	22.1	14.3	19.2	22.4	22.5	24.4	26.5
Inventory valuation adjustment	−4.5	−4.4	−2.6	−3.5	−4.4	−5.8	−4.0	−5.6
Net interest	33.0	35.6	34.2	34.8	35.4	35.9	36.4	36.9

Table 7.—National Income by Industry Division (1.11)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I*
	Billions of dollars, seasonally adjusted at annual rates							
All industries, total	795.9	851.1	802.1	831.7	847.3	855.2	870.1	898.7
Agriculture, forestry, and fisheries	24.5	25.4	23.3	23.9	24.4	26.1	27.1	.....
Mining and construction	49.4	51.8	50.3	50.6	51.8	51.9	52.8	.....
Manufacturing	217.7	226.9	210.1	224.4	227.3	225.4	230.2	.....
Nondurable goods	87.4	91.8	87.8	89.8	91.6	92.4	93.2	.....
Durable goods	130.3	135.1	122.4	134.6	135.7	133.1	137.0	.....
Transportation	29.5	32.3	30.0	31.9	32.1	32.3	32.7	.....
Communication	16.9	17.4	17.3	17.4	17.5	16.7	17.8	.....
Electric, gas, and sanitary services	14.4	15.8	14.8	15.2	15.6	16.1	16.2	.....
Wholesale and retail trade	122.1	131.6	124.7	126.9	131.0	133.6	135.0	.....
Finance, insurance, and real estate	87.0	94.4	90.9	92.4	93.8	95.6	96.0	.....
Services	103.2	111.6	106.2	108.8	110.4	112.8	114.5	.....
Government and government enterprises	126.5	137.5	129.4	134.5	136.1	138.7	140.7	.....
Rest of the world	4.6	6.5	5.1	5.8	7.3	6.0	7.0	.....

Table 8.—Corporate Profits (Before Tax) and Inventory Valuation Adjustment by Broad Industry Groups (6.12)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I*
	Billions of dollars, seasonally adjusted at annual rates							
All industries, total	70.8	81.0	69.0	79.5	82.5	80.0	82.0	86.0
Financial institutions	12.8	14.0	14.0	14.2	13.7	14.2	14.0	14.1
Nonfinancial corporations	58.1	67.0	54.9	65.3	68.9	65.8	68.1	71.9
Manufacturing	29.5	34.2	25.0	34.4	35.0	33.0	34.6	.....
Nondurable goods	16.6	17.9	16.2	17.2	18.1	18.1	18.3	.....
Durable goods	13.0	16.3	8.8	17.2	17.0	14.8	16.2	.....
Transportation, communication, and public utilities	8.0	8.5	8.1	8.4	8.5	8.5	8.8	.....
All other industries	20.5	24.2	21.9	22.5	25.3	24.3	24.7	.....

Wages and Salaries

Wages and salaries as measured in personal income are on a cash or receipts basis, and the figures for first quarter 1972 incorporate disbursements of pay increases approved retroactively by the Pay Board. Wages and salaries are measured in national income on an accrual basis and the first quarter 1972 figures include estimates of the amount of the retroactive pay earned in the quarter. The 1971 figures for wages and salaries in national income have not yet been revised to incorporate the accrual of the earnings paid retroactively in 1972.

Table 9.—Gross Corporate Product [1] (1.14)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I*
			Seasonally adjusted at annual rates					
	Billions of dollars							
Gross corporate product	541.6	580.9	544.3	567.9	578.2	583.0	594.6	616.5
Capital consumption allowances	56.2	61.9	58.0	59.4	61.0	62.7	64.4	66.3
Indirect business taxes plus transfer payments less subsidies	52.2	56.9	53.4	55.3	55.7	57.3	59.1	59.9
Income originating in corporate business	433.1	462.2	432.9	453.1	461.5	463.1	471.1	490.4
Compensation of employees	366.0	386.0	367.9	377.9	384.5	387.4	394.3	408.6
Wages and salaries	324.2	339.9	325.2	333.1	338.8	340.9	346.9	358.8
Supplements	41.8	46.1	42.7	44.8	45.7	46.5	47.4	49.7
Net interest	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.1
Corporate profits and inventory valuation adjustment	66.0	75.2	64.0	74.2	75.9	74.7	75.7	80.7
Profits before tax	70.6	79.6	66.6	77.8	80.3	80.5	79.7	86.4
Profits tax liability	34.1	37.8	32.3	38.3	39.1	37.5	36.4	39.3
Profits after tax	36.4	41.8	34.3	39.5	41.2	42.9	43.4	47.1
Dividends	22.8	22.7	22.7	23.1	22.2	23.2	22.3	23.4
Undistributed profits	13.6	19.1	11.6	16.4	19.0	19.8	21.1	23.7
Inventory valuation adjustment	−4.5	−4.4	−2.6	−3.5	−4.4	−5.8	−4.0	−5.6
Cash flow, gross of dividends	92.6	103.6	92.3	99.0	102.1	105.6	107.8	113.4
Cash flow, net of dividends	69.8	80.9	69.6	75.8	79.9	82.4	85.6	90.0
Gross product originating in financial institutions	25.4	27.9	26.9	27.6	27.7	28.3	28.1	28.7
Gross product originating in nonfinancial corporations	516.2	553.0	517.4	540.3	550.5	554.7	566.5	587.8
Capital consumption allowances	54.1	59.3	55.7	57.0	58.5	60.1	61.8	63.5
Indirect business taxes plus transfer payments less subsidies	49.9	54.2	50.9	52.8	53.2	54.6	56.4	57.1
Income originating in nonfinancial corporations	412.2	439.4	410.7	430.5	438.8	440.0	448.3	467.2
Compensation of employees	344.2	362.0	345.4	354.7	360.6	363.1	369.8	383.4
Wages and salaries	305.2	319.2	305.6	313.0	318.1	319.9	325.7	337.1
Supplements	39.0	42.9	39.8	41.7	42.5	43.2	44.1	46.3
Net interest	14.8	16.2	15.4	15.7	16.0	16.4	16.8	17.2
Corporate profits and inventory valuation adjustment	53.3	61.1	50.0	60.1	62.3	60.5	61.8	66.6
Profits before tax	57.8	65.6	52.6	63.6	66.7	66.3	65.8	72.3
Profits tax liability	27.1	30.6	24.8	30.9	32.1	30.2	29.2	32.1
Profits after tax	30.7	35.0	27.8	32.7	34.6	36.0	36.6	40.2
Dividends	21.1	20.9	20.9	21.3	20.4	21.3	20.5	21.5
Undistributed profits	9.6	14.1	6.9	11.4	14.1	14.7	16.1	18.6
Inventory valuation adjustment	−4.5	−4.4	−2.6	−3.5	−4.4	−5.8	−4.0	−5.6
Cash flow, gross of dividends	84.8	94.3	83.5	89.8	93.0	96.1	98.3	103.7
Cash flow, net of dividends	63.7	73.4	62.7	68.5	72.6	74.8	77.8	82.2
	Billions of 1958 dollars							
Gross product originating in nonfinancial corporations	425.0	437.3	416.7	431.3	435.6	436.5	446.0	458.8
	Dollars							
Current dollar cost per unit of 1958 dollar gross product originating in nonfinancial corporations [2]	1.215	1.264	1.242	1.253	1.264	1.271	1.270	1.281
Capital consumption allowances	.127	.136	.134	.132	.134	.138	.139	.138
Indirect business taxes plus transfer payments less subsidies	.117	.124	.122	.122	.122	.125	.126	.125
Compensation of employees	.810	.828	.829	.822	.828	.832	.829	.836
Net interest	.035	.037	.037	.036	.037	.038	.038	.037
Corporate profits and inventory valuation adjustment	.125	.140	.120	.139	.143	.139	.138	.145
Profits tax liability	.064	.070	.059	.072	.074	.069	.065	.070
Profits after tax plus inventory valuation adjustment	.062	.070	.060	.068	.069	.069	.073	.075

*See footnote on page 13.

1. Excludes gross product originating in the rest of the world.
2. This is equal to the deflator for gross product of nonfinancial corporations, with the decimal point shifted two places to the left.
3. Personal saving as a percentage of disposable personal income.

Table 10.—Personal Income and its Disposition (2.1)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I
			Seasonally adjusted at annual rates					
	Billions of dollars							
Personal income	803.6	857.0	816.7	833.5	853.4	864.6	876.7	900.1
Wage and salary disbursements	541.4	574.2	547.2	561.4	571.0	577.3	587.0	608.9
Commodity-producing industries	200.7	205.7	198.4	202.5	205.7	205.6	209.0	216.2
Manufacturing	158.3	160.8	155.1	158.9	160.7	160.5	163.2	168.9
Distributive industries	129.1	138.8	131.8	135.3	137.9	139.6	142.4	148.1
Service industries	96.7	105.9	99.7	102.6	104.9	107.1	108.9	112.4
Government	114.8	123.8	117.3	121.0	122.6	125.0	126.7	132.3
Other labor income	30.8	33.7	32.0	32.6	33.4	34.1	34.6	35.2
Proprietors' income	66.9	68.3	65.9	66.4	67.2	69.2	70.5	71.2
Business and professional	51.0	52.1	51.5	51.6	51.9	52.3	52.5	52.6
Farm	15.8	16.3	14.4	14.8	15.2	17.0	18.1	18.7
Rental income of persons	23.3	24.3	23.7	23.8	24.2	24.5	24.6	24.8
Dividends	25.0	25.5	25.0	25.6	25.4	25.7	25.3	25.8
Personal interest income	64.7	67.5	66.7	66.6	66.7	68.1	68.6	68.7
Transfer payments	79.6	94.7	84.8	87.9	96.4	96.9	97.7	99.5
Old-age, survivors, disability, and health insurance benefits	38.5	44.8	39.4	40.7	47.0	45.6	45.9	46.6
State unemployment insurance benefits	3.9	5.8	5.1	5.0	6.1	6.3	6.0	5.7
Veterans benefits	9.7	11.5	10.4	11.0	11.4	11.5	11.9	12.0
Other	27.4	32.6	29.8	31.1	31.9	33.4	34.0	35.3
Less: Personal contributions for social insurance	28.0	31.2	28.4	30.7	31.0	31.3	31.7	34.2
Less: Personal tax and nontax payments	115.9	115.8	115.2	111.6	113.8	116.0	121.7	135.7
Equals: Disposable personal income	687.8	741.3	701.5	722.0	739.6	748.5	755.0	764.3
Less: Personal outlays	633.7	680.7	643.0	663.3	676.0	687.6	696.0	710.8
Personal consumption expenditures	615.8	662.1	624.7	644.9	657.4	668.8	677.2	691.8
Interest paid by consumers	16.9	17.7	17.4	17.6	17.7	17.8	17.9	18.0
Personal transfer payments to foreigners	.9	.9	.9	.9	.9	1.0	.9	1.0
Equals: Personal saving	54.1	60.5	58.5	58.6	63.6	61.0	59.0	53.5
Addenda:								
Disposable personal income:								
Total, billions of 1958 dollars	531.5	550.6	532.5	542.7	550.5	553.2	556.1	558.0
Per capita, current dollars	3,358	3,581	3,410	3,500	3,577	3,611	3,633	3,670
Per capita, 1958 dollars	2,595	2,660	2,588	2,631	2,663	2,669	2,676	2,679
Personal saving rate,[3] percent	7.9	8.2	8.3	8.1	8.6	8.1	7.8	7.0

Table 11.—Personal Consumption Expenditures by Major Type (2.3)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I
			Seasonally adjusted at annual rates					
	Billions of dollars							
Personal consumption expenditures	615.8	662.1	624.7	644.9	657.4	668.8	677.2	691.8
Durable goods	88.6	100.5	84.9	96.6	99.1	102.8	103.6	107.6
Automobiles and parts	37.1	46.2	32.7	43.8	45.3	48.2	47.6	48.7
Furniture and household equipment	37.4	39.6	37.6	38.8	39.4	39.6	40.8	43.6
Other	14.2	14.7	14.6	14.0	14.5	15.1	15.2	15.4
Nondurable goods	264.7	278.6	270.9	273.2	277.8	280.2	283.3	288.0
Food and beverages	131.8	136.5	134.3	134.4	136.3	137.3	138.1	140.7
Clothing and shoes	52.6	57.0	54.2	55.4	57.0	57.4	58.0	59.0
Gasoline and oil	22.9	24.4	23.5	23.8	23.8	24.5	25.4	25.4
Other	57.5	60.8	59.0	59.6	60.8	61.0	61.8	62.9
Services	262.5	282.9	268.9	275.0	280.5	285.8	290.3	296.2
Housing	91.2	99.7	94.1	96.5	98.7	100.7	102.8	104.8
Household operation	36.1	39.2	36.9	37.7	38.9	39.9	40.5	41.2
Transportation	17.9	19.1	18.3	18.6	19.0	19.2	19.6	20.0
Other	117.3	124.9	119.5	122.3	124.0	125.9	127.4	130.2

Table 12.—Foreign Transactions in the National Income and Product Accounts (4.1)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I
			Seasonally adjusted at annual rates					
	Billions of dollars							
Receipts from foreigners	63.8	66.1	64.0	66.9	67.3	68.9	61.1	69.9
Exports of goods and services	62.9	65.3	63.2	66.2	66.5	68.2	60.4	69.2
Capital grants received by the United States	.9	.7	.9	.7	.7	.7	.7	.7
Payments to foreigners	63.8	66.1	64.0	66.9	67.3	68.9	61.1	69.9
Imports of goods and services	59.3	65.3	60.5	61.5	66.4	68.2	65.0	75.4
Transfers to foreigners	3.1	3.4	3.3	3.1	3.4	3.7	3.5	3.8
Personal	.9	.9	.9	.9	.9	1.0	.9	1.0
Government	2.2	2.5	2.4	2.2	2.5	2.7	2.6	2.8
Net foreign investment	1.3	−2.6	.2	2.3	−2.5	−3.0	−7.4	−9.2

Table 13.—Federal Government Receipts and Expenditures (3.1, 3.2)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I*
	Billions of dollars		Seasonally adjusted at annual rates					
Federal Government receipts	191.5	198.8	189.3	196.5	197.7	197.8	203.0	222.1
Personal tax and nontax receipts	92.2	89.0	91.0	86.6	87.6	88.8	93.0	105.4
Corporate profits tax accruals	30.6	33.6	29.0	34.1	34.8	33.2	32.1	34.6
Indirect business tax and nontax accruals	19.3	20.3	19.4	20.7	19.9	19.7	20.7	20.3
Contributions for social insurance	49.3	56.0	49.8	55.1	55.5	56.1	57.2	61.8
Federal Government expenditures	205.1	221.9	209.8	212.7	221.4	224.6	228.7	235.5
Purchases of goods and services	97.2	97.6	95.9	96.4	96.0	97.6	100.3	104.9
National defense	75.4	71.4	73.2	72.6	71.4	70.2	71.4	75.8
Other	21.9	26.2	22.7	23.7	24.6	27.4	28.9	29.0
Transfer payments	63.4	75.9	67.5	69.6	77.8	78.0	78.1	79.4
To persons	61.2	73.4	65.0	67.4	75.3	75.3	75.6	76.6
To foreigners (net)	2.2	2.5	2.4	2.2	2.5	2.7	2.6	2.8
Grants-in-aid to State and local governments	24.4	29.6	25.9	27.0	29.5	30.2	31.6	32.2
Net interest paid	14.6	13.7	14.8	14.0	13.3	13.9	13.8	13.1
Subsidies less current surplus of government enterprises	5.5	5.1	5.7	5.8	4.8	4.8	4.9	5.8
Less: Wage accruals less disbursements	.0	.0	.0	.0	.0	.0	.0	.0
Surplus or deficit (−), national income and product accounts	−13.6	−23.1	−20.5	−16.2	−23.7	−26.7	−25.7	−13.3

Table 14.—State and Local Government Receipts and Expenditures (3.3, 3.4)

	133.4	151.7	138.5	143.4	149.6	154.4	159.5	164.5
State and local government receipts								
Personal tax and nontax receipts	23.6	26.8	24.2	25.0	26.3	27.2	28.7	30.3
Corporate profits tax accruals	3.5	4.3	3.3	4.2	4.3	4.3	4.3	4.7
Indirect business tax and nontax accruals	73.6	81.8	76.4	78.3	80.4	83.3	85.5	87.6
Contributions for social insurance	8.3	9.2	8.7	8.9	9.1	9.3	9.5	9.7
Federal grants-in-aid	24.4	29.6	25.9	27.0	29.5	30.2	31.6	32.2
State and local government expenditures	132.9	148.9	139.8	144.2	146.8	149.8	154.7	160.2
Purchases of goods and services	122.2	135.5	127.9	131.6	133.6	136.2	140.5	144.8
Transfer payments to persons	14.4	17.1	15.6	16.4	16.9	17.2	17.7	18.3
Net interest paid	.1	.5	.2	.3	.4	.5	.6	.7
Less: Current surplus of government enterprises	3.8	4.1	4.0	4.1	4.1	4.1	4.2	4.2
Less: Wage accruals less disbursements	.0	.0	.0	.0	.0	.0	.0	−.6
Surplus or deficit (−), national income and product accounts	.5	2.8	−1.3	−.8	2.8	4.6	4.8	4.4

Table 15.—Sources and Uses of Gross Saving (5.1)

	153.4	173.4	160.0	166.2	175.4	174.0	178.0	174.5
Gross private saving								
Personal saving	54.1	60.5	58.5	58.6	63.6	61.0	59.0	53.5
Undistributed corporate profits	16.2	22.1	14.3	19.2	22.4	22.5	24.4	26.5
Corporate inventory valuation adjustment	−4.5	−4.4	−2.6	−3.5	−4.4	−5.8	−4.0	−5.6
Corporate capital consumption allowances	56.2	61.9	58.0	59.4	61.0	62.7	64.4	66.3
Noncorporate capital consumption allowances	31.4	33.3	31.8	32.6	32.9	33.6	34.2	34.9
Wage accruals less disbursements	.0	.0	.0	.0	.0	.0	.0	−1.1
Government surplus or deficit (−), national income and product accounts	−13.1	−20.3	−21.7	−17.1	−20.9	−22.2	−20.9	−9.0
Federal	−13.6	−23.1	−20.5	−16.2	−23.7	−26.7	−25.7	−13.3
State and local	.5	2.8	−1.3	−.8	2.8	4.6	4.8	4.4
Capital grants received by the United States	.9	.7	.9	.7	.7	.7	.7	.7
Gross investment	136.6	148.9	137.5	145.6	150.3	147.8	152.1	159.1
Gross private domestic investment	135.3	151.6	137.3	143.3	152.9	150.8	159.4	168.3
Net foreign investment	1.3	−2.6	.2	2.3	−2.5	−3.0	−7.4	−9.2
Statistical discrepancy	−4.5	−4.9	−1.6	−4.3	−4.9	−4.7	−5.8	−7.2

*See footnote on page 13.

Table 16.—Implicit Price Deflators for Gross National Product (8.1)

	1970	1971	1970 IV	1971 I	1971 II	1971 III	1971 IV	1972 I
	Index numbers, 1958=100		Seasonally adjusted					
Gross national product	135.29	141.57	138.07	139.88	141.34	142.21	142.80	144.90
Personal consumption expenditures	129.4	134.6	131.7	133.0	134.3	135.3	135.8	137.0
Durable goods	108.9	112.4	110.8	112.5	112.9	112.7	111.4	112.7
Nondurable goods	127.7	131.8	129.2	130.1	131.4	132.4	133.2	134.4
Services	140.2	148.2	143.1	145.6	147.5	149.3	150.3	151.6
Gross private domestic investment								
Fixed investment	132.6	140.4	136.2	137.7	140.0	141.7	142.1	144.4
Nonresidential	130.0	137.1	133.6	134.9	136.8	138.4	138.2	140.0
Structures	152.0	170.3	157.9	162.1	168.1	174.9	176.2	181.8
Producers' durable equipment	120.1	124.0	122.6	123.7	124.1	124.3	124.0	125.5
Residential structures	142.4	150.3	144.7	146.9	149.5	150.9	153.1	156.1
Nonfarm	142.5	150.3	144.8	146.9	149.5	151.0	153.2	156.2
Farm	138.6	145.6	140.0	142.7	144.8	146.0	148.0	151.0
Change in business inventories								
Net exports of goods and services								
Exports	120.6	125.5	121.7	125.2	125.2	125.2	126.5	128.3
Imports	119.2	125.2	121.5	123.4	123.8	125.5	128.0	129.9
Government purchases of goods and services	157.3	167.4	161.7	165.6	167.6	167.5	168.8	173.3
Federal	148.6	156.9	151.8	157.2	158.1	155.6	156.7	163.3
State and local	165.1	175.9	170.2	172.4	175.2	177.3	178.7	181.3

Table 17.—Implicit Price Deflators for Gross National Product by Major Type of Product (8.2)

	135.29	141.57	138.07	139.88	141.34	142.21	142.80	144.90
Gross national product								
Final sales	135.3	141.7	138.2	139.9	141.5	142.3	142.9	144.9
Goods output	122.3	125.6	124.1	125.1	125.8	125.8	125.6	127.1
Durable goods	115.4	118.4	117.5	118.7	118.9	118.4	117.7	119.2
Nondurable goods	127.0	130.7	128.3	129.7	130.7	131.0	131.3	133.0
Services	150.1	159.1	153.2	156.5	158.4	160.0	161.5	164.2
Structures	150.2	162.5	154.9	157.3	161.1	164.6	166.7	170.0
Addendum:								
Gross auto product	107.9	112.6	112.4	114.3	114.9	112.3	108.9	111.8

Table 18.—Implicit Price Deflators for Gross National Product by Sector (8.4)

	135.29	141.57	138.07	139.88	141.34	142.21	142.80	144.90
Gross national product								
Private	130.38	136.05	132.98	134.44	135.87	136.71	137.13	138.83
Business	129.0	134.4	131.4	132.9	134.3	135.0	135.4	137.1
Nonfarm	129.4	135.1	132.4	133.7	135.0	135.9	135.8	137.1
Farm	118.0	117.2	108.4	112.8	115.6	115.1	125.1	135.9
Households and institutions	186.8	199.5						
General government	188.7	202.8	193.2	199.7	202.0	203.2	206.4	213.7

Table 19.—Gross National Product: Change from Preceding Period (7.7)

	Percent		Percent at annual rate					
Gross national product:								
Current dollars	4.8	7.5	2.0	13.7	7.8	5.2	7.6	12.0
Constant dollars	−.6	2.7	−4.1	8.0	3.4	2.7	5.8	5.6
Implicit price deflator	5.5	4.6	6.3	5.4	4.2	2.5	1.7	6.0
Chain price index	5.3	5.0	5.5	6.4	4.8	3.3	2.2	5.6
Gross private product:								
Current dollars	4.2	7.3	1.5	13.3	8.1	5.3	7.5	11.3
Constant dollars	−.7	2.9	−4.4	8.5	3.6	2.7	6.2	5.9
Implicit price deflator	4.9	4.3	6.2	4.5	4.3	2.5	1.2	5.1
Chain price index	4.7	4.8	5.4	5.5	4.8	3.4	1.7	4.4

By EVELYN PARRISH and ANTHONY DILULLO

U.S. Merchandise Trade Projections

This article presents two equations, one for exports and one for imports, which serve as the main tools for short-term trade projections in the BEA Balance of Payments Division. The equations mainly concentrate on the effects of cyclical changes in foreign and domestic business activity. The equations are useful in the preparation of projections, but the equation results must be modified by judgment concerning the impact of many trade developments that cannot be explained fully by regression analysis because they are related to events for which there is little or no quantitative historical experience.

THIS article discusses procedures used by the Balance of Payments Division, Bureau of Economic Analysis, to prepare short-term projections of U.S. merchandise exports and imports. As the trade accounts are by far the largest of the balance of payments entries, such projections are of great importance in assessing the balance of payments outlook.

The focus of this article is on the two equations, one for exports and one for imports, which serve as the main tools for trade projections. The equations are based on a theoretical structure that is demand-oriented, and they primarily concentrate on the effects of cyclical changes in foreign and domestic business activity and related price movements. The equations cannot be expected to project the effects of developments that are not within the range of experience in the periods covered by the equations; the effects of such factors must be estimated by other methods. This applies particularly to the widespread changes in foreign exchange rates that occurred from May to December 1971.

The introduction discusses the background and orientation of the work. This is followed by a brief discussion of the considerations involved in choosing the variables included in the equations. Finally, the specifications and performance of the two equations are described in detail.

Introduction

Research by the Balance of Payments Division on the development of forecasting equations for U.S. merchandise exports and imports was begun several years ago. The formulation of the equations has benefited substantially from the ideas of staff members of various Government agencies concerned with the U.S. balance of payments.

The primary purpose of the equations is to produce short-term (1 to 2 years) quarterly projections of U.S. merchandise exports and imports in current dollars. The equations also provide a framework for studying the effects on trade of hypothetical cyclical conditions here and abroad. For example, the equations can be used to estimate exports and imports that could be expected if economic growth, here and abroad, was at the maximum sustainable rate. The results can then be compared with exports and imports that actually occurred.

Although the equations are useful in the preparation of projections, there are many trade developments that cannot be explained adequately by regression analysis because they are related to events for which there is little or no quantitative historical experience. Therefore, in making a projection, the estimates obtained from the equations must be modified by practical judgments concerning the impact of these other factors.

Before the explanatory variables used in the equations were chosen, numerous economic relationships were tested, concentrating particularly on variables for which satisfactory historical series were available on a quarterly basis and for which forecasts could be readily constructed. Not only were equations using total exports and total imports tested, but, to a limited extent, also equations which disaggregated exports and imports by broad geographic areas and commodity groups. The disaggregated equations provide useful insights into the changing structure of international trade, but they generally re-

Table 1.—Contribution of Changes in Explanatory Variables to Changes in Calculated Exports, 1970 and 1971

[Millions of dollars]

Variable	Increase in exports (+); decrease (−) Change from:	
	1969–70	1970–71
Change in calculated exports in 1963 dollars resulting from change in:		
Foreign industrial production (FIP)	1,650	870
Foreign capacity pressure ($1/UFC)_{t-2}$	100	−605
U.S. imports (M_{t-4}/P_{us})	110	345
Price ratio (P_{us}/P_f)	275	420
Time trend (T)	−610	−610
Dummy (D)	125	−125
Total change in calculated exports in 1963 dollars	1,650	295
Change in calculated exports resulting from change in price deflator (P_{us})	*1,310*	*1,080*
Total change in calculated exports in current dollars	*2,960*	*1,375*

quire the use of narrowly defined explanatory variables that are considerably more difficult to forecast than the more broadly based variables that can be used in projecting overall exports or imports. Disaggregated equations are also more vulnerable to random movements that are frequently offsetting in aggregated equations.

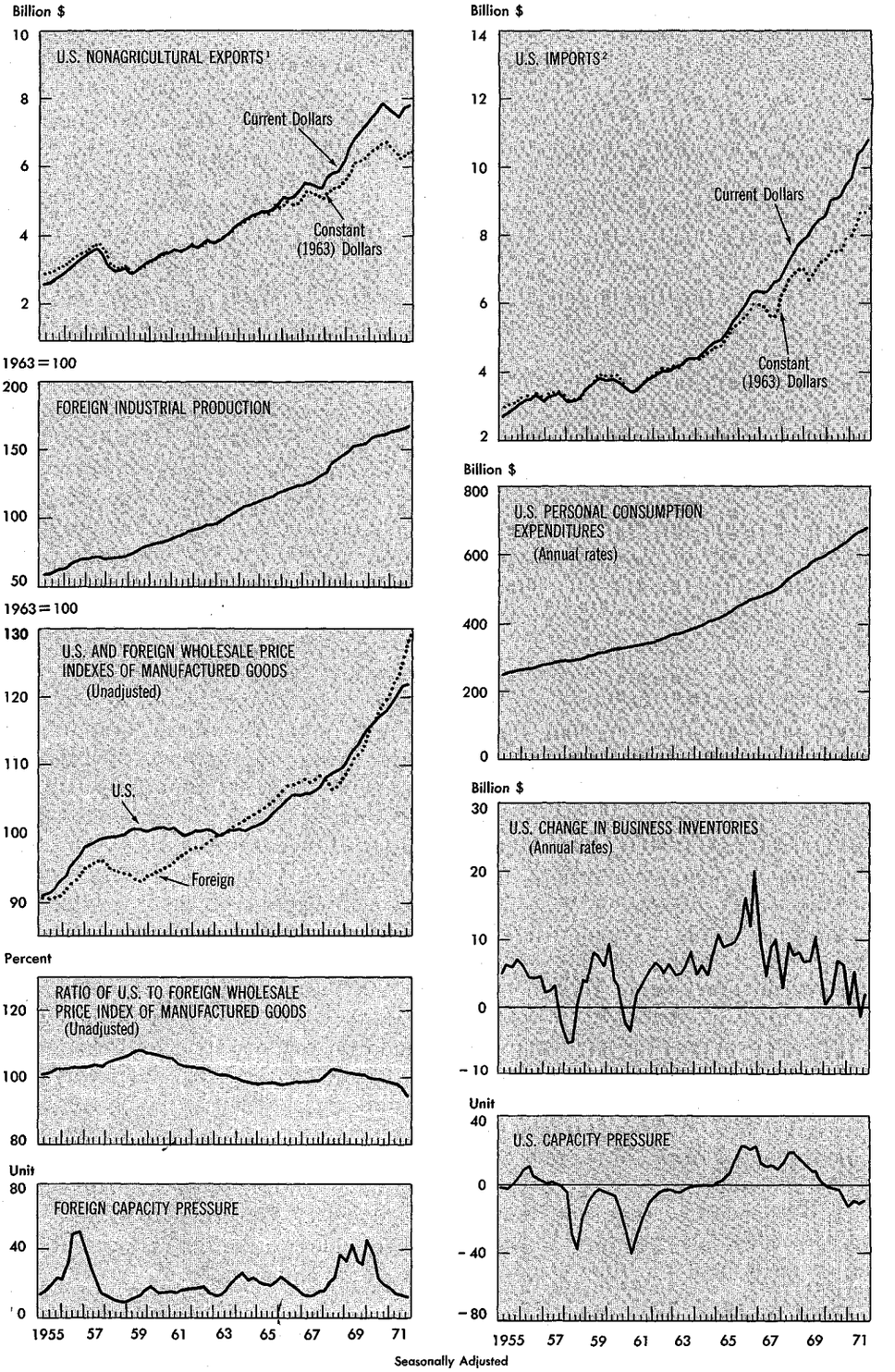
In order to identify properly the structural relationships between exports, imports, and their explanatory variables, it is necessary to remove distortions in the data that are caused by large temporary disturbances such as strikes, insofar as such effects can be reasonably quantified. For instance, exports and imports tend to rise just before a strike occurs, drop during the strike, and then temporarily rise very sharply immediately after the strike. Such distortions tend to obscure the underlying developments and must be taken into account in developing the equations and in making forecasts. The equations, therefore, were fitted using data (for exports, imports, and explanatory variables) that were adjusted to remove distortions resulting from major strikes and other temporary extraordinary events. The adjustments were made by smoothing the irregular movements in the pertinent statistical time series. In some cases, this resulted in adjusted series that add to the same total as actual series. In other instances, the smoothing resulted in omissions from the data of large, nonrepetitive transactions (such as the steel import bulge arising from threats of a domestic steel strike) or in additions to the data (such as estimated losses from strikes). (Further information on the special adjustments applied to the data used in the equations is available upon request. See the note at the end of the article.)

Current equations

The two equations discussed in this article are the most satisfactory of those that have been explored by the Balance of Payments Division to date. The performance of the export equation has been relatively satisfactory; the import equation is less reliable. The equations have deliberately been kept relatively simple so that forecasts can be revised

CHART 9

Variables Used in the Export and Import Equations



1. On the balance of payments basis, excluding military shipments. Data also exclude exports of automotive products to Canada and of aircraft and are adjusted to exclude effects of strikes and other temporary aberrations.

2. On the balance of payments basis, excluding military shipments and imports of Canadian automotive products. Imports in 1963 dollars (as used in the export equation) are adjusted to smooth out fluctuations due to U.S. longshoremen's strikes. Imports in current dollars (as used in the import equation) are adjusted to remove major distortions due to domestic strikes and other temporary disturbances.

Note.– For definition of variables, see text.

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and updated frequently and quickly without the use of complicated techniques. The equations are subject to change as evolving circumstances reveal the need for adjustments. Work on the equations continues, and different formulations and additional variables are being tested.

The export equation and the import equation are formulated to produce seasonally adjusted quarterly estimates. Each equation includes a time trend variable (T) which has the statistical effect of removing linear trends from all variables, including the dependent variable. That is, the inclusion of "T" produces coefficients for the other independent variables that are the same as those obtained when all variables are expressed as deviations from a least squares linear trend. The introduction of the "T" variable improves the fit of the equation and reduces the multicollinearity between those variables that have strong trends in the same direction.

The export equation produces estimates in constant (1963) dollars. It is based on data from the first quarter 1956 through the fourth quarter 1970, which was found to be the period of best fit for a series of observations ending in 1970. Exports are adjusted to the balance of payments basis, excluding military shipments, and also exclude agricultural goods, automotive products shipped to Canada, and aircraft. Exports are deflated by the U.S. wholesale price index of manufactured goods. Explanatory variables include foreign industrial production, a measure of foreign capacity pressure lagged two quarters, U.S. imports lagged four quarters and deflated, the ratio of the U.S. wholesale price index of manufactured goods to a composite index of foreign wholesale prices of manufactured goods, and the time trend. (See chart 9.)

For the import equation, the period of best fit for a series of observations ending in 1970 is the first quarter 1955 through the fourth quarter 1970. The equation produces current dollar estimates. (An acceptable import equation in constant dollars has not yet been developed.) Imports are adjusted to the balance of payments basis, excluding military shipments, and also exclude automotive products shipped from Canada. The explanatory variables in the equation are U.S. personal consumption expenditures, changes in U.S. business inventories, a measure of U.S. capacity pressure, the U.S. wholesale price index of manufactured goods, a composite index of foreign wholesale prices of manufactured goods, and the time trend.[1]

For projections, foreign economic variables used in the equations are forecast on the basis of available information on the economic outlook for major industrial countries. Forecasts for variables that relate to the domestic economy can be derived from GNP forecasts. Calculated exports obtained from the equation in 1963 dollars are reflated using the projected values of the U.S. wholesale price index of manufactured goods.

The commodities excluded from the export and import data used in the equations were omitted because they seem more responsive to special factors than to the general demand and price factors that influence the bulk of trade. Agricultural exports usually reflect foreign and domestic crop conditions, foreign and U.S. Government agricultural policies, and U.S. Government foreign assistance programs. U.S. civilian aircraft exports are subject to large irregular movements that mainly reflect the introduction of major innovations. Automotive trade with Canada underwent major structural changes as a result of the 1965 U.S.–Canadian Automotive Products Trade Act. Projections for trade in these commodities are prepared separately, with the assistance of information available from industry or Government sources, and then added to the projections obtained from the equations.

Factors Affecting Foreign Trade

This section briefly reviews factors affecting foreign trade that were considered in choosing the variables for the export and import equations.

Fluctuations in U.S. exports primarily reflect economic conditions in the importing countries; fluctuations in U.S. imports primarily reflect economic conditions here. To measure these effects, broad indicators such as gross national product, personal consumption expenditures, or industrial production can be used together with indicators of capacity utilization and price movements. Other factors affecting trade patterns that are more difficult to quantify include changes in quality of goods, in technology, in tariffs or other trade barriers, and in consumer tastes. Moreover, trade movements are often distorted by unexpected economic, social, or political developments. Such distortions are usually limited to a relatively short period, but occasionally result in permanent changes in trade patterns.

Economic activity

Deviations of imports from their longer run trends tend to mirror the cyclical movements of demand in the importing country. Import growth accelerates in periods of economic recovery and slows in recessions. Gross national product (GNP)—the market value of total output of goods and services—is the most comprehensive measure of economic activity. However, the relative weights of the various components of the GNP do not necessarily reflect the importance of their influence on imports. Demand for imported consumer goods could be expected to be related to the personal consumption expenditures component of GNP. Industrial production indexes mainly measure the output of manufactures, and could be expected to be particularly relevant in explaining demand for imported industrial materials and capital goods.

As it turns out, personal consumption expenditures (for goods and services) seem to be the most effective variable for representing U.S. demand as a determinant of U.S. imports. This presumably reflects the fact that consumer goods and the materials and components used in their production

1. Donald Curtis, U.S. Treasury Department, made major contributions to the formulations of the foreign and U.S. capacity pressure measures and the foreign wholesale price index.

comprise the major part of imports. Although imports of capital goods have been rising, and some imported industrial materials and components are used in domestic capital goods production, the addition of a separate variable such as private domestic investment to represent the demand for imported capital goods did not produce results significant enough to justify inclusion of the variable in the import equation.

Another GNP component—change in business inventories—has been included in the import equation to reflect changes in imported goods that may be more immediately responsive to changes in demand resulting from inventory accumulation or liquidation than to current changes in personal consumption expenditures. However, this variable may also represent cyclical variations in overall economic activity.

In the export equation, foreign industrial production is used to represent demand for U.S. nonagricultural exports. The decision to use foreign industrial production rather than foreign GNP was partly governed by the timely availability of quarterly data; GNP data for many foreign countries are on an annual basis and not readily and quickly available. Industrial production abroad seems to relate closely to U.S. exports in the same quarter. However, exports tend to continue upward in quarters immediately following cyclical peaks in foreign industrial production and in certain other cases when expansion of foreign industrial production initially decelerates. A dummy (D) is included in the equation with a value of one in the pertinent quarters to explain the faster than expected export growth.

U.S. imports lagged four quarters and deflated by the U.S. wholesale price index of manufactured goods are also included in the export equation as a proxy for foreign demand for U.S. goods generated by U.S. economic activity. (The larger the foreign exchange earnings of foreign countries resulting from previous export sales to the United States, the greater is their demand for U.S. exports.)

Pressures on capacity

Demand for imported goods seems to be related nonlinearly to utilization of productive capacity in the importing country. To reflect this, the import equation includes a measure of U.S. capacity pressure and the export equation includes a measure of foreign capacity pressure, both "pressure" variables being nonlinear with respect to capacity utilization.

During periods of high U.S. utilization, imports tend to expand even more rapidly than aggregate economic activity; during periods of low utilization, imports tend to decline more rapidly, or rise less rapidly, than aggregate economic activity. There also appears to be a nonlinear relationship between foreign capacity utilization and foreign demand for U.S. goods. Utilization in major foreign industrial countries affects not only demand for U.S. goods in those countries but also the strength of competition faced by U.S. exports in third markets.

Capacity pressures may also have an impact on an exporting country's supply. If a country's utilization is high, its exports may be dampened because of lengthened waiting periods for delivery and tendencies to give preference to domestic orders; the opposite would hold in conditions of low utilization. (Also, during the early stages of cyclical recoveries—when utilization is low—exports could be bolstered by the favorable effects that rising productivity has on unit costs and thus on prices.) However, measures of supply influences are not included in the equations. In the export equation, the U.S. capacity pressure variable, used to reflect supply influences, is not statistically significant; in the import equation, the main effect of the foreign capacity pressure variable is to reduce the significance of the foreign price variable.

Prices

A decrease in the ratio of domestic to foreign prices theoretically should have a stimulative effect on the volume of exports and a dampening effect on the volume of imports. However, it is hard to find a strong relationship in the data. One problem is the lack of appropriate price indicators for internationally traded goods. Another problem is that for a number of commodities the gap between the absolute level of foreign and domestic prices is sufficiently large that the total volume of trade may not be noticeably affected by small changes in relative movements of prices as indicated by broadly based index numbers. In addition, the impact on the volume of trade of a shift in relative movements of prices may be distributed over a long period, and this sort of impact is hard to isolate. A further difficulty for the import equation, in which imports are denominated in current dollars, is that in the short run a rise in the ratio of foreign to domestic price indexes that reflects an absolute increase in foreign prices may initially increase the value of imports, making any longer term drop in import volume more difficult to isolate.

In the export equation, in which exports are expressed in constant dollars, the most significant of the various price formulations tested was the ratio of the U.S. to the foreign wholesale price index of manufactured goods. This suggests that exports show the same sensitivity, roughly, to a 1 percent rise in U.S. price as to a 1 percent decline in foreign prices. In the import equation, in which imports are expressed in current dollars, the most significant of the various price formulations tested was separate entry of the U.S. and of the foreign wholesale price indexes of manufactured goods. Changes in the U.S. price index appear to have a much greater effect on imports than changes in foreign price, at least for the periods for which the equation was fitted.

The price indexes selected for use in the equations—the U.S. and the foreign wholesale price indexes of manufactured goods—give a general indication of the theoretically expected trends. These indexes are not specifically measures of the prices of U.S. exports or U.S. imports, but only proxies for the general trend of prices here and abroad. (The foreign price indexes are adjusted to include the changes resulting from foreign currency revaluations relative

to the U.S. dollar: foreign currency depreciations tend to reduce foreign prices vis-a-vis U.S. prices; foreign currency appreciations tend to increase foreign prices.) Available measures of prices of U.S. exports and imports—the unit value indexes—were not used because they have a limited coverage of manufactured commodities and they reflect changes in commodity mix as well as changes in prices. In addition, the unit value indexes are difficult to project because they do not appear to have consistent relationships with other available economic indicators.

Other factors

Among other factors that affect trade, the only one studied very thoroughly was the effect on imports of changes in U.S. tariffs. The most successful formulation used was the ratio of U.S. duty collections to total imports (excluding Canadian automotive products). The ratio does not appear to have been noticeably influenced by tariff changes until the introduction of across-the-board tariff reductions resulting from the "Kennedy round" of GATT negotiations. Those reductions were effective in five stages beginning January 1, 1968, and ending January 1, 1972. However, the duty collection variable adds little of significance to the import equation and is omitted in the equation discussed in this article.

The Export Equation

The export equation is based on quarterly, seasonally adjusted data from the first quarter 1956 through the fourth quarter 1970. Exports are expressed in constant (1963) dollars. For projections, exports calculated from the equation are converted into current dollars by multiplying them by the projected U.S. wholesale price index of manufactured goods. The equation has the following specification: [2]

$$NX/P_{us} = \underset{(6.86)}{3{,}604.67} + \underset{(12.73)}{48.54}\ FIP + \underset{(5.18)}{8.30}\ (1/UFC)_{t-2} + \underset{(3.78)}{0.14}\ M_{t-4}/P_{us} - \underset{(7.62)}{38.39}\ P_{us}/P_f - \underset{(7.04)}{38.10}\ T + \underset{(3.39)}{126.18}\ D$$

The numbers in parentheses are "t" ratios (ratios of regression coefficients to their standard errors). The coefficient of determination corrected for degrees of freedom ($\bar{R}^2$) is 0.995; the Durbin-Watson statistic (D.W.) is 1.90; the corrected standard error of the estimate ($\bar{S}_e$) is 74; and the corrected standard error of the estimate divided by the mean of the dependent variable ($\bar{S}_p$) is 1.71.

Variables:

NX—U.S. nonagricultural exports, excluding automotive products shipped to Canada and aircraft, seasonally adjusted quarterly rates in millions of dollars. The data are on the balance of payments basis, excluding military shipments, and are adjusted to remove distortions due to major domestic strikes and other important identifiable temporary disturbances.

P_{us}—U.S. wholesale price index of manufactured goods, 1963=100.

FIP—Foreign industrial production index, 1963=100. The index is a composite of seasonally adjusted industrial production indexes for Canada, Japan, United Kingdom, and continental Western Europe, weighted by the annual shares of these areas in U.S. exports. The index for continental Western Europe is derived from indexes for Germany, France, Italy, and the Netherlands weighted by the 1963 values of their gross domestic products.

UFC_{t-2}—Unutilized foreign industrial capacity lagged two quarters [UFC=1−(FIP/FC)]. The calculation of foreign capacity (FC) is explained below.

M_{t-4}—U.S. imports, excluding Canadian automotive products, lagged four quarters, seasonally adjusted quarterly rates in millions of dollars. The data are on the balance of payments basis, excluding military shipments, and are adjusted to smooth out irregular movements due to U.S. dockworkers' strikes.

P_f—Foreign wholesale price index of manufactured goods, 1963=100. The index is a composite of the wholesale price indexes of manufactured goods for Canada, Japan, United Kingdom, Germany, France, Italy, the Netherlands, and Belgium, weighted by each country's share in the group's total exports of manufactured goods in the preceding year. The price data are adjusted to include changes resulting from foreign currency revaluations relative to the U.S. dollar. These adjustments are entered gradually over a four-quarter period following the revaluation.

T—Linear time trend, first quarter 1955=1.

D—Dummy variable with a value of 1 is used in all quarters when foreign industrial production (FIP) declines and in all quarters when expansion of FIP first slows to less than 0.4 of an index point following periods of faster increase.

The foreign capacity index (FC) used in the calculation of the measure of foreign capacity pressure is computed from the composite foreign industrial production index. For the period from the first quarter 1954 through the fourth quarter of 1970, a straight line was fitted to the logarithms of the foreign industrial production index. The highest 25 percent of the observations, in terms of deviations from the trend line, was isolated. A trend line was then fitted to those observations. The level of that trend line was raised by 2 percent and the resulting trend line was used to represent the index of foreign industrial capacity. The procedure that was followed ensured that the foreign industrial production index would never exceed the foreign industrial capacity index. Several formulations of the capacity pressure variable were tried in the export equation. The reciprocal of unutilized capacity, lagged two quarters, proved to be the most significant measure. This capacity pressure variable increases at a sharply accelerating rate as unutilized capacity approaches zero, and decreases at a sharply decelerating rate as unutilized capacity increases.

[2] An equation expressed in current dollars that performs somewhat less satisfactorily has the following specification:

$$NX = \underset{(0.23)}{151.81} + \underset{(13.94)}{42.62}\ FIP(P_{us}) + \underset{(5.59)}{9.72}\ (1/UFC)_{t-8} + \underset{(2.44)}{0.10}\ M_{t-4} - \underset{(0.07)}{0.42}\ P_{us}/P_f - \underset{(6.21)}{27.10}\ T + \underset{(2.90)}{115.16}\ D$$

The $\bar{R}^2$ is 0.997; *D.W.* is 1.71; $\bar{S}_e$ is 74; and $\bar{S}_p$ is 1.77.

Table 2.—Actual and Calculated Values of U.S. Nonagricultural Exports

[Seasonally adjusted]

	Total [1]	Exclusions: Autos to Canada, aircraft, and agricultural goods	Adjustments	Exports minus exclusions plus adjustments					
				Actual	Calculated (reflated)	Actual minus calculated (reflated)	Actual	Calculated	Actual minus calculated
	Millions of current dollars						Millions of 1963 dollars		
1955–I	3,545	984		2,561	[2]	[2]	2,814	[2]	[2]
II	3,450	858		2,592	[2]	[2]	2,842	[2]	[2]
III	3,695	975		2,720	[2]	[2]	2,957	[2]	[2]
IV	3,734	903		2,831	[2]	[2]	3,044	[2]	[2]
1956–I	3,975	1,016		2,959	2,991	−32	3,155	3,188	−33
II	4,299	1,184		3,115	3,107	8	3,275	3,267	8
III	4,513	1,252		3,261	3,172	89	3,404	3,311	93
IV	4,769	1,365	−100	3,304	3,344	−40	3,410	3,451	−41
1957–I	5,160	1,452	−260	3,448	3,507	−59	3,522	3,582	−60
II	5,021	1,314	−140	3,567	3,509	58	3,632	3,573	59
III	4,854	1,258		3,596	3,541	55	3,640	3,584	56
IV	4,527	1,137		3,390	3,363	27	3,428	3,400	28
1958–I	4,140	1,089		3,051	3,144	−93	3,073	3,167	−94
II	4,082	1,137		2,945	3,015	−70	2,963	3,034	−71
III	4,112	1,148		2,964	2,985	−21	2,979	3,000	−21
IV	4,080	1,052		3,028	2,952	76	3,037	2,961	76
1959–I	3,888	994		2,894	2,959	−65	2,891	2,956	−65
II	3,977	1,059		2,918	2,987	−69	2,903	2,974	−71
III	4,376	[3] 1,218	−75	3,083	3,037	46	3,071	3,025	46
IV	4,217	[3] 1,267	250	3,200	3,197	3	3,194	3,191	3
1960–I	4,684	1,414		3,270	3,310	−40	3,254	3,293	−39
II	4,916	1,427	−100	3,389	3,369	20	3,372	3,352	20
III	5,032	1,438	−100	3,494	3,401	93	3,466	3,374	92
IV	5,018	1,521		3,497	3,427	70	3,483	3,413	70
1961–I	5,095	1,509	−25	3,561	3,470	91	3,536	3,446	90
II	4,806	1,378	50	3,478	3,525	−47	3,478	3,525	−47
III	5,037	1,417	−50	3,570	3,596	−26	3,577	3,603	−26
IV	5,169	1,478		3,691	3,618	73	3,695	3,622	73
1962–I	5,077	1,457		3,620	3,669	−49	3,613	3,662	−49
II	5,335	1,585		3,750	3,723	27	3,746	3,719	27
III	5,332	1,481		3,851	3,819	32	3,839	3,807	32
IV	5,035	[3] 1,450	200	3,785	3,963	−178	3,781	3,959	−178
1963–I	5,058	[3] 1,540	300	3,818	3,863	−45	3,826	3,871	−45
II	5,593	[3] 1,585	−100	3,908	3,948	−40	3,916	3,956	−40
III	5,666	1,618		4,048	4,035	13	4,040	4,027	13
IV	5,935	1,725		4,210	4,201	9	4,197	4,188	9
1964–I	6,233	[3] 1,785	−80	4,368	4,318	50	4,347	4,296	51
II	6,197	[3] 1,756	−30	4,411	4,448	−37	4,400	4,440	−40
III	6,417	1,826	−50	4,541	4,507	34	4,518	4,485	33
IV	6,631	[3] 1,825	−165	4,641	4,617	24	4,604	4,580	24
1965–I	5,679	[3] 1,876	865	4,668	4,622	46	4,613	4,567	46
II	6,933	[3] 1,928	−325	4,680	4,713	−33	4,593	4,625	−32
III	6,857	2,077	−30	4,750	4,772	−22	4,630	4,651	−21
IV	6,969	2,044		4,925	4,895	30	4,777	4,748	29
1966–I	7,223	2,094		5,129	5,046	83	4,932	4,852	80
II	7,191	2,117		5,074	5,165	−91	4,842	4,928	−86
III	7,413	2,278		5,135	5,259	−124	4,858	4,975	−117
IV	7,563	2,294		5,269	5,273	−4	4,990	4,993	−3
1967–I	7,693	2,176		5,517	5,387	130	5,215	5,092	123
II	7,719	2,251		5,468	5,280	188	5,168	4,990	178
III	7,669	2,294		5,375	5,392	−17	5,056	5,072	−16
IV	7,599	2,274	25	5,350	5,547	−197	5,014	5,199	−185
1968–I	7,947	2,474	240	5,713	5,595	118	5,290	5,181	109
II	8,385	2,499	−125	5,761	5,735	26	5,305	5,281	24
III	8,878	[3] 2,557	−505	5,816	5,866	−50	5,331	5,377	−46
IV	8,378	[3] 2,547	330	6,161	6,266	−105	5,621	5,717	−96
1969–I	7,510	[3] 2,585	1,600	6,525	6,497	28	5,878	5,853	25
II	9,490	[3] 2,392	−300	6,798	6,882	−84	6,064	6,139	−75
III	9,602	2,618		6,984	6,958	26	6,181	6,158	23
IV	9,888	2,711		7,177	7,220	−43	6,285	6,322	−37
1970–I	10,241	2,750		7,491	7,396	95	6,475	6,393	82
II	10,582	2,982		7,600	7,530	70	6,529	6,469	60
III	10,696	2,851		7,845	7,878	−33	6,688	6,716	−28
IV	10,461	2,766		7,695	7,715	−20	6,527	6,544	−17
1971–I	11,016	3,418		7,598	[4] 7,811	−213	6,374	[4] 6,553	−179
II	10,706	3,272		7,434	[4] 7,810	−376	6,180	[4] 6,492	−312
III	11,475	[3] 3,263	−600	7,612	[4] 8,019	−407	6,255	[4] 6,589	−334
IV	9,572	[3] 3,187	1,300	7,685	[4] 8,252	−567	6,315	[4] 6,781	−466

1. Balance of payments basis, excluding military shipments.
2. The equation for nonagricultural exports begins in the first quarter of 1956.
3. Agricultural exports are adjusted for U.S. dockworkers' strikes and in 1964 I and II for extraordinary shipments of wheat to U.S.S.R.
4. Equation ends in the fourth quarter of 1970; 1971 data are projections.

Contributions of explanatory variables

In the export equation the foreign industrial production index is the most significant explanatory variable as indicated by the "t" ratio. The other variables in descending order of statistical significance are the price ratio, the time trend, foreign capacity pressure, imports, and the dummy.

The impact of changes in the explanatory variables on changes in calculated exports depends upon the size of each variable's regression coefficient and the amount of change in each variable, which varies from period to period. For the years 1970 and 1971, the contribution of variables to the total change in exports is shown in table 1. The amount of change in calculated exports contributed by each explanatory variable was obtained by multiplying the actual quarterly values of each explanatory variable by its regression coefficient, then summing the quarterly values to annual totals, and calculating the differences between years.

Performance of the export equation

The export equation performs quite well during the period to which it is fitted, i.e., first quarter 1956 through fourth quarter 1970 (see chart 10 and table 2).

In only three out of the 60 observations included in the equation did actual and calculated exports differ by more than two standard errors. In those periods, the differences may have been due to the difficulties in adjusting the data for the effects of special developments. The overestimate of $178 million in the fourth quarter 1962 may have reflected an insufficient adjustment to actual exports for effects of a dock strike. In the second quarter 1967 there was an underestimate of $178 million, followed in the fourth quarter of 1967 by an overestimate of $185 million. These differences may have been associated partly with the trade disruptions resulting from the closure of the Suez Canal in late May 1967.

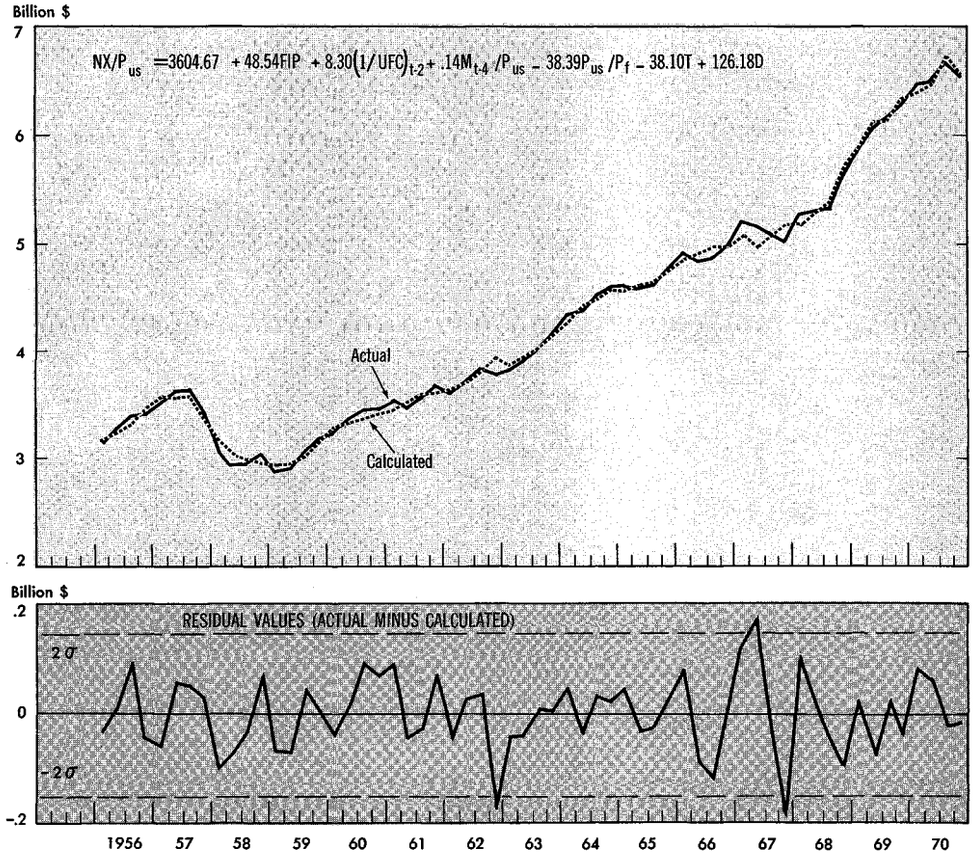
The characteristics of the export equation do not change markedly when the period to which it is fitted is changed (table 3). The coefficients are relatively stable and statistical measures remain significant in equations beginning in 1955 or 1956 and ending in any one of the years 1967–70. In equations beginning in 1957, the "t" ratios for most of the variables are poorer and in two instances are below statistically significant levels.

To test how well the equations would forecast, they were solved for the quarters beyond the periods to which they were fitted, using the actual values of the explanatory variables in those quarters. The resulting calculated exports were then compared with actual export values. Table 3 shows the annual error at a quarterly rate (actual less calculated) resulting from projections of the equations made for 1 year beyond the period of fit. (Projections made for more than 1 year beyond the period of fit are not shown in table 3 but are available upon request.)

The export equations covering the periods beginning in 1956 and ending in 1967, 1968, and 1969 produce forecasts 1 year ahead with annual errors at a quarterly rate ranging from −$30 million to +$45 million (−0.6 to +0.7 percent of actual exports). The equations beginning in 1956 and ending in 1967 and 1968 produce forecasts for the second year beyond the period of fit—1969 and 1970, respectively—with annual errors at a quarterly rate of −$63 million and +$37 million (−1.0 and

CHART 10

Actual and Calculated Values of U.S. Nonagricultural Exports and Residuals, in 1963 Dollars



NOTE:—Exports are on the balance of payments basis excluding military shipments. Data also exclude exports of automotive products to Canada and of aircraft, and are adjusted to exclude effects of strikes and other temporary aberrations.

U.S. Department of Commerce, Bureau of Economic Analysis

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+0.6 percent). All of these equations as well as the one for the period beginning in 1956 and ending in 1970 sharply overestimate 1971 exports with annual errors at a quarterly rate ranging from −$304 million to −$340 million (−4.8 to −5.4 percent). The large forecasting errors for 1971 are probably due for the most part to the adverse impact on exports of unsettled international financial conditions and of strikes or threats of strikes that prevailed during most of the year. However, it should be noted that the values now available for the explanatory variables for 1971 are still uncertain and adjustments for strike effects are based on incomplete information. These data may be revised and the overestimate may be reduced. (The equation fitted through 1969, for instance, predicted 1970 exports with an error of 2.0 percent using data available in May 1971 for the explanatory variables; it predicted 1970 exports with an error of 0.7 percent using data available in May 1972.)

The Import Equation

The import equation is based on quarterly, seasonally adjusted data from the first quarter 1955 through the fourth quarter 1970. Imports are expressed in current dollars. The equation has the following specification:

$$M = -7{,}558.73 + 23.65\ PCE + 11.02\ CBI + 6.45\ CPSQ + 57.88\ P_{us} - 8.85\ P_f - 58.86T$$
$$(11.63)\quad (32.50)\quad (3.33)\quad (5.50)\quad (8.91)\quad (1.44)\quad (22.25)$$

The numbers in parentheses are "t" ratios. The coefficient of determination corrected for degrees of freedom ($\overline{R}^2$) is .999; the Durbin-Watson statistic (D.W.) is 1.76; the corrected standard error of the estimate ($\overline{S}_e$) is 75; and the corrected standard error of the estimate divided by the mean of the dependent variable ($\overline{S}_p$) is 1.51.

It might be desirable to construct the import equation in constant dollars to parallel the export equation. Thus far, a constant dollar import equation that produces forecasts with the same or less error than the current dollar equations has not been developed.[3]

Variables:

M—U.S. imports, excluding Canadian automotive products, seasonally adjusted quarterly rates in millions of dollars. The data are on the balance of payments basis, excluding military shipments, and adjusted to remove distortions due to major domestic strikes and other important identifiable temporary disturbances.

PCE—U.S. personal consumption expenditures (including goods and services) as measured in GNP, in billions

3. One version yielded the following:

$$M/P_f = -14{,}090.41 + 32.94\ \text{Deflated PCE} + 11.37\ \text{Deflated CBI} + 0.69\ CPSQ + 125.98\ P_{us} - 36.84\ P_f - 69.38\ T$$
$$(18.66)\quad (14.68)\quad (1.97)\quad (.30)\quad (13.99)\quad (3.77)\quad (10.63)$$

$\overline{R}^2$ is .993; D.W. is 0.84; $\overline{S}_e$ is 126; and $\overline{S}_p$ is 2.61.

Omission of the capacity pressure variable (CPSQ) causes very little change in the remaining coefficients or the statistical measures.

Table 3.—Nonagricultural Export Equation Fitted to Various Time Periods

Regression period	Constant	FIP	$(1/UFC)_{t-2}$	M_{t-4}/P_{us}	P_{us}/P_f	T	D	Forecast error 1 year forward (quarterly rate in millions of 1963 dollars)	$\overline{S}_e$	$\overline{S}_p$	$\overline{R}^2$	D.W.
A. Equations beginning in 1955:												
1955-I—70-IV	2,963.39 (6.06)	45.01 (12.79)	10.89 (8.41)	0.12 (3.08)	−30.83 (7.08)	−29.26 (7.11)	121.17 (3.15)	−261	76	1.80	0.995	1.77
1955-I—69-IV	3,141.66 (6.06)	42.80 (10.97)	11.03 (8.40)	.13 (3.30)	−31.76 (7.10)	−26.90 (5.93)	129.36 (3.04)	40	77	1.89	.994	1.76
1955-I—68-IV	2,972.02 (4.91)	43.45 (10.30)	11.57 (8.19)	.13 (3.23)	−30.63 (6.23)	−27.70 (5.46)	125.85 (2.90)	−34	78	1.98	.991	1.69
1955-I—67-IV	1,833.96 (1.67)	51.72 (6.82)	11.39 (7.96)	.10 (2.23)	−23.24 (3.03)	−36.81 (4.19)	139.87 (3.18)	−77	77	2.02	.989	1.55
B. Equations beginning in 1956:												
1956-I—70-IV	3,604.67 (6.86)	48.54 (12.73)	8.30 (5.18)	.14 (3.78)	−38.39 (7.62)	−38.10 (7.04)	126.18 (3.39)	−323	74	1.71	.995	1.90
1956-I—69-IV	3,765.03 (6.77)	46.01 (10.92)	8.56 (5.20)	.16 (3.94)	−39.02 (7.50)	−35.11 (6.02)	128.76 (3.12)	45	75	1.80	.994	1.92
1956-I—68-IV	3,679.62 (5.49)	45.85 (10.21)	9.02 (4.88)	.16 (3.73)	−38.20 (6.47)	−34.54 (5.56)	126.81 (2.98)	−8	77	1.92	.991	1.84
1956-I—67-IV	2,994.51 (2.45)	50.61 (6.48)	9.16 (4.94)	.13 (2.78)	−33.57 (3.70)	−39.43 (4.25)	135.46 (3.10)	−30	77	1.98	.988	1.62
C. Equations beginning in 1957:												
1957-I—70-IV	3,395.17 (5.01)	45.88 (7.95)	9.39 (3.98)	.14 (3.57)	−35.47 (4.73)	−32.91 (3.18)	124.64 (3.28)	−300	75	1.71	.995	1.91
1957-I—69-IV	3,275.45 (4.61)	39.67 (5.98)	10.98 (4.30)	.15 (3.71)	−32.14 (4.05)	−22.83 (1.95)	131.90 (3.15)	51	75	1.78	.994	1.95
1957-I—68-IV	2,942.79 (3.48)	37.54 (5.31)	12.52 (4.26)	.15 (3.47)	−28.35 (3.15)	−18.19 (1.45)	129.93 (3.04)	−19	77	1.89	.991	1.85
1957-I—67-IV	2,656.71 (2.04)	41.49 (4.01)	12.24 (4.06)	.13 (2.69)	−27.04 (2.46)	−23.17 (1.49)	134.87 (3.05)	−5	77	1.95	.988	1.62

NOTE.—Figures in parentheses are "t" ratios.

of dollars at seasonally adjusted annual rates.

CBI—Change in U.S. business inventories as measured in GNP, in billions of dollars at seasonally adjusted annual rates.

CPSQ—Measure of U.S. capacity pressure, derived from the ratio of actual to potential gross national product; the calculation of this variable is explained below.

P_{us}—U.S. wholesale price index of manufactured goods, 1963=100.

P_f—Foreign wholesale price index of manufactured goods, 1963=100. The index is a composite of the wholesale price indexes of manufactured goods for Canada, Japan, United Kingdom, Germany, France, Italy, the Netherlands, and Belgium, weighted by each country's share in the group's total exports of manufactured goods in the preceding year. The price data are adjusted to include changes resulting from foreign currency revaluations relative to the U.S. dollar. These adjustments are entered gradually over a four-quarter period following the revaluation.

T—Linear time trend, first quarter 1955=1.

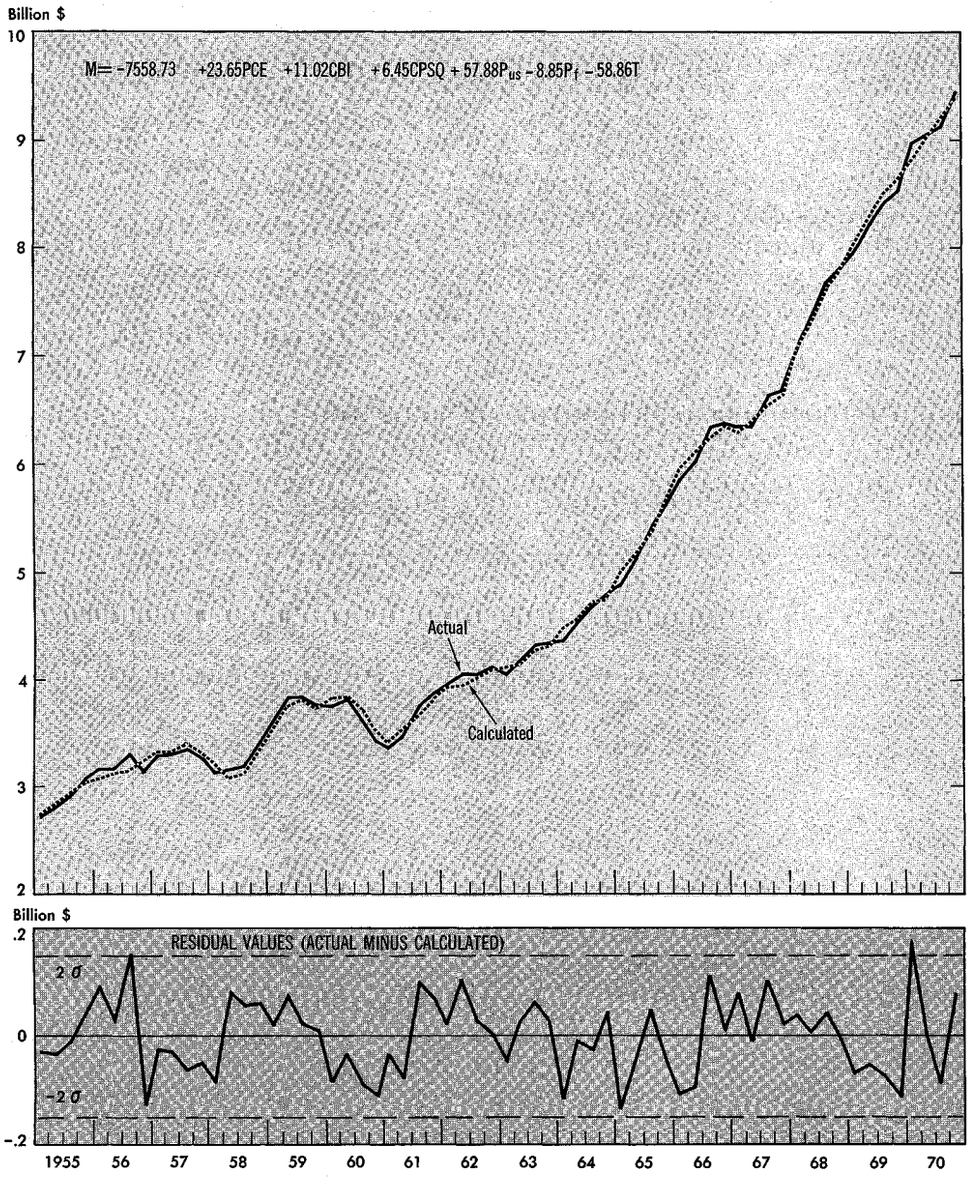
The U.S. capacity pressure measure used in the import equation is calculated as follows: the difference between the ratio of actual to potential GNP and 0.97 is multiplied by 100, then squared and expressed with a positive sign if the ratio of actual GNP to potential GNP is greater than 0.97 and with a negative sign otherwise—

$$CPSQ = (100\ [(\text{Actual GNP}/\text{Potential GNP}) - 0.97])^2.$$

The 97-percent figure is the average of the ratio of actual GNP to potential GNP in 1955–70, and is used to represent average capacity utilization. It was chosen after experimentation with a series of ratios ranging from 93 through 98 percent. In this formulation, capacity pressure increases at a sharply accelerating rate as utilization rises above average levels and decreases at a sharply accelerating rate as utilization falls below average. This measure of capacity pressure produces more significant results in the import equation than were obtained using several other formulations including one with a capacity pressure similar to that used in the export equation.

CHART 11

Actual and Calculated Values of U.S. Imports and Residuals



NOTE:—Imports are on the balance of payments basis excluding military shipments. Data also exclude imports of automotive products from Canada and are adjusted to exclude effects of strikes and other temporary aberrations.

U.S. Department of Commerce, Bureau of Economic Analysis 72-5-11

Contribution of variables

In the import equation, U.S. personal consumption expenditures is the most significant explanatory variable as indicated by the "t" ratio. The other variables, in descending order of statistical significance, are the time trend, U.S. price, U.S. capacity pressure, change in U.S. business inventories, and foreign price.

The contribution of changes in the variables to the calculated change in imports depends upon the size of each variable's regression coefficient and on the amount of change in each variable, which may differ in each period. This is shown in table 4 for the years 1970 and

1971. The method of measuring the amount of change in calculated imports contributed by each explanatory variable is the same one used for exports, already described.

Performance of import equation

In the period covered by the equation—first quarter 1955 through fourth quarter 1970—calculated imports were generally quite close to actual imports (chart 11). During the 1957–58 and 1960–61 recessions, downturns of actual and calculated imports coincided; the calculated 1958 upturn was one quarter later than the actual rise, but the equation's timing was correct for the 1961 upturn. During the 1970 recession, neither actual nor calculated imports declined. Import strength in the recent recession reflected the continued (although slower) growth in both personal consumption expenditures and business inventories in 1970, as contrasted with actual declines in both measures in earlier recessions.

The two quarters in which calculated and actual imports differed by more than two standard errors were: (1) the third quarter 1956, when extraordinary coffee deliveries pushed actual imports up sharply (these were largely offset in the following quarter); and (2) the first quarter 1970, when actual imports rose very sharply, partly reflecting aberrations due to effects of actual and anticipated import quotas (imports leveled off in the second quarter).

Table 4.—Contribution of Changes in Explanatory Variables to Changes in Calculated Imports, 1970 and 1971

[Millions of dollars]

Variable	Increase in imports (+); decrease (−)	
	Change from:	
	1969–70	1970–71
Change in calculated imports resulting from change in:		
U.S. personal consumption expenditures (PCE)	3,585	4,130
Change in U.S. business inventories (CBI)	−150	−100
U.S. capacity pressure (CPSQ)	−290	−200
U.S. price (P_{us})	985	900
Foreign price (P_f)	−225	−255
Time trend (T)	−940	−940
Total change in calculated imports	2,965	3,535

When the time period to which the equation is fitted is changed, the characteristics of the import equation are fairly stable (see table 6). However, the coefficients of the price variables change considerably and are less significant in equations that begin in 1957.

To test the forecasting reliability of

Table 5.—Actual and Calculated Values of U.S. Imports

[Millions of dollars, seasonally adjusted]

	Total [1]	Canadian autos	Adjustments	Imports minus Canadian autos plus adjustments		
				Actual	Calculated	Actual less calculated
1955–I	2,718	(*)		2,718	2,746	−28
II	2,802	(*)		2,802	2,835	−33
III	2,919	(*)		2,919	2,929	−10
IV	3,088	(*)		3,088	3,046	42
1956–I	3,174	(*)		3,174	3,080	94
II	3,184	(*)		3,184	3,148	36
III	3,315	(*)		3,315	3,160	155
IV	3,130	(*)		3,130	3,261	−131
1957–I	3,292	(*)		3,292	3,317	−25
II	3,357	(*)	−60	3,297	3,329	−32
III	3,355	(*)		3,355	3,415	−60
IV	3,287	(*)		3,287	3,337	−50
1958–I	3,145	4		3,141	3,226	−85
II	3,175	4		3,171	3,091	80
III	3,208	5		3,203	3,146	57
IV	3,424	6		3,418	3,359	59
1959–I	3,621	4	−20	3,597	3,576	21
II	3,882	4	−45	3,833	3,759	74
III	3,949	7	−105	3,837	3,816	21
IV	3,857	6	−85	3,766	3,754	12
1960–I	3,811	3	−40	3,768	3,854	−86
II	3,854	4	−40	3,810	3,848	−38
III	3,646	3		3,643	3,732	−89
IV	3,433	1		3,432	3,540	−108
1961–I	3,390	2		3,388	3,423	−35
II	3,433	2	50	3,481	3,555	−74
III	3,804	2	−50	3,752	3,654	98
IV	3,892	2		3,890	3,819	71
1962–I	3,959	2		3,957	3,934	23
II	4,074	2		4,072	3,964	108
III	4,109	2	−45	4,062	4,038	24
IV	4,076	3	45	4,118	4,114	4
1963–I	4,050	4	35	4,081	4,126	−45
II	4,214	6	−25	4,183	4,155	28
III	4,365	8		4,357	4,295	62
IV	4,382	11		4,371	4,341	30
1964–I	4,404	16		4,388	4,500	−112
II	4,591	23		4,568	4,576	−8
III	4,736	29		4,707	4,731	−24
IV	4,916	34	−65	4,817	4,769	48
1965–I	4,680	35	250	4,895	5,026	−131
II	5,482	39	−305	5,138	5,181	−43
III	5,564	63	−70	5,431	5,385	46
IV	5,770	92	−55	5,623	5,670	−47
1966–I	6,027	163		5,864	5,972	−108
II	6,165	155		6,010	6,101	−91
III	6,595	229		6,366	6,256	110
IV	6,676	294		6,382	6,368	14
1967–I	6,661	296		6,365	6,286	79
II	6,465	344	245	6,366	6,374	−8
III	6,542	400	490	6,632	6,530	102
IV	7,153	397	−70	6,686	6,658	28
1968–I	7,821	499	−270	7,052	7,013	39
II	8,134	543	−235	7,356	7,344	12
III	8,568	578	−300	7,690	7,645	45
IV	8,441	698	50	7,793	7,790	3
1969–I	7,589	709	1,100	7,980	8,046	−66
II	9,566	732	−600	8,234	8,288	−54
III	9,278	840		8,438	8,508	−70
IV	9,397	864		8,533	8,643	−110
1970–I	9,728	791	50	8,987	8,813	174
II	9,831	847	50	9,034	9,025	9
III	9,992	857		9,135	9,221	−86
IV	10,319	748	−100	9,471	9,392	79
1971–I	10,768	998	−50	9,720	[2] 9,550	170
II	11,767	1,013	−350	10,404	[2] 9,973	431
III	12,015	1,147	−400	10,468	[2] 10,154	314
IV	11,098	1,016	650	10,732	[2] 10,309	423

*Less than $500,000.
1. Balance of payments basis, excluding military shipments.
2. Equation ends in fourth quarter of 1970; 1971 data are projections.

the equations, they were solved for the quarters beyond the period to which they were fitted, using the actual values of the explanatory variables in those quarters. The equations for the periods beginning in 1955 and ending in 1967, 1968, and 1969 produce forecasts 1 year beyond the period of fit with annual errors at a quarterly rate ranging from −$102 million to $148 million (−1.2 to +1.6 percent of actual imports) as shown in table 6. The equations beginning in 1955 and ending in 1967 and 1968 produce forecasts for 1969 and 1970, respectively, with annual errors at a quarterly rate of −$108 million and $32 million (−1.3 and +0.3 percent). However, the forecast errors for 1971 are much larger: the equations beginning in 1955 and ending in 1967, 1968, 1969, and 1970 underestimate actual 1971 imports by annual errors ranging from $331 million to $504 million (+3.2 to +4.8 percent). The exceptional conditions prevailing in 1971 were probably the main causes of the large errors. Anticipations of strikes, fears of imposition of quotas or other controls, and expectations of revaluations of several leading currencies undoubtedly contributed to the extraordinary rise in imports. Revision of the 1971 values of the independent variables used in the import equation will probably be much less important than revisions of the 1971 variables used in the export equation, but the adjustments for strikes and other unusual occurrences may be changed as additional information becomes available. (The equation fitted through 1969 predicted 1970 imports with an error of 1.2 percent using data available in May 1971 for the explanatory variables; it predicted 1970 imports with essentially the same amount of error using revised data available in May 1972.)

NOTE

A technical appendix is available upon request to the Balance of Payments Division, BEA. It contains tables showing (1) the data input to the equations, (2) the identification of all special adjustments applied to U.S. exports, U.S. imports, foreign industrial production indexes, and foreign wholesale price indexes, and (3) the specifications of some of the additional export and import equations that have been tested, including equations in log form. The appendix also includes notes explaining in detail the construction of some of the variables included in the equations.

Table 6.—Import Equation Fitted to Various Time Periods

Regression period	Constant	PCE	CBI	CPSQ	P_{us}	P_f	T	Forecast error 1 year forward (quarterly rate in millions of dollars)	$\bar{S}_e$	$\bar{S}_b$	$\bar{R}^2$	D.W.
A. Equations beginning in 1955:												
1955-I—70-IV	−7558.73 (11.63)	23.65 (32.50)	11.02 (3.33)	6.45 (5.50)	57.88 (8.91)	−8.85 (1.44)	−58.86 (22.25)	333	75	1.51	0.999	1.76
1955-I—69-IV	−6660.50 (8.51)	23.49 (34.47)	11.68 (3.55)	7.31 (5.82)	56.71 (9.27)	−17.16 (2.37)	−55.45 (18.07)	148	70	1.49	.998	1.63
1955-I—68-IV	−7304.90 (8.08)	24.20 (29.75)	12.66 (3.66)	6.20 (4.21)	58.35 (9.29)	−13.63 (1.74)	−60.11 (14.16)	−102	71	1.60	.997	1.70
1955-I—67-IV	−7308.35 (7.38)	24.29 (19.33)	12.98 (3.19)	6.12 (3.91)	58.55 (8.94)	−14.05 (1.36)	−60.46 (12.30)	−4	75	1.74	.995	1.76
B. Equations beginning in 1956:												
1956-I—70-IV	−7138.82 (7.57)	24.33 (18.39)	11.49 (3.25)	5.92 (4.12)	52.25 (4.76)	−9.20 (1.44)	−61.15 (13.08)	335	77	1.51	.998	1.78
1956-I—69-IV	−5725.82 (5.25)	24.78 (20.05)	12.67 (3.66)	6.47 (4.53)	45.82 (4.35)	−19.14 (2.52)	−59.50 (12.28)	168	71	1.47	.998	1.67
1956-I—68-IV	−6358.12 (5.31)	25.53 (19.13)	13.66 (3.76)	5.34 (3.28)	47.31 (4.41)	−15.69 (1.90)	−64.27 (11.87)	−105	72	1.58	.997	1.76
1956-I—67-IV	−6118.44 (4.50)	26.14 (13.81)	13.62 (3.25)	5.21 (3.03)	46.14 (4.06)	−18.66 (1.67)	−66.01 (10.15)	−31	75	1.74	.995	1.76
C. Equations beginning in 1957:												
1957-I—70-IV	−9092.56 (7.54)	20.87 (10.61)	9.71 (2.84)	7.19 (4.92)	78.83 (5.06)	−7.79 (1.30)	−47.52 (6.20)	303	72	1.37	.999	1.72
1957-I—69-IV	−7645.38 (4.77)	22.29 (10.62)	11.78 (3.46)	6.97 (4.90)	66.27 (3.84)	−13.82 (1.79)	−51.30 (6.79)	104	67	1.36	.998	1.48
1957-I—68-IV	−9321.56 (5.25)	22.20 (10.52)	12.81 (3.74)	5.59 (3.65)	76.93 (4.31)	−6.70 (.80)	−54.15 (7.09)	−137	66	1.42	998	1.61
1957-I—67-IV	−9818.22 (4.40)	21.38 (6.99)	13.74 (3.51)	5.49 (3.37)	80.25 (3.83)	−2.73 (.22)	−52.05 (5.22)	38	69	1.57	.996	1.63

NOTE: Figures in parentheses are "t" ratios.

By REGIONAL ECONOMICS DIVISION STAFF

Metropolitan Area Income In 1970

PERSONAL income in the Nation's standard metropolitan statistical areas rose 7.1 percent in the aggregate from 1969 to 1970. Among SMSA's, changes varied from increases of 14 percent in Fort Myer and Fort Lauderdale, Fla. to declines of 4 percent in Melbourne-Titusville-Cocoa, Fla. and Augusta, Ga. One-third of all SMSA's had income increases within the comparatively narrow range of 6 to 8 percent. Outside SMSA's, personal income rose 7.3 percent in the aggregate.

Per capita personal income (total income divided by total population) in SMSA's averaged $4,283 in 1970, and ranged from $5,410 in San Francisco-Oakland, Calif. to $1,973 in McAllen-Pharr-Edinburg, Tex. Per capita income outside SMSA's was $3,032, only 71 percent of the SMSA average.

The geographic distribution of SMSA's by rate of change in personal income in 1970 is shown in table A. The SMSA's with the largest increases were in the Southeast, Southwest, Far West, and in Alaska and Hawaii. Weakest showing was in the Great Lakes region, where 16 SMSA's had either income declines or increases of less than 4 percent. However, the two SMSA's with the largest declines—4 percent—were in the Southeast: Melbourne-Titusville-Cocoa, Fla. and Augusta, Ga.

On a regional basis, above-average 1970 increases in personal income in SMSA's occurred in six of the eight regions delineated by BEA—Rocky Mountain, Southwest, Southeast, Mideast, New England, and Plains, in that order. However, in only the first three was the rate of increase substantially more than that in the Nation. Income gains in the Far West and Great Lakes were well below average.

Three factors—one local and two national—were mainly responsible for differences among SMSA's in rates of change in total personal income from 1969 to 1970. These were: (1) the movement of people to SMSA's in southern areas, both as retirees and as tourists seeking recreation and entertainment; (2) sharp reduction in military forces in many areas; and (3) the recession of 1970, which centered mainly in a curtailment of manufacturing activity. Developments affecting income change in 1970 can be seen most clearly in the SMSA's with the fastest and slowest growth; these SMSA's are listed in table B.

Table A.—Distribution of SMSA's by Percent Change in Personal Income, 1969–70

Percent change	United States	New England	Mideast	Great Lakes	Plains	Southeast	Southwest	Rocky Mountain	Far West	Alaska and Hawaii
12.0 and more	16					9	4		2	1
10.0 to 11.9	33	1	5	2	1	7	11	4	1	1
8.0 to 9.9	61	1	10	4	4	21	5	5	11	
6.0 to 7.9	84	12	16	12	9	18	7	1	9	
4.0 to 5.9	33		2	15	4	7	2		3	
2.0 to 3.9	16			12	1	2	1			
0 to 1.9	4			2			1		1	
0 to −1.9	3			1		2				
−2.0 to −2.9	1			1						
−3.0 and less	2					2				
Total	253	14	33	49	19	68	31	10	27	2

Rapid growth areas

The continuing migration of people to areas offering attractive climate and outdoor recreational facilities was a major factor in income expansion in the fastest growing SMSA's in 1970. In 14 of the 16 top-ranking SMSA's, population growth was three to 10 times as fast as the all-SMSA average. In five of the 16 SMSA's, many of the inmigrants were retirees who brought with them incomes from retirement funds (mainly social security and Federal civil service retirement programs) and from personal investments. Still other persons migrated to these areas to fill the jobs created by the presence of the retirees. Increased retiree income was a major impetus to the increase in personal income in the Fort Myers, Fort Lauderdale, Sarasota, and Tampa-St. Petersburg SMSA's in Florida and the Tucson area in Arizona. With few exceptions, each of these areas had large percentage gains in total income, total population, trade and service activities, transfer payments, and property income.

The large percentage increases in total income in the Honolulu, Las Vegas, Reno, and Miami SMSA's stemmed from exceptionally large gains in the trade and service industries as these recreation centers attracted tourists in large numbers. In Honolulu, expanded Federal Government activity also contributed to the income rise.

Special factors were mainly responsible for the large increases in personal income in the remaining seven of the top 16 SMSA's. Sharp increases in military payrolls accounted for the above-average increases in the Jacksonville (Fla.), Albany (Ga.), and Killeen-Temple (Tex.) SMSA's. In Gainesville,

Table B.—SMSA's with Fastest and Slowest Rates of Personal Income Change, 1969–70

Fastest		Slowest	
SMSA	Percent change	SMSA	Percent change
Fort Myers, Fla.	14.1	Melbourne-Titusville-Cocoa, Fla.	−4.1
Fort Lauderdale-Hollywood, Fla.	13.8	Augusta, Ga–S.C.	−3.9
Albany, Ga.	13.1	Flint, Mich.	−2.7
Killeen-Temple, Tex.	13.0	Anderson, Ind.	−1.4
Honolulu, Hawaii	13.0	Biloxi-Gulfport, Miss.	−1.2
Sarasota, Fla.	12.9	Columbus, Ga–Ala.	−.8
Tallahassee, Fla.	12.8	Seattle-Everett, Wash.	.0
Las Vegas, Nev.	12.7	Lansing, Mich.	1.2
Jacksonville, Fla.	12.6	Saginaw, Mich.	1.6
Tampa-St. Petersburg, Fla.	12.5	Lawton, Okla.	1.9
Gainesville, Fla.	12.2	Ann Arbor, Mich.	2.0
Tucson, Ariz.	12.2	Gadsden, Ala.	2.1
McAllen-Pharr-Edinburg, Tex.	12.2	Texarkana, Tex–Ark.	2.2
Reno, Nev.	12.1	Detroit, Mich.	2.4
Bryan-College Station, Tex.	12.0	Fayetteville, N.C.	2.4
Miami, Fla.	12.0	Battle Creek, Mich.	2.5

Fla. and Bryan-College Station, Tex., gains in State and local payrolls—stemming mainly from the universities located there—provided the major stimulus. In Tallahassee, Fla., increased State government payrolls were the major factor, and in McAllen-Pharr-Edinburg, Tex., a spurt in agricultural earnings provided the impetus. The strong influence of climate on economic growth within the United States is reflected in the fact that of the 16 fastest growing SMSA's in 1970, eight are in Florida and another seven are generally on a line from southern Georgia to Reno, Nev.; the 16th, Honolulu, though far removed from the others, presents especially desirable climatic and scenic attractions.

Slower-growth areas

At the other end of the spectrum, the major economic factors limiting the 1969–70 rise in personal income, or causing an actual loss, were declines in manufacturing and military activity.

In 11 of the 16 bottom-ranking SMSA's—those with the smallest percentage increases or actual delines—there were drops in earnings of persons from manufacturing ranging from 5 to 25 percent. Because manufacturing earnings account for between 25 and 50 percent of total personal income in these areas, the declines had a large impact on total income. Six of these 11 SMSA's are in Michigan: Flint, Lansing, Saginaw, Ann Arbor, Detroit, and Battle Creek. The other five are Anderson (Ind.), Seattle-Everett (Wash.) Gadsden (Ala.), Melbourne-Titusville-Cocoa (Fla.), and Texarkana (Tex.).

Reduced military payrolls were the factor limiting income expansion in another four low-ranking SMSA's—Biloxi-Gulfport (Miss.), Columbus (Ga.), Lawton (Okla.), and Fayetteville (N.C.). In Augusta, Ga., a drop of one-third in military pay and a bare 1-percent increase in income from manufacturing were mainly responsible for the 4-percent decline in total personal income.

Transfer payments expand

Transfer payments were an expansionary factor in nearly all SMSA's in 1970. Nationally, transfers increased 21 percent—three times the rate of increase in total personal income and nearly twice the rate of increase in any other major income source. This expansion was due in part to major increases in social insurance and welfare payments and in part to large unemployment insurance benefits.

In their effect on regional income change, transfer payments were a major influence in both rapid-growth and lagging SMSA's. Among the former, they were a major cause of income growth; among the latter, they were a symptom of, and a partial offset, to economic distress.

In rapid-growth areas, transfer payments usually are of above-average importance. With this type of income increasing sharply in 1970, areas with large amounts of transfer income benefited more than other areas. Moreover, many new retirees move into retirement areas each year, bringing additional transfer income with them. The expenditure of these increments of transfers in 1970 resulted in increased activity in the trade and service industries, thereby further boosting personal income in the fast-growing areas.

In the slower growing SMSA's, transfer payments were an even more expansionary influence because these SMSA's were in most instances areas where manufacturing activity declined and where there consequently were exceptionally large gains in unemployment benefits. These gains often ranged from 200 to 300 percent or more. The increases in unemployment benefits were of course not a net gain in income, but rather a partial offset to the decline in manufacturing payrolls.

Per capita income

Per capita income change varied among the 253 SMSA's. In 30 SMSA's, per capita income as a percent of the national average rose by 3 percentage points or more. These areas were scattered throughout the Nation in all regions except New England; 18 of the 30 were in the Southeast and Southwest regions where average incomes are lowest and where the historical rate of increase has been largest.

There were 33 SMSA's where per capita incomes as a percent of the national average declined by 3 percentage points or more; 20 of these were in the Great Lakes region, the region with the slowest income growth. Here, a decline, or slow growth, in manufacturing was mainly responsible. There were six SMSA's in the Southeast that suffered substantial relative decline in per capita income. In five of these, declines in military payrolls were responsible. In the sixth, Melbourne-Titusville-Cocoa, Fla., a drop of 25 percent in manufacturing earnings was responsible.

Scope of Report

The metropolitan area data presented here update and broaden the income series introduced in the May 1967

SURVEY. The existing series, covering selected years from 1929 to 1965 and every year thereafter, is extended to cover 1970 in this report. In addition, the 20 new SMSA's designated by the Office of Management and Budget in 1971 have been added.

The classification of SMSA's used in this report accords with the official definitions as made by the Office of Management and Budget with the following exceptions.

In New England, SMSA's are defined officially in terms of cities and towns instead of counties. Because satisfactory data for measuring local-area income are available on a county basis but not for cities and towns, SMSA's in New England were redefined for use in the metropolitan area income series to conform to a county basis. This reduced the number of SMSA's in New England from 23 to 14.

In Vermont and Wyoming—States without official SMSA's—Burlington and Cheyenne, respectively, are treated here as SMSA's. Because the U.S. national income accounts do not cover territories and possessions, the four SMSA's in Puerto Rico are omitted from the series.

Geographic boundaries of officially designated SMSA's are changed from time to time. For this series, however, the geographic definition of each SMSA is held constant over the entire period 1929–70. That is, counties included in an SMSA as of 1972 are also included in each earlier year even though they may not then have been officially part of the SMSA.

Personal income defined

Personal income is the current income of persons in an area from all sources. It is measured before deduction of income and other personal taxes, but after deduction of personal contributions to social security, government retirement, and other social insurance programs. It consists of wages and salaries (in cash and in kind, and including tips and bonuses as well as contractual compensation), various types of supplementary earnings termed "other labor income" (the largest item of which is employer contributions to private pension and welfare funds), net incomes of owners of unincorporated businesses (farm and nonfarm, including the incomes of independent professionals), net rental income, dividends, interest, and government and business transfer payments (consisting of disbursements to persons for which no services are rendered currently, such as unemployment benefits, social security payments, and welfare and relief payments).

To measure personal income on a local area basis, criteria must be established for allocating income to these areas. In the case of labor and entrepreneurial income, appropriate criteria are the income recipient's place-of-work or his place-of-residence. The difference between the two is the net flow of commuters' earnings.[1] The distinction between place of work and of residence cannot be applied to the other components of the income flow—property incomes and transfer payments. For them, residence is the only applicable principle of classification.[2]

Two versions of area personal income are presented in this report; they differ in the treatment of the earnings component, which is the sum of wages and salaries, other labor income, and proprietors' income. In the first version, termed "where-earned," earnings reflect place of work. In the second version, termed "where-received," earnings reflect place of residence. The measures of property and transfer income are the same for both versions.

The "where-earned" version is useful for analyzing an area's income structure by industrial origin and by type of income. It provides a tool, for example, for identifying the factors underlying an area's economic progress or deterioration or for evaluating the effect of a remedial program. The "where-received" version is useful in the analysis of consumer markets and purchasing power. When expressed on a per capita basis, it can also be used as an indicator of living standards and welfare.

Personal income is shown on both a where-earned and a where-received basis in table 1. The where-earned total is classified by type of income and the earnings component of the where-earned total by industrial source in table 2.

Comparison with national totals

The U.S. totals in the accompanying tables differ from those in the national income and product accounts for two reasons. First, the national accounts include and the SMSA series excludes the wages and salaries received by Federal civilian and military employees stationed abroad temporarily. Second, because of the huge volume of calculations involved in the SMSA series (100 separate income items are estimated for each of approximately 3,100 counties), it has not been feasible to maintain the same schedule of revisions in the SMSA series as in the national accounts. However, the SMSA estimates in this report are in full accord with revised national totals from 1966 through 1970.

Availability of unpublished data

A large amount of local area income information beyond that in this report is now available. A sample of the detail available is shown on page 44. Comparable tables are available for any SMSA and for most of the 2,630 non-SMSA counties. Also, counties can be grouped in any specified combination. The cost of special tabulations of unpublished data is computed at $10 per area (SMSA or county) for table 5.00 (see page 44) plus $1 per area for each of tables 5.01–5.06. Address requests for tabulations to the Regional Economics Division, Bureau of Economic Analysis, U.S. Department of Commerce, Washington, D.C. 20230, specifying the area and tables desired. A cost estimate will be issued immediately.

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1. An area's earnings on a place-of-work basis minus the earnings of persons who work in the area but reside in another area, plus the earnings of persons who reside in the area but work in another, equal the area's earnings on a residence basis.

2. In the case of property incomes, an alternative criterion resembling the place-of-work criterion would be possible, e.g., the allocation of these incomes to the areas in which the businesses that generate these incomes are located. However, conceptual and statistical difficulties stand in the way of the application of this criterion. Even if these difficulties could be resolved, it would not be advisable to apply the criterion to the property income component of personal income. Property income cannot be transformed into a satisfactory measure of the contribution of capital to production, mainly because it excludes all components of profits other than dividends.

Table 1.—Total Personal Income, by SMSA's and

Line		Total personal income, where earned								
		Millions of dollars								
		1950	1959	1962	1965	1966	1967	1968	1969	1970
1	**Total United States**	**226,197**	**382,840**	**440,190**	**534,816**	**580,535**	**625,490**	**684,746**	**745,869**	**798,949**
2	**Sum of SMSA's**	**168,985**	**297,569**	**341,616**	**415,260**	**450,402**	**487,146**	**534,033**	**581,406**	**622,480**
3	**Non-SMSA area**	**57,212**	**85,271**	**98,574**	**119,556**	**130,133**	**138,344**	**150,713**	**164,463**	**176,469**
	New England:									
4	Boston, Mass	5,072	8,328	9,567	11,321	12,172	13,438	14,701	16,049	17,401
5	Bridgeport-Norwalk-Stamford, Conn	916	1,709	2,086	2,475	2,733	3,122	3,374	3,685	3,938
6	Burlington, Vt	72	138	161	202	243	279	324	358	398
7	Fall River-New Bedford, Mass	590	783	895	1,039	1,116	1,205	1,313	1,429	1,543
8	Hartford-New Britain, Conn	1,134	2,009	2,323	2,872	3,192	3,592	3,868	4,186	4,446
9	Lewiston-Auburn, Maine	112	161	173	195	215	228	251	269	291
10	Manchester, N.H	247	399	474	558	622	693	769	843	894
11	New Haven-Waterbury-Meriden, Conn	996	1,698	1,971	2,361	2,545	2,711	2,938	3,190	3,402
12	Norwich-Groton-New London, Conn	235	456	493	651	711	720	779	858	917
13	Pittsfield, Mass	216	318	383	417	452	497	543	572	610
14	Portland-South Portland, Maine	220	386	430	503	530	580	636	692	741
15	Providence-Pawtucket-Warwick, R.I	1,115	1,536	1,751	2,057	2,220	2,430	2,641	2,793	3,009
16	Springfield-Chicopee-Holyoke, Mass	759	1,188	1,303	1,549	1,674	1,786	1,942	2,086	2,228
17	Worcester-Fitchburg-Leominster, Mass	878	1,251	1,422	1,691	1,813	1,926	2,078	2,255	2,420
18	**Sum of SMAS's**	**12,562**	**20,360**	**23,431**	**27,888**	**30,240**	**33,208**	**36,158**	**39,265**	**42,236**
19	**Non-SMAS area**	**2,293**	**3,715**	**4,282**	**5,155**	**5,579**	**6,060**	**6,613**	**7,157**	**7,687**
	MIDEAST:									
20	Albany-Schenectady-Troy, N.Y	958	1,492	1,709	2,047	2,198	2,367	2,542	2,745	3,031
21	Allentown-Bethlehem-Easton, PA.-N.J	737	1,115	1,272	1,545	1,651	1,748	1,910	2,072	2,239
22	Altoona, Pa	182	251	272	318	337	362	393	432	466
23	Atlantic City, N.J	189	301	360	416	444	496	548	591	644
24	Baltimore, Md	2,482	4,097	4,731	5,764	6,228	6,721	7,390	8,001	8,660
25	Binghamton, N.Y.-Pa	339	616	700	810	871	946	1,035	1,109	1,183
26	Buffalo, N.Y	1,923	3,205	3,375	3,973	4,210	4,470	4,848	5,166	5,463
27	Elmira, N.Y	137	213	230	279	311	341	362	377	404
28	Erie, Pa	370	510	574	710	758	786	834	898	981
29	Harrisburg, Pa	497	831	896	1,076	1,171	1,298	1,418	1,575	1,720
30	Jersey City, N.J	1,115	1,622	1,830	2,032	2,161	2,298	2,467	2,633	2,833
31	Johnstown, Pa	343	437	470	552	586	615	656	708	671
32	Lancaster, Pa	375	606	678	818	892	941	1,000	1,101	1,197
33	Long Branch-Asbury Park N.J	307	590	719	919	1,008	1,148	1,247	1,363	1,482
34	New Brunswick-Perth Amboy-Sayreville, N.J	463	977	1,180	1,469	1,598	1,758	1,933	2,116	2,348
35	New York, N.Y	20,303	32,171	37,161	43,303	46,211	50,109	54,968	59,310	63,599
36	Newark, N.J	2,801	4,713	5,495	6,657	7,115	7,599	8,257	8,938	9,687
37	Paterson-Clifton-Passaic, N.J	1,465	2,820	3,326	4,059	4,362	4,775	5,249	5,728	6,238
38	Philadelphia, Pa.-N.J	6,356	10,722	11,981	13,968	15,231	16,390	17,734	19,239	20,494
39	Pittsburgh, Pa	3,724	5,763	6,008	7,077	7,601	8,067	8,695	9,281	9,898
40	Poughkeepsie, N.Y	204	374	488	693	669	714	795	883	972
41	Reading, Pa	412	602	667	808	870	925	1,005	1,091	1,167
42	Rochester, N.Y	1,066	1,922	2,148	2,680	2,943	3,211	3,508	3,800	4,022
43	Scranton, Pa	319	420	465	531	562	607	652	707	755
44	Syracuse, N.Y	724	1,229	1,451	1,673	1,825	1,954	2,080	2,240	2,395
45	Trenton, N.J	437	743	802	1,004	1,075	1,163	1,269	1,387	1,493
46	Utica-Rome, N.Y	416	704	769	874	956	1,017	1,098	1,189	1,276
47	Vineland-Millville-Bridgeton, N.J	136	236	277	321	349	372	410	446	482
48	Washington, D.C.-MD.-VA	3,068	5,472	6,647	8,598	9,352	10,133	11,239	12,350	13,623
49	Wilkes-Barre-Hazleton, Pa	489	584	627	738	796	880	967	1,049	1,139
50	Williamsport, Pa	147	219	237	284	310	338	366	390	421
51	Wilmington, Del.-N.J.-MD	656	1,193	1,376	1,739	1,869	1,930	2,092	2,270	2,447
52	York, Pa	384	600	658	798	859	945	1,046	1,167	1,287
53	**Sum of SMSA's**	**53,526**	**87,353**	**99,579**	**118,533**	**127,379**	**137,424**	**150,013**	**162,354**	**174,803**
54	**Non-SMSA area**	**6,360**	**9,731**	**10,814**	**13,071**	**14,153**	**15,358**	**16,662**	**18,190**	**19,620**
	Great Lakes:									
55	Akron, Ohio	800	1,414	1,556	1,847	1,973	2,124	2,349	2,540	2,668
56	Anderson, Ind	171	304	347	425	442	454	498	537	530
57	Ann Arbor, Mich	238	441	544	735	815	890	1,029	1,131	1,154
58	Appleton-Oshkosh, Wis	290	500	571	705	780	818	894	976	1,046
59	Battle Creek, Mich	215	329	346	433	484	513	542	589	604
60	Bay City, Mich	120	195	198	262	287	304	334	364	376
61	Bloomington- Normal, Ill	112	175	217	263	289	328	349	375	402
62	Canton, Ohio	467	766	833	1,019	1,097	1,159	1,259	1,381	1,457
63	Champaign-Urbana, Ill	164	280	326	416	488	537	551	609	641
64	Chicago, Ill	10,806	17,911	20,119	24,141	26,095	27,800	30,036	32,529	34,493
65	Cincinnati, Ohio-Ky.-Ind	1,746	3,112	3,344	3,900	4,259	4,588	4,992	5,389	5,763
66	Cleveland, Ohio	3,044	5,164	5,624	6,852	7,372	7,742	8,467	9,197	9,519
67	Columbus, Ohio	939	1,796	2,011	2,425	2,626	2,827	3,141	3,421	3,694
68	Davenport-Rock Island-Moline, Iowa-Ill	510	800	848	1,046	1,153	1,247	1,334	1,406	1,486
69	Dayton, Ohio	976	1,780	1,996	2,493	2,753	2,987	3,226	3,616	3,776
70	Decatur, Ill	165	287	308	399	446	483	526	572	616
71	Detroit, Mich	6,112	9,547	10,497	14,207	15,397	16,141	17,931	19,523	19,993
72	Evansville, Ind.-Ky	315	436	483	629	683	735	792	868	910
73	Flint, Mich	533	1,017	1,186	1,610	1,666	1,714	1,943	2,102	2,044
74	Fort Wayne, Ind	346	575	699	875	965	1,019	1,111	1,221	1,288
75	Gary-Hammond-East Chicago, Ind	725	1,401	1,523	1,890	2,007	2,075	2,255	2,476	2,569
76	Grand Rapids, Mich	632	1,036	1,149	1,456	1,604	1,724	1,879	2,041	2,130
77	Greenbay, Wis	144	253	288	347	379	418	462	505	548
78	Hamilton-Middletown, Ohio	245	447	486	583	633	686	731	778	830
79	Indianapolis, Ind	1,353	2,306	2,648	3,269	3,569	3,789	4,129	4,499	4,678

See footnotes at end of table.

Non-SMSA's, Selected Years, 1950–70

Total personal income, where earned—continued								Total personal income, where received								
Average annual rates of growth						Percent of United States		Millions of dollars								Line
1950–59	1959–65	1965–70	1950–70	1959–70	1969–70	1959	1970	1959	1962	1965	1966	1967	1968	1969	1970	
6.02	5.73	8.36	6.51	6.92	7.12	100.00	100.00	382,840	440 190	534,816	580,535	625,490	684,746	745,869	798,949	1
6.49	5.71	8.43	6.74	6.94	7.06	77.73	77.91	296,249	340,164	413,517	448,513	485,120	531,812	578,906	619,806	2
4.53	5.79	8.10	5.79	6.84	7.30	22.27	22.09	86,591	100,026	121,299	132,022	140,370	152,934	166,963	179,143	3
5.67	5.25	8.98	6.36	6.93	8.43	2.18	2.18	8,339	9,579	11,335	12,188	13,455	14,720	16,070	17,423	4
7.17	6.36	9.74	7.56	7.88	6.88	.45	.49	1,752	2,138	2,534	2,799	3,197	3,454	3,773	4,031	5
7.43	6.58	14.55	8.91	10.13	11.22	.04	.05	138	162	202	243	280	324	358	398	6
3.19	4.82	8.23	4.92	6.35	7.94	.20	.19	807	933	1,099	1,189	1,294	1,413	1,512	1,621	7
6.56	6.14	9.13	7.07	7.49	6.23	.52	.56	1,905	2,203	2,662	2,961	3,332	3,573	3,862	4,100	8
4.11	3.19	8.36	4.88	5.51	7.94	.04	.04	164	176	198	219	232	255	274	296	9
5.49	5.73	9.89	6.65	7.60	6.02	.10	.11	403	478	562	628	699	775	850	901	10
6.10	5.65	7.58	6.33	6.52	6.65	.44	.43	1,726	2,002	2,400	2,588	2,755	2,985	3,241	3,455	11
7.64	6.12	7.10	7.05	6.56	6.79	.12	.11	451	510	667	736	795	853	936	1,003	12
4.40	4.64	7.90	5.34	6.11	6.51	.08	.08	319	385	419	454	499	545	575	612	13
6.46	4.52	8.07	6.28	6.12	7.09	.10	.09	385	429	503	530	580	636	692	741	14
3.62	4.98	7.91	5.09	6.30	7.74	.40	.38	1,560	1,777	2,088	2,255	2,467	2,681	2,835	3,053	15
5.10	4.52	7.54	5.53	5.88	6.79	.31	.28	1,198	1,314	1,652	1,688	1,801	1,957	2,103	2,245	16
4.01	5.16	7.43	5.20	6.18	7.30	.33	.30	1,279	1,454	1,729	1,854	1,969	2,124	2,306	2,472	17
5.51	5.38	8.66	6.25	6.86	7.57	5.32	5.29	20,425	23,540	27,960	30,331	33,356	36,298	39,387	42,353	18
5.51	5.61	8.32	6.24	6.83	7.41	.97	.96	3,860	4,460	5,369	5,813	6,316	6,889	7,464	8,011	19
5.05	5.41	8.17	5.93	6.66	10.41	.39	.38	1,489	1,705	2,042	2,193	2,362	2,536	2,739	3,024	20
4.70	5.59	7.70	5.71	6.54	8.07	.29	.28	1,099	1,253	1,521	1,625	1,720	1,880	2,039	2,203	21
3.63	4.03	7.92	4.81	5.78	7.71	.07	.06	245	265	310	328	353	383	421	454	22
5.31	5.51	9.14	6.32	7.15	8.81	.08	.08	307	366	423	452	505	558	602	655	23
5.73	5.85	8.48	6.45	7.04	8.24	1.07	1.08	4,098	4,732	5,765	6,229	6,722	7,392	8,002	8,661	24
6.88	4.67	7.87	6.46	6.11	6.70	.16	.15	619	703	814	875	950	1,039	1,113	1,188	25
5.84	3.64	6.58	5.36	4.97	5.75	.84	.68	3,191	3,360	3,955	4,190	4,450	4,825	5,142	5,438	26
5.03	4.63	7.69	5.58	6.01	7.21	.06	.05	207	223	271	301	330	351	366	392	27
3.61	5.67	6.70	5.00	6.14	9.25	.13	.12	505	568	702	750	777	824	888	970	28
5.88	4.40	9.82	6.40	6.83	9.22	.22	.22	815	880	1,058	1,145	1,252	1,384	1,535	1,681	29
4.25	3.83	6.87	4.77	5.20	7.59	.42	.35	1,610	1,816	2,016	2,144	2,279	2,448	2,612	2,811	30
2.73	3.99	6.63	4.07	5.18	7.41	.11	.10	437	471	553	587	615	656	709	761	31
5.49	5.12	7.91	5.98	6.38	8.75	.16	.15	608	680	820	894	943	1,003	1,103	1,200	32
7.52	7.67	10.02	8.19	8.73	8.69	.15	.19	742	908	1,170	1,275	1,407	1,549	1,694	1,849	33
8.65	7.03	9.83	8.45	8.30	10.95	.26	.29	994	1,229	1,539	1,669	1,844	2,033	2,224	2,440	34
5.25	5.08	7.99	5.88	6.39	7.23	8.40	7.96	31,457	36,309	42,310	45,133	48,940	53,691	57,919	62,122	35
5.95	5.92	7.79	6.40	6.77	8.38	1.23	1.21	4,666	5,439	6,588	7,039	7,518	8,170	8,844	9,584	36
7.55	6.26	8.98	7.51	7.48	8.91	.74	.78	3,457	4,078	4,869	5,195	5,704	6,287	6,791	7,265	37
5.98	4.51	7.97	6.03	6.07	6.52	2.80	2.57	10,771	12,036	14,033	15,302	16,466	17,816	19,328	20,586	38
4.97	3.48	6.94	5.01	5.04	6.66	1.51	1.24	5,695	5,934	6,987	7,502	7,964	8,582	9,160	9,771	39
6.98	10.81	6.98	8.12	9.06	10.00	.10	.12	374	487	692	668	712	793	882	970	40
4.30	5.02	7.64	5.34	6.20	6.93	.16	.15	608	674	816	879	935	1,015	1,102	1,179	41
6.77	5.70	8.46	6.87	6.94	5.84	.50	.50	1,900	2,123	2,647	2,905	3,169	3,462	3,750	3,970	42
3.12	3.98	7.28	4.41	5.47	6.79	.11	.09	422	466	533	564	610	654	710	758	43
6.06	5.27	7.43	6.17	6.25	6.88	.32	.30	1,223	1,443	1,664	1,815	1,943	2,068	2,227	2,381	44
6.08	5.14	8.25	6.34	6.55	7.59	.19	.19	694	792	948	1,037	1,129	1,213	1,298	1,358	45
6.02	3.67	7.85	5.76	5.55	7.27	.18	.16	695	759	862	942	1,002	1,083	1,172	1,258	46
6.29	5.25	8.46	6.52	6.69	7.97	.06	.06	230	269	312	339	361	398	433	468	47
6.64	7.82	9.64	7.74	8.64	10.30	1.43	1.71	5,433	6,595	8,526	9,273	10,046	11,142	12,242	13,503	48
1.99	3.96	9.08	4.32	6.26	8.55	.15	.14	601	655	766	818	896	971	1,053	1,135	49
4.47	4.47	8.17	5.39	6.13	7.97	.06	.05	216	234	281	306	334	362	385	416	50
6.88	6.49	7.07	6.81	6.75	7.79	.31	.31	1,168	1,346	1,700	1,825	1,883	2,041	2,215	2,388	51
5.10	4.85	10.04	6.24	7.18	10.29	.16	.16	613	672	815	879	966	1,069	1,193	1,316	52
5.59	5.22	8.08	6.10	6.51	7.67	22.82	21.88	87,186	99,473	118,308	127,079	137,088	149,678	161,895	174,156	53
4.84	5.04	8.46	5.79	6.58	7.86	2.54	2.46	10,051	11,165	13,509	14,625	15,861	17,209	18,796	20,270	54
6.53	4.55	7.63	6.21	5.94	5.03	.37	.33	1,441	1,585	1,883	2,011	2,164	2,394	2,589	2,718	55
6.62	5.73	4.50	5.82	5.17	−1.44	.08	.07	289	327	387	432	454	494	534	545	56
7.11	8.88	9.45	8.23	9.14	2.00	.12	.14	430	484	670	744	781	880	1,013	1,091	57
6.24	5.90	8.20	6.63	6.94	7.16	.13	.13	495	565	698	772	809	884	965	1,035	58
4.83	4.66	6.87	5.29	5.66	2.54	.09	.08	303	342	419	465	507	537	550	558	59
5.53	5.05	7.46	5.87	6.14	3.08	.05	.05	211	229	296	325	343	375	405	416	60
5.04	7.02	8.88	6.59	7.86	7.34	.05	.05	178	220	267	294	333	355	381	409	61
5.65	4.88	7.41	5.85	6.02	5.49	.20	.18	748	814	994	1,068	1,130	1,227	1,346	1,420	62
6.09	6.84	9.05	7.05	7.84	5.36	.07	.08	277	323	412	483	532	546	603	635	63
5.78	5.10	7.40	5.98	6.14	6.04	4.68	4.32	17,840	20,038	24,041	25,984	27,681	29,907	32,387	34,344	64
6.63	3.83	8.12	6.15	5.76	6.93	.81	.72	3,099	3,329	3,882	4,240	4,567	4,968	5,363	5,735	65
6.05	4.83	6.79	5.87	5.72	3.51	1.35	1.19	5,061	5,510	6,707	7,210	7,574	8,280	8,993	9,312	66
7.48	5.13	8.78	7.09	6.77	7.96	.47	.46	1,750	1,957	2,358	2,551	2,746	3,049	3,321	3,585	67
5.14	4.56	7.29	5.50	5.79	5.72	.21	.19	786	832	1,025	1,129	1,222	1,308	1,379	1,458	68
6.90	5.77	8.66	7.00	7.08	4.44	.46	.47	1,720	1,927	2,401	2,649	2,875	3,104	3,477	3,635	69
6.32	5.65	9.08	6.81	7.20	7.70	.07	.08	277	298	385	430	465	507	550	593	70
5.08	6.85	7.07	6.11	6.95	2.40	2.49	2.50	9,545	10,495	14,204	15,393	16,137	17,927	19,519	19,988	71
3.70	6.27	7.68	5.46	6.91	4.85	.11	.11	426	472	613	665	717	772	846	887	72
7.44	7.96	4.88	6.95	6.55	−2.73	.27	.26	996	1,160	1,573	1,627	1,673	1,897	2,051	1,998	73
5.79	7.24	8.05	6.79	7.61	5.45	.15	.16	534	640	820	911	945	1,027	1,133	1,200	74
7.59	5.11	6.34	6.53	5.67	3.75	.37	.32	1,352	1,469	1,819	1,932	1,997	2,170	2,382	2,472	75
5.64	5.83	7.90	6.26	6.77	4.35	.27	.27	1,020	1,129	1,431	1,575	1,692	1,845	2,003	2,091	76
6.46	5.40	9.54	6.91	7.26	8.53	.07	.07	251	286	344	375	414	457	500	542	77
6.92	4.53	7.30	6.30	5.78	6.60	.12	.10	445	484	581	631	683	728	775	826	78
6.11	5.99	7.44	6.40	6.64	3.99	.60	.59	2,296	2,637	3,254	3,553	3,771	4,110	4,478	4,657	79

Table 1.—Total Personal Income, by SMSA's and

Line		Total personal income, where earned								
		Millions of dollars								
		1950	1959	1962	1965	1966	1967	1968	1969	1970
	Great Lakes—Continued									
80	Jackson, Mich	175	295	313	408	458	483	523	576	596
81	Kalamazoo, Mich	219	390	444	548	616	670	733	793	841
82	Kenosha, Wis	135	280	309	354	340	333	356	381	426
83	La Crosse, Wis	101	154	167	208	231	243	263	281	302
84	Lafayette-West Lafayette, Ind	111	199	228	293	327	342	364	408	434
85	Lansing-East Lansing, Mich	367	665	741	1,002	1,097	1,189	1,351	1,480	1,498
86	Lima, Ohio	209	316	370	443	501	523	587	650	679
87	Lorain-Elyria, Ohio	254	449	500	635	678	673	793	866	902
88	Madison, Wis	273	511	599	735	817	875	957	1,043	1,148
89	Mansfield, Ohio	162	299	318	378	411	431	478	515	539
90	Milwaukee, Wis	1,992	3,405	3,787	4,464	4,835	5,122	5,469	5,877	6,207
91	Muncie, Ind	152	237	284	352	374	389	422	458	474
92	Muskegon-Muskegon Heights, Mich	199	316	353	429	478	504	531	582	601
93	Peoria, Ill	520	791	812	1,062	1,146	1,218	1,313	1,391	1,514
94	Racine, Wis	209	312	354	468	497	536	565	623	650
95	Rockford, Ill	353	584	664	847	940	1,004	1,071	1,134	1,178
96	Saginaw, Mich	247	425	470	653	697	727	806	867	881
97	South Bend, Ind	490	692	675	769	835	878	947	1,002	1,034
98	Sprinfield, Ill	216	341	407	494	529	581	624	666	728
99	Springfield, Ohio	188	280	306	382	427	456	487	532	564
100	Steubenville-Weirton, Ohio-W. Va	248	389	429	536	541	561	588	616	664
101	Terre Haute, Ind	215	306	345	408	441	463	500	561	605
102	Toledo, Ohio-Mich	970	1,452	1,571	1,900	2,067	2,199	2,436	2,657	2,815
103	Youngstown-Warren, Ohio	648	1,124	1,206	1,467	1,563	1,646	1,847	2,050	2,113
104	**Sum of SMSA's**	**39,819**	**66,485**	**73,801**	**91,461**	**99,109**	**105,147**	**114,769**	**124,654**	**130,605**
105	**Non-SMSA area**	**10,640**	**16,414**	**18,789**	**23,257**	**25,520**	**26,929**	**29,284**	**31,800**	**33,507**
	Plains:									
106	Cedar Rapids, Iowa	202	368	424	490	539	572	610	655	690
107	Columbia, Mo	53	105	120	164	176	186	206	222	245
108	Des Moines, Iowa	427	739	789	885	976	1,042	1,117	1,203	1,298
109	Dubuque, Iowa	110	171	189	248	265	278	301	331	357
110	Duluth-Superior, Minn.-Wis	363	526	575	663	716	755	807	851	930
111	Fargo-Moorehead, N. Dak.-Minn	149	221	266	287	292	329	355	382	410
112	Kansas City, Mo.-Kans	1,424	2,631	2,996	3,687	3,985	4,370	4,798	5,184	5,558
113	Lincoln, Nebr	185	361	415	482	484	516	562	629	679
114	Minneapolis-St. Paul, Minn	2,128	3,847	4,499	5,455	5,961	6,540	7,247	8,060	8,647
115	Omaha, Nebr.-Iowa	619	1,082	1,286	1,488	1,602	1,739	1,873	2,066	2,249
116	Rochester, Minn	74	141	189	236	255	275	307	334	357
117	Sioux City, Iowa-Nebr	201	273	290	315	341	365	396	416	437
118	Sioux Falls, S. Dak	104	154	195	221	235	290	318	343	360
119	Springfield, Mo	147	250	280	325	347	391	437	473	516
120	St. Joseph, Mo	148	212	230	241	256	282	301	319	345
121	St. Louis, Mo.-Ill	3,163	5,236	5,792	7,089	7,653	8,220	8,888	9,473	10,135
122	Topeka, Kans	173	330	374	439	454	523	566	613	653
123	Waterloo, Iowa	191	339	334	377	420	429	466	489	514
124	Wichita, Kans	475	955	1,029	1,126	1,227	1,319	1,410	1,453	1,497
125	**Sum of SMSA's**	**10,337**	**17,942**	**20,274**	**24,217**	**26,184**	**28,420**	**30,965**	**33,497**	**35,876**
126	**Non-SMSA area**	**10,310**	**13,167**	**15,713**	**18,846**	**20,487**	**21,066**	**22,625**	**24,901**	**26,274**
	Southeast:									
127	Albany, Ga	52	122	145	188	207	200	216	246	278
128	Alexandria, La	88	159	169	211	226	259	287	304	325
129	Asheville, N.C	145	224	258	327	354	378	411	448	479
130	Atlanta, Ga	1,166	2,324	2,775	3,721	4,114	4,524	5,064	5,730	6,212
131	Augusta, Ga.-S.C	195	370	491	605	744	776	845	922	886
132	Baton Rouge, La	244	510	531	664	764	875	975	1,009	1,068
133	Biloxi-Gulfport, Miss	123	190	240	270	327	334	391	444	439
134	Birmingham, Ala	817	1,394	1,511	1,826	1,939	2,048	2,215	2,415	2,605
135	Charleston, S.C	203	360	434	550	629	712	791	856	907
136	Charleston, W. Va	355	569	585	654	704	768	797	833	908
137	Charlotte, N.C	351	673	822	1,051	1,173	1,303	1,443	1,607	1,766
138	Chattanooga, Tenn.-Ga	324	552	608	779	868	937	1,025	1,127	1,208
139	Columbia, S.C	211	430	488	636	720	770	856	945	1,042
140	Columbus, Ga.-Ala	238	363	405	568	647	699	770	807	800
141	Daytona Beach, Fla	84	194	235	333	356	393	445	493	536
142	Durham, N.C	152	254	306	377	415	481	536	593	655
143	Fayetteville, N.C	150	231	309	383	418	548	609	665	681
144	Florence, Ala	82	156	197	240	256	271	292	329	350
145	Fort Lauderdale-Hollywood, Fla	130	589	732	1,035	1,161	1,388	1,666	2,020	2,299
146	Fort Myers, Fla	28	86	111	152	174	197	226	276	315
147	Fort Smith, Ark.-Okla	128	208	262	270	289	322	350	392	427
148	Gadsden, Ala	105	164	161	196	218	233	260	279	285
149	Gainsville, Fla	50	113	142	192	213	242	271	304	341
150	Gastonia, N.C	145	212	246	314	351	369	406	441	465
151	Greensboro-Winston-Salem-High Point, N.C	579	1,067	1,277	1,587	1,771	1,958	2,153	2,400	2,619
152	Greenville, S.C	244	420	517	646	747	802	888	970	1,055
153	Huntington-Ashland, W. Va.-Ky.-Ohio	283	472	511	630	673	717	756	820	899
154	Huntsville, Ala	71	278	327	547	598	596	641	674	720
155	Jacksonville, Fla	436	938	1,100	1,323	1,433	1,543	1,717	1,885	2,121
156	Jackson, Miss	213	393	460	554	602	650	715	781	838
157	Knoxville, Tenn	458	682	761	922	1,001	1,068	1,164	1,270	1,374
158	Lafayette, La	64	141	161	211	222	250	278	311	341

See footnotes at end of table.

Non-SMSA's, Selected Years, 1950–70—Continued

Total personal income, where earned-continued								Total personal income, where received								Line
Average annual rates of growth						Percent of United States		Millions of dollars								
1950–59	1959–65	1965–70	1950–70	1959–70	1969–70	1959	1970	1959	1962	1965	1966	1967	1968	1969	1970	
5.99	5.53	7.90	6.33	6.60	3.51	0.08	0.07	294	312	406	456	481	521	574	594	80
6.63	5.85	8.94	6.97	7.24	6.00	.10	.11	377	429	529	594	646	706	764	810	81
8.44	4.01	3.77	5.92	3.90	11.69	.07	.05	279	309	353	340	333	355	381	425	82
4.84	5.13	7.77	5.66	6.32	7.63	.04	.04	149	162	201	224	235	255	272	292	83
6.63	6.68	8.17	7.04	7.35	6.28	.05	.05	189	217	284	316	332	355	399	422	84
6.82	7.08	8.37	7.28	7.66	1.24	.17	.19	659	735	993	1,087	1,177	1,338	1,465	1,484	85
4.71	5.79	8.90	6.07	7.19	4.34	.08	.08	311	363	435	491	512	575	637	665	86
6.54	5.97	7.27	6.56	6.56	4.14	.12	.11	458	516	650	693	725	814	889	925	87
7.23	6.24	9.34	7.46	7.64	10.09	.13	.14	507	595	729	810	867	948	1,034	1,138	88
7.09	3.96	7.38	6.22	5.50	4.74	.08	.07	278	300	359	386	406	450	483	509	89
6.14	4.62	6.82	5.85	5.61	5.61	.89	.78	3,374	3,751	4,420	4,787	5,071	5,415	5,818	6,145	90
5.06	6.83	6.11	5.85	6.50	3.42	.06	.06	233	278	346	367	382	413	449	465	91
5.26	5.20	7.01	5.68	6.02	3.36	.08	.08	308	343	417	465	489	516	566	585	92
4.75	5.04	7.36	5.49	6.09	8.89	.21	.19	772	793	1,036	1,118	1,188	1,281	1,356	1,476	93
4.55	7.00	6.79	5.84	6.91	4.37	.08	.08	340	386	496	526	565	604	653	686	94
5.78	6.39	6.82	6.22	6.58	3.93	.15	.15	578	657	838	929	992	1,057	1,120	1,164	95
6.23	7.42	6.16	6.57	6.84	1.58	.11	.11	423	467	649	693	722	801	862	875	96
3.89	1.79	6.09	3.80	3.72	3.13	.18	.13	678	662	754	818	860	928	982	1,013	97
5.24	6.35	8.06	6.28	7.12	9.22	.09	.09	333	397	481	515	566	608	649	709	98
4.51	5.34	8.08	5.65	6.58	6.01	.07	.07	276	300	387	426	460	495	557	589	99
5.12	5.47	4.37	5.04	4.97	7.75	.10	.08	400	441	551	557	576	605	633	682	100
4.04	4.89	8.19	5.32	6.38	7.91	.08	.08	309	348	411	445	467	504	565	610	101
4.58	4.58	8.17	5.47	6.20	5.93	.38	.35	1,460	1,579	1,911	2,079	2,211	2,450	2,672	2,830	102
6.31	4.53	7.56	6.09	5.90	3.05	.29	.26	1,107	1,187	1,442	1,535	1,617	1,815	2,013	2,076	103
5.86	**5.46**	**7.38**	**6.12**	**6.33**	**4.77**	**17.37**	**16.35**	**65,863**	**73,079**	**90,541**	**98,105**	**104,095**	**113,557**	**123,335**	**129,319**	**104**
4.93	**5.98**	**7.58**	**5.90**	**6.70**	**5.37**	**4.29**	**4.19**	**16,803**	**19,215**	**23,773**	**26,076**	**27,502**	**29,912**	**32,489**	**34,214**	**105**
6.88	4.89	7.08	6.33	5.88	5.22	.10	.09	361	416	480	528	560	597	642	675	106
7.90	7.69	8.35	7.96	7.99	10.34	.03	.03	105	120	164	177	187	206	223	246	107
6.27	3.06	7.95	5.71	5.25	7.89	.19	.16	716	765	858	944	1,008	1,081	1,163	1,254	108
5.06	6.39	7.57	6.09	6.92	7.76	.04	.04	156	175	223	241	252	275	297	323	109
4.20	3.94	7.02	4.82	5.33	9.38	.14	.12	521	570	657	710	749	800	844	923	110
4.49	4.40	7.43	5.20	5.77	7.39	.06	.05	222	268	288	294	331	357	384	412	111
7.06	5.79	8.55	7.05	7.04	7.21	.69	.70	2,609	2,971	3,655	3,949	4,330	4,754	5,136	5,506	112
7.72	4.93	7.11	6.73	5.92	7.97	.09	.09	361	415	482	484	516	562	629	680	113
6.80	5.99	9.65	7.26	7.64	7.27	1.00	1.08	3,804	4,446	5,388	5,886	6,457	7,155	7,956	8,536	114
6.40	5.45	8.60	6.66	6.87	8.83	.28	.28	1,065	1,263	1,463	1,575	1,709	1,840	2,030	2,209	115
7.41	8.94	8.68	8.20	8.82	6.86	.04	.04	138	184	230	248	267	299	325	348	116
3.45	2.43	6.77	3.97	4.38	4.99	.07	.05	269	287	311	337	360	392	411	431	117
4.42	6.22	10.23	6.40	8.02	5.03	.04	.05	153	193	219	233	286	315	339	356	118
6.10	4.45	9.66	6.48	6.79	9.09	.07	.06	244	272	316	336	379	424	458	500	119
4.12	2.10	7.44	4.33	4.49	7.88	.06	.04	204	220	235	245	269	287	304	327	120
5.76	5.18	7.41	5.99	6.19	6.99	1.37	1.27	5,152	5,697	6,968	7,518	8,074	8,730	9,304	9,957	121
7.45	4.87	8.25	6.87	6.40	6.49	.09	.08	322	365	428	442	509	551	596	635	122
6.55	1.78	6.42	5.07	3.86	5.06	.09	.06	331	327	368	410	419	455	477	502	123
8.06	2.78	5.86	5.90	4.17	3.06	.25	.19	941	1,013	1,109	1,207	1,298	1,387	1,429	1,474	124
6.32	**5.13**	**8.18**	**6.42**	**6.50**	**7.10**	**4.69**	**4.49**	**17,676**	**19,969**	**23,843**	**25,765**	**27,959**	**30,465**	**32,948**	**35,294**	**125**
2.76	**6.16**	**6.87**	**4.79**	**6.48**	**5.52**	**3.44**	**3.29**	**13,250**	**15,803**	**18,956**	**20,606**	**21,187**	**22,758**	**25,050**	**26,439**	**126**
9.86	7.43	8.19	8.72	7.77	13.06	.03	.03	122	147	194	213	207	223	255	287	127
6.76	4.82	8.97	6.73	6.69	6.84	.04	.04	157	167	208	222	255	282	299	320	128
4.96	6.55	7.91	6.17	7.17	6.89	.06	.06	219	253	320	346	370	402	438	468	129
7.97	8.16	10.79	8.72	9.35	8.42	.61	.78	2,249	2,681	3,587	3,962	4,356	4,876	5,514	5,980	130
7.34	8.57	7.92	7.86	8.27	—3.93	.10	.11	359	471	580	700	730	793	863	830	131
8.54	4.50	9.98	7.67	6.95	5.87	.13	.13	482	501	620	716	818	907	941	996	132
4.96	6.01	10.19	6.57	7.89	—1.22	.05	.05	189	238	268	324	330	387	440	434	133
6.11	4.60	7.36	5.97	5.85	7.85	.36	.33	1,367	1,481	1,789	1,899	2,005	2,169	2,364	2,550	134
6.58	7.33	10.54	7.78	8.78	5.89	.09	.11	357	431	545	625	707	785	849	899	135
5.37	2.34	6.79	4.81	4.34	9.03	.15	.11	547	564	626	672	726	754	794	880	136
7.51	7.72	10.93	8.42	9.17	9.93	.18	.22	678	828	1,066	1,193	1,310	1,450	1,612	1,774	137
6.08	5.91	9.16	6.80	7.38	7.14	.14	.15	514	566	717	802	869	943	1,038	1,110	138
8.25	6.74	10.36	8.32	8.37	10.23	.11	.13	429	486	633	716	765	851	940	1,036	139
4.82	7.74	7.10	6.26	7.45	—.84	.09	.10	358	398	559	637	688	758	794	787	140
9.75	9.43	9.94	9.71	9.66	8.68	.05	.07	196	237	337	360	398	450	498	541	141
5.90	6.78	11.67	7.58	8.98	10.54	.07	.08	255	307	378	415	482	537	594	656	142
4.94	8.81	12.20	7.88	10.33	2.42	.06	.09	229	306	380	415	543	603	659	674	143
7.40	7.42	7.81	7.52	7.60	6.20	.04	.04	154	193	236	252	267	287	323	344	144
18.25	9.84	17.32	15.43	13.18	13.84	.15	.29	687	839	1,187	1,336	1,571	1,869	2,229	2,548	145
13.05	10.08	15.65	12.80	12.58	14.11	.02	.04	86	112	154	176	198	228	279	318	146
5.55	4.43	9.61	6.22	6.76	8.84	.05	.05	209	264	272	292	324	353	395	430	147
5.13	2.99	7.78	5.14	5.14	2.08	.04	.04	163	159	194	216	231	257	277	282	148
9.39	9.31	12.14	10.05	10.58	12.24	.03	.04	112	140	190	210	240	268	300	337	149
4.35	6.76	8.13	6.01	7.38	5.41	.06	.06	210	243	311	347	365	402	436	460	150
7.03	6.85	10.53	7.84	8.51	9.09	.28	.33	1,028	1,230	1,526	1,702	1,883	2,069	2,306	2,514	151
6.22	7.45	10.30	7.60	8.74	8.73	.11	.13	417	513	641	740	795	880	962	1,045	152
5.83	4.94	7.35	5.94	6.03	9.56	.12	.11	468	506	625	667	710	749	813	890	153
16.33	11.97	5.65	12.27	9.05	6.94	.07	.09	265	321	534	583	592	643	689	743	154
8.88	5.89	9.91	8.23	7.70	12.55	.25	.27	932	1,093	1,314	1,423	1,532	1,705	1,871	2,106	155
7.02	5.88	8.62	7.08	7.12	7.27	.10	.10	390	457	550	597	645	709	774	830	156
4.53	5.14	8.31	5.65	6.57	8.15	.18	.17	664	740	896	973	1,037	1,130	1,234	1,335	157
9.19	6.94	10.14	8.75	8.38	9.85	.04	.04	140	160	208	220	247	275	307	338	158

Table 1.—Total Personal Income, by SMSA's and

Line		Total personal income, where earned								
		Millions of dollars								
		1950	1959	1962	1965	1966	1967	1968	1969	1970
	Southeast—Continued									
159	Lake Charles, La	123	289	279	310	333	387	431	450	484
160	Lakeland-Winter Haven, Fla	191	397	437	571	609	675	712	804	855
161	Lexington, Ky	122	263	331	439	485	534	594	652	701
162	Little Rock-North Little Rock, Ark	277	522	609	790	856	921	1,002	1,081	1,173
163	Louisville, Ky.-Ind	903	1,627	1,862	2,267	2,468	2,646	2,952	3,222	3,464
164	Lynchburg, Va	109	199	248	306	330	351	394	434	473
165	Macon, Ga	161	302	357	443	488	556	618	684	754
166	Melbourne-Titusville-Cocoa, Fla	34	243	361	639	743	862	954	965	926
167	Memphis, Tenn.-Ark	719	1,191	1,397	1,759	1,933	2,067	2,284	2,517	2,722
168	Miami, Fla	834	2,120	2,496	3,139	3,432	3,922	4,462	5,128	5,743
169	Mobile, Ala	297	601	658	857	892	886	938	1,008	1,107
170	Monroe, La	91	166	190	234	258	285	316	329	344
171	Montgomery, Ala	204	327	365	449	474	517	560	609	653
172	Nashville, Tenn	509	928	1,065	1,356	1,502	1,621	1,796	1,980	2,120
173	New Orleans, La	1,090	1,905	2,107	2,736	2,986	3,177	3,418	3,645	3,909
174	Newport News-Hampton, Va	213	470	577	734	793	872	924	1,002	1,095
175	Norfolk-Portsmouth, Va	702	1,070	1,273	1,605	1,740	1,895	2,094	2,257	2,402
176	Orlando, Fla	195	644	753	883	942	1,057	1,192	1,363	1,501
177	Owensboro, Ky	79	142	149	187	204	210	221	234	245
178	Parkersburg-Marietta, W. Va.-Ohio	127	239	262	332	365	410	436	458	491
179	Pensacola, Fla	157	375	419	538	566	606	672	765	817
180	Petersburg-Hopewell, Va	101	161	203	265	296	347	385	409	434
181	Pine Bluff, Ark	63	117	140	172	185	204	214	236	249
182	Raleigh, N.C	163	298	367	473	532	578	653	740	819
183	Richmond, Va	595	1,006	1,200	1,517	1,652	1,780	1,942	2,119	2,308
184	Roanoke, Va	199	323	382	475	506	562	628	688	749
185	Sarasota, Fla	37	139	180	233	253	288	338	407	460
186	Savannah, Ga	196	351	356	423	449	510	578	658	693
187	Shreveport, La	342	543	567	665	718	780	857	896	970
188	Spartanburg, S.C	163	234	282	365	416	443	482	534	582
189	Tallahassee, Fla	55	127	148	196	211	237	277	317	358
190	Tampa-St. Petersburg, Fla	522	1,440	1,714	2,079	2,240	2,488	2,815	3,189	3,587
191	Tuscaloosa, Ala	80	163	176	200	215	233	266	288	311
192	West Palm Beach, Fla	161	452	562	727	837	951	1,094	1,270	1,417
193	Wheeling, W. Va.-Ohio	257	356	368	422	453	493	531	572	627
194	Wilmington, N.C	89	132	155	198	214	236	271	310	343
195	**Sum of SMSA's**	**18,074**	**34,700**	**40,272**	**50,945**	**55,893**	**61,194**	**67,760**	**74,816**	**81,127**
196	**Non-SMSA Area**	**15,776**	**23,925**	**28,085**	**34,897**	**38,353**	**41,747**	**45,947**	**50,284**	**54,476**
	Southwest:									
197	Abilene, Tex	116	230	269	284	300	328	348	371	408
198	Albuquerque, N. Mex	217	581	653	773	813	872	930	1,017	1,128
199	Amarillo, Tex	175	328	387	432	514	518	502	506	540
200	Austin, Tex	198	377	441	558	604	686	797	901	995
201	Beaumont-Port Arthur-Orange, Tex	348	642	716	828	913	992	1,049	1,139	1,222
202	Brownsville-Harlingen-San Benito, Tex	115	180	181	244	261	253	281	300	334
203	Bryan-College Station, Tex	35	64	76	101	111	120	133	146	163
204	Corpus Christi, Tex	270	447	519	634	675	733	773	840	916
205	Dallas, Tex	1,430	2,741	3,157	3,945	4,320	4,886	5,553	6,289	6,730
206	El Paso, Tex	289	557	604	665	790	843	949	1,018	1,067
207	Fort Worth, Tex	644	1,238	1,328	1,675	1,845	2,145	2,425	2,655	2,818
208	Galveston-Texas City, Tex	180	279	321	381	410	461	501	516	577
209	Houston, Tex	1,726	3,251	3,713	4,705	5,136	5,846	6,580	7,314	8,073
210	Killeen-Temple, Tex	128	218	312	336	344	492	465	534	603
211	Laredo, Tex	42	71	78	99	111	128	146	164	180
212	Lawton, Okla	78	171	196	236	282	357	389	403	410
213	Lubbock, Tex	159	307	360	446	476	496	529	570	632
214	McAllen-Pharr-Edinburg, Tex	119	177	198	240	259	267	300	319	358
215	Midland, Tex	64	168	205	230	240	255	268	277	300
216	Odessa, Tex	68	198	205	240	256	270	282	301	329
217	Oklahoma City, Okla	591	1,063	1,269	1,565	1,691	1,845	2,022	2,217	2,477
218	Phoenix, Ariz	455	1,276	1,710	2,128	2,356	2,616	2,923	3,334	3,716
219	San Angelo, Tex	84	112	141	166	179	195	213	226	252
220	San Antonio, Tex	697	1,175	1,364	1,692	1,944	2,068	2,334	2,602	2,811
221	Sherman-Denison, Tex	84	126	144	178	192	206	238	275	295
222	Texarkana, Tex.-Ark	93	132	163	213	237	284	332	354	362
223	Tucson, Ariz	181	515	664	712	795	885	983	1,130	1,269
224	Tulsa, Okla	525	1,007	1,063	1,290	1,409	1,519	1,668	1,784	1,900
225	Tyler, Tex	95	155	187	225	243	263	291	321	353
226	Waco, Tex	163	269	307	366	381	405	454	480	516
227	Wichita Falls, Tex	196	247	315	321	386	402	445	488	510
228	Sum of SMSA's	9,563	18,300	21,246	25,912	28,472	31,635	35,104	38,790	42,244
229	Non-SMSA area	5,286	8,070	9,141	10,651	11,415	11,981	13,088	14,218	15,572
	Rocky Mountain:									
230	Billings, Mont	91	182	194	218	226	251	270	281	306
231	Boise City, Idaho	101	194	227	256	273	291	319	362	403
232	Cheyenne, Wyo	92	130	153	173	174	188	194	207	226
233	Colorado Springs, Colo	112	299	381	473	519	611	699	773	850
234	Denver, Colo	1,107	2,276	2,825	3,222	3,504	3,791	4,257	4,744	5,265
235	Great Falls, Mont	97	165	198	226	240	244	262	283	305
236	Ogden, Utah	116	218	254	310	353	378	394	406	438
237	Provo-Orem, Utah	84	166	183	219	230	250	295	312	341
238	Pueblo, Colo	118	217	257	286	300	309	341	367	407
239	Salt Lake City, Utah	486	933	1,170	1,338	1,412	1,490	1,612	1,765	1,956
240	**Sum of SMSA's**	**2,404**	**4,781**	**5,840**	**6,720**	**7,232**	**7,803**	**8,643**	**9,501**	**10,497**
241	**Non-SMSA area**	**2,687**	**3,936**	**4,569**	**5,105**	**5,380**	**5,606**	**6,008**	**6,623**	**7,216**

See footnotes at end of table.

Non-SMSA's, Selected Years, 1950–70—Continued

Total personal income, where earned-continued								Total personal income, where received								Line
Average annual rates of growth						Percent of United States		Millions of dollars								
1950–59	1959–65	1965–70	1950–70	1959–70	1969–70	1959	1970	1959	1962	1965	1966	1967	1968	1969	1970	
10.00	1.18	9.30	7.11	4.79	7.45	0.08	0.06	289	279	311	334	387	431	451	485	159
8.49	6.22	8.42	7.79	7.21	6.30	.10	.11	393	432	563	600	666	703	794	843	160
8.95	8.87	9.83	9.15	9.30	7.60	.07	.09	252	323	416	459	501	562	618	666	161
7.29	7.16	8.23	7.48	7.64	8.44	.14	.15	516	601	780	845	909	989	1,067	1,157	162
6.76	5.68	8.84	6.95	7.11	7.49	.43	.43	1,587	1,815	2,208	2,401	2,574	2,871	3,132	3,367	163
6.88	7.39	9.12	7.60	8.17	8.85	.05	.06	190	238	292	314	336	379	417	454	164
7.22	6.64	11.22	8.03	8.70	10.37	.08	.09	297	353	438	478	544	601	667	733	165
24.21	17.52	7.70	17.89	12.95	−4.06	.06	.12	237	352	622	722	836	927	938	903	166
5.77	6.71	9.12	6.88	7.80	8.13	.31	.34	1,178	1,381	1,738	1,909	2,040	2,254	2,484	2,686	167
10.92	6.76	12.84	10.13	9.48	11.98	.55	.72	2,093	2,465	3,097	3,385	3,868	4,400	5,055	5,660	168
8.17	6.07	5.27	6.81	5.71	9.83	.16	.14	600	656	854	890	883	934	1,005	1,104	169
6.91	5.85	8.05	6.88	6.84	4.65	.04	.04	165	189	233	257	284	315	327	342	170
5.39	5.42	7.80	6.00	6.50	7.19	.09	.08	326	364	448	473	515	559	608	652	171
6.90	6.54	9.35	7.40	7.80	7.08	.24	.27	903	1,037	1,318	1,457	1,572	1,742	1,920	2,057	172
6.40	6.22	7.39	6.59	6.75	7.24	.50	.49	1,905	2,107	2,735	2,985	3,176	3,417	3,643	3,907	173
9.16	7.71	8.35	8.53	8.00	9.30	.12	.14	465	570	726	785	863	915	992	1,085	174
4.80	7.00	8.39	6.35	7.63	6.41	.28	.30	1,060	1,261	1,589	1,723	1,877	2,074	2,235	2,377	175
14.21	5.42	11.19	10.76	8.01	10.17	.17	.19	642	751	881	939	1,054	1,189	1,359	1,498	176
6.69	4.73	5.53	5.82	5.09	4.74	.04	.03	139	145	183	199	205	215	228	239	177
7.31	5.62	8.13	7.01	6.75	7.16	.06	.06	241	264	334	368	414	439	461	494	178
10.16	6.17	8.72	8.59	7.32	6.80	.10	.10	378	423	542	570	610	677	770	822	179
5.35	8.65	10.38	7.58	9.43	6.11	.04	.05	157	198	258	288	338	376	400	424	180
7.17	6.66	7.73	7.16	7.14	5.26	.03	.03	116	139	170	184	202	213	235	247	181
6.95	7.98	11.60	8.41	9.61	10.67	.08	.10	291	358	459	516	561	633	716	793	182
6.00	7.08	8.76	7.01	7.84	8.91	.26	.29	1,006	1,200	1,517	1,652	1,780	1,942	2,120	2,309	183
5.54	6.62	9.54	6.85	7.94	8.98	.08	.09	336	399	492	524	580	650	713	777	184
15.81	9.01	14.55	13.42	11.49	12.91	.04	.06	136	177	228	248	282	331	399	450	185
6.67	3.17	10.38	6.52	6.38	5.30	.09	.09	345	349	415	440	500	567	646	680	186
5.28	3.43	7.83	5.35	5.41	8.22	.14	.12	537	560	657	710	771	846	885	958	187
4.10	7.70	9.77	6.57	8.63	9.11	.06	.07	238	288	373	424	452	492	544	593	188
9.73	7.54	12.80	9.83	9.90	12.75	.03	.04	125	147	194	209	234	274	313	353	189
11.95	6.31	11.52	10.12	8.65	12.49	.38	.45	1,445	1,720	2,086	2,248	2,497	2,825	3,200	3,599	190
8.23	3.44	9.30	7.04	6.06	7.89	.04	.04	163	176	199	215	233	265	288	311	191
12.12	8.24	14.29	11.48	10.95	11.65	.12	.18	449	558	721	831	944	1,085	1,259	1,405	192
3.71	2.88	8.24	4.58	5.28	9.59	.09	.08	361	373	428	460	500	538	581	636	193
4.57	6.91	11.70	7.02	9.06	10.95	.03	.04	133	156	199	215	237	273	312	346	194
7.52	**6.61**	**9.75**	**7.80**	**8.03**	**8.44**	**9.06**	**10.15**	**34,329**	**39,834**	**50,350**	**55,206**	**60,423**	**66,900**	**73,870**	**80,156**	195
4.74	**6.49**	**9.32**	**6.39**	**7.77**	**8.34**	**6.25**	**6.82**	**24,246**	**28,446**	**35,394**	**38,899**	**42,334**	**46,605**	**51,035**	**55,282**	196
7.94	3.56	7.50	6.51	5.33	9.85	.06	.05	232	271	286	302	330	350	373	410	197
11.58	4.90	7.83	8.60	6.22	10.89	.15	.14	576	648	766	805	865	921	1,008	1,118	198
7.23	4.69	4.53	5.79	4.62	6.55	.09	.07	332	391	436	518	523	507	512	545	199
7.42	6.76	12.26	8.41	9.22	10.39	.10	.12	373	437	553	598	679	789	891	983	200
7.05	4.34	8.09	6.49	6.03	7.28	.17	.15	629	701	811	893	969	1,026	1,114	1,195	201
5.10	5.22	6.48	5.49	5.80	11.28	.05	.04	180	181	244	261	253	281	301	334	202
6.80	8.06	9.97	7.98	8.93	12.01	.02	.02	64	76	102	111	121	133	146	164	203
5.76	5.99	7.63	6.30	6.73	9.04	.12	.11	449	521	637	678	736	777	843	920	204
7.50	6.25	11.27	8.05	8.51	7.01	.72	.84	2,711	3,120	3,897	4,266	4,824	5,482	6,206	6,642	205
7.54	3.01	9.92	6.74	6.09	4.82	.15	.13	561	610	671	796	850	957	1,027	1,077	206
7.52	5.18	10.96	7.66	7.77	6.12	.32	.35	1,250	1,341	1,693	1,865	2,168	2,451	2,684	2,847	207
5.02	5.33	8.65	6.01	6.82	11.90	.07	.07	281	323	383	412	463	503	518	580	208
7.29	6.36	11.40	8.02	8.62	10.38	.85	1.01	3,246	3,707	4,697	5,127	5,836	6,569	7,301	8,059	209
6.07	7.51	12.40	8.06	9.70	12.96	.06	.08	217	312	335	343	491	464	533	602	210
6.10	5.69	12.68	7.59	8.81	10.17	.02	.02	72	79	100	111	129	146	164	181	211
9.10	5.59	11.64	8.67	8.30	1.87	.04	.05	170	196	235	281	356	387	401	409	212
7.62	6.39	7.24	7.16	6.78	10.95	.08	.08	309	363	448	479	499	533	574	636	213
4.51	5.18	8.35	5.67	6.61	12.15	.05	.04	178	200	241	260	269	302	321	360	214
11.32	5.44	5.38	8.04	5.41	7.99	.04	.04	169	207	232	243	257	270	280	302	215
12.53	3.25	6.53	8.18	4.73	9.46	.05	.04	189	211	248	263	280	289	306	334	216
6.75	6.66	9.62	7.43	7.99	11.75	.28	.31	1,051	1,253	1,545	1,669	1,821	1,995	2,187	2,444	217
12.14	8.90	11.79	11.07	10.20	11.46	.33	.47	1,278	1,712	2,131	2,359	2,619	2,927	3,339	3,721	218
3.15	6.85	8.70	5.63	7.68	11.28	.03	.03	112	142	167	180	196	215	228	254	219
5.97	6.28	10.68	7.22	8.26	8.06	.31	.35	1,168	1,356	1,683	1,933	2,056	2,320	2,586	2,795	220
4.70	5.86	10.69	6.53	8.03	7.39	.03	.04	126	144	177	192	206	237	275	295	221
4.00	8.28	11.18	7.05	9.59	2.18	.03	.05	131	161	211	235	281	329	350	358	222
12.33	5.56	12.23	10.23	8.54	12.23	.13	.16	518	667	716	798	889	988	1,136	1,275	223
7.51	4.22	8.05	6.65	5.94	6.53	.26	.24	985	1,040	1,260	1,375	1,481	1,626	1,739	1,853	224
5.58	6.50	9.40	6.81	7.81	10.08	.04	.04	154	187	225	243	263	291	320	353	225
5.75	5.27	7.12	5.95	6.11	7.49	.07	.06	268	306	365	380	404	453	479	515	226
2.62	4.43	9.74	4.91	6.81	4.60	.06	.06	246	314	319	385	401	444	486	508	227
7.48	5.97	10.27	7.71	7.90	8.90	4.78	5.29	18,226	21,173	25,816	28,363	31,514	34,961	38,627	42,066	228
4.81	4.73	7.89	5.55	6.16	9.52	2.11	1.95	8,097	9,168	10,987	11,453	12,024	13,134	14,270	15,622	229
8.08	3.01	7.07	6.29	4.83	8.95	.05	.04	184	196	220	229	254	273	285	310	230
7.52	4.69	9.49	7.16	6.85	11.23	.05	.05	197	231	260	278	296	325	368	410	231
3.89	4.84	5.50	4.59	5.14	8.86	.03	.03	130	153	173	174	188	194	207	226	232
11.55	7.96	12.43	10.68	9.97	9.89	.08	.11	299	381	474	519	612	700	774	851	233
8.34	5.97	10.32	8.11	7.92	10.99	.59	.66	2,276	2,825	3,223	3,505	3,791	4,257	4,744	5,266	234
6.08	5.37	6.19	5.90	5.74	8.10	.04	.04	166	199	228	242	245	264	284	307	235
7.25	5.99	7.20	6.87	6.54	7.90	.06	.05	221	268	300	315	331	358	389	428	236
7.80	4.74	9.31	7.26	6.79	9.27	.04	.04	169	186	223	234	254	301	318	348	237
7.00	4.70	7.28	6.38	5.87	10.75	0.06	0.05	215	254	283	297	305	337	363	402	238
7.52	6.19	7.88	7.21	6.96	10.78	.24	.24	922	1,155	1,320	1,393	1,470	1,590	1,741	1,928	239
7.94	**5.84**	**9.33**	**7.65**	**7.41**	**10.48**	**1.25**	**1.31**	**4,780**	**5,848**	**6,703**	**7,186**	**7,748**	**8,598**	**9,474**	**10,475**	240
4.33	**4.43**	**7.17**	**5.06**	**5.67**	**8.96**	**1.03**	**.90**	**3,952**	**4,578**	**5,123**	**5,400**	**5,628**	**6,032**	**6,649**	**7,244**	241

Table 1.—Total Personal Income, by SMSA's and

Line		Total personal income, where earned								
		Millions of dollars								
		1950	1959	1962	1965	1966	1967	1968	1969	1970
	Far West:									
242	Anaheim-Santa Ana-Garden Grove, Calif.	348	1,415	2,077	2,882	3,116	3,525	3,928	4,379	4,771
243	Bakersfield, Calif.	360	648	721	937	989	1,033	1,121	1,149	1,216
244	Eugene-Springfield, Oreg.	204	351	380	481	496	521	571	619	672
245	Fresno, Calif.	429	780	880	1,079	1,157	1,283	1,427	1,497	1,623
246	Las Vegas, Nev.	97	336	590	658	696	757	881	1,036	1,168
247	Los Angeles-Long Beach, Calif.	8,178	17,536	20,393	24,642	26,695	28,575	31,056	33,633	35,482
248	Modesto, Calif.	186	329	400	477	523	547	607	653	709
249	Oxnard-Simi Valley-Ventura, Calif.	185	454	542	754	821	850	964	1,052	1,136
250	Portland, Oreg.-Wash.	1,213	1,923	2,241	2,767	3,013	3,286	3,618	3,985	4,230
251	Reno, Nev.	116	257	312	412	411	431	471	534	599
252	Richland-Kennewick, Wash.	134	203	250	274	293	310	323	347	371
253	Riverside-San Bernardino-Ontario, Calif.	641	1,700	1,987	2,493	2,657	2,880	3,181	3,492	3,803
254	Sacramento, Calif.	627	1,470	1,877	2,254	2,356	2,487	2,679	2,869	3,129
255	Salem, Oreg.	177	262	318	403	432	468	506	558	603
256	Salinas-Seaside-Monterey, Calif.	244	514	607	690	834	828	962	1,029	1,144
257	San Diego, Calif.	942	2,329	2,765	3,258	3,683	4,092	4,661	5,134	5,447
258	San Francisco-Oakland, Calif.	4,542	7,760	9,273	11,450	12,387	13,407	14,633	15,770	16,906
259	San Jose, Calif.	461	1,561	2,099	2,692	3,025	3,351	3,821	4,208	4,515
260	Santa Barbara-Santa Maria-Lompoc, Calif.	201	442	620	688	741	763	827	898	957
261	Santa Cruz, Calif.	102	170	236	285	309	319	359	381	413
262	Santa Rosa, Calif.	155	308	349	446	478	492	544	604	662
263	Seattle-Everett, Wash.	1,577	2,956	3,515	3,919	4,593	5,257	5,861	6,301	6,301
264	Spokane, Wash.	352	601	660	746	815	888	966	1,063	1,142
265	Stockton, Calif.	343	569	672	807	872	1,007	1,106	1,156	1,245
266	Tacoma, Wash.	459	653	769	867	974	1,109	1,274	1,411	1,551
267	Vallejo-Fairfield-Napa, Calif.	252	437	534	665	720	760	843	903	986
268	Yakima, Wash.	177	263	307	339	385	408	433	470	489
269	**Sum of SMSA's**	**22,700**	**46,226**	**55,373**	**67,365**	**73,474**	**79,634**	**87,627**	**95,133**	**101,273**
270	**Non-SMSA area**	**3,860**	**5,837**	**6,608**	**7,867**	**8,508**	**8,806**	**9,625**	**10,335**	**11,040**
	Alaska and Hawaii:									
271	Anchorage, Alaska	0	340	396	513	548	640	698	792	878
272	Honolulu, Hawaii	0	1,083	1,404	1,705	1,871	2,040	2,297	2,604	2,941
273	**Sum of SMSA's**	**0**	**1,423**	**1,800**	**2,218**	**2,419**	**2,680**	**2,995**	**3,396**	**3,819**
274	**Non-SMSA area**	**0**	**477**	**573**	**706**	**738**	**793**	**861**	**955**	**1,077**

1. U.S. totals shown for 1965 and 1966 do not agree with totals shown in the State personal income series (August 1971 SURVEY).
2. The BEA definition of SMSA's in New England differs from that of the Office of Management and Budget.
3. Included in the Boston SMSA are Brockton, Lawrence, Haverhill, and Lowell SMSA's and the non-SMSA portions of Essex, Middlesex, and Plymouth counties.
4. The independent city of Colonial Heights, Va. is included in Richmond SMSA. This differs from OMB's definition which includes Colonial Heights with the Petersburg SMSA.

Table 2.—Per Capita Income, Major Types of Payment, and Earnings by

Line		Per capita income, where received											
		Dollars						Percent of the national average		Rank in SMSA's		Percent increase	
		1965	1966	1967	1968	1969	1970	1959	1970	1959	1970	1929–70	1959–70
1	**Total United States**	**2,765**	**2,970**	**3,169**	**3,436**	**3,705**	**3,920**	**100**	**100**			**456**	**81**
2	**Sum of SMSA's**	**3,049**	**3,263**	**3,483**	**3,772**	**4,057**	**4,283**	**112**	**109**			**366**	**76**
3	**Non-SMSA area**	**2,097**	**2,274**	**2,417**	**2,623**	**2,849**	**3,032**	**73**	**77**			**670**	**93**
	New England:												
4	Boston, Mass.	3,157	3,373	3,686	4,020	4,363	4,690	116	120	36	16	371	88
5	Bridgeport-Norwalk-Stamford, Conn.	3,427	3,726	4,194	4,498	4,832	5,072	125	129	15	5	365	88
6	Burlington, Vt.	2,500	2,916	3,232	3,547	3,725	3,999	86	102	190	80	490	114
7	Fall River-New Bedford, Mass.	2,604	2,790	2,987	3,222	3,428	3,643	94	93	157	153	426	79
8	Hartford-New Britain, Conn.	3,470	3,769	4,203	4,470	4,777	5,009	128	128	11	6	348	81
9	Lewiston-Auburn, Maine	2,200	2,425	2,545	2,816	3,015	3,235	89	83	182	217	411	68
10	Manchester, N.H.	2,778	3,036	3,316	3,557	3,845	4,001	106	102	74	79	398	74
11	New Haven-Waterbury-Meriden, Conn.	3,331	3,551	3,703	3,990	4,339	4,628	122	118	24	19	374	76
12	Norwich-Groton-New London, Conn.	3,086	3,330	3,610	3,873	4,149	4,340	113	111	46	34	433	78
13	Pittsfield, Mass.	2,879	3,123	3,386	3,666	3,858	4,090	104	104	87	62	422	81
14	Portland-South Portland, Maine	2,639	2,769	3,010	3,323	3,609	3,842	99	98	130	115	361	80
15	Providence-Pawtucket-Warwick, R.I.	2,841	3,062	3,302	3,572	3,745	3,961	101	101	118	90	357	82
16	Springfield-Chicopee-Holyoke, Mass.	2,756	2,958	3,154	3,398	3,630	3,844	105	98	85	114	385	70
17	Worcester-Fitchburg-Leominster, Mass.	2,775	2,972	3,111	3,366	3,635	3,869	102	99	105	108	406	75
18	**Sum of SMSA's**	**3,706**	**3,306**	**3,593**	**3,889**	**4,188**	**4,456**	**113**	**114**			**381**	**83**
19	**Non-SMSA area**	**2,398**	**2,576**	**2,771**	**2,991**	**3,204**	**3,381**	**87**	**86**			**441**	**79**
	Mideast:												
20	Albany-Schenectady-Troy, N.Y.	2,907	3,088	3,314	3,503	3,796	4,183	105	107	81	59	327	84
21	Allentown-Bethlehem-Easton, Pa.-N.J.	2,946	3,103	3,265	3,512	3,787	4,045	104	103	89	69	410	80
22	Altoona, Pa.	2,257	2,368	2,556	2,813	3,110	3,347	83	85	205	206	436	86
23	Atlantic City, N.J.	2,477	2,634	2,910	3,211	3,449	3,728	89	95	183	139	338	94
24	Baltimore, Md.	2,910	3,092	3,311	3,617	3,895	4,167	106	106	76	52	356	81
25	Binghamton, N.Y.-Pa.	2,748	2,943	3,150	3,413	3,676	3,920	102	100	111	97	476	79
26	Buffalo, N.Y.	2,945	3,099	3,282	3,535	3,798	4,026	114	103	44	72	310	64
27	Elmira, N.Y.	2,594	2,920	3,180	3,379	3,569	3,860	98	98	146	111	351	83
28	Erie, Pa.	2,738	2,907	3,023	3,142	3,384	3,672	94	94	159	150	390	81
29	Harrisburg, Pa.	2,678	2,875	3,130	3,419	3,775	4,086	102	104	104	63	432	85

Non-SMSA's, Selected Years, 1950–70—Continued

Total personal income, where earned-continued								Total personal income, where received								Line
Average annual rates of growth						Percent of United States		Millions of dollars								
1950–59	1959–65	1965–70	1950–70	1959–70	1969–70	1959	1970	1959	1962	1965	1966	1967	1968	1969	1970	
16.87	12.59	10.61	13.99	11.69	8.96	.37	.60	1,743	2,403	3,502	3,925	4,371	4,892	5,463	5,935	242
6.73	6.34	5.37	6.27	5.90	5.88	.17	.15	634	704	915	966	1,008	1,094	1,120	1,187	243
6.22	5.40	6.90	6.14	6.08	8.54	.09	.08	352	382	483	497	523	573	621	674	244
6.87	5.55	8.51	6.88	6.89	8.44	.20	.20	782	881	1,081	1,160	1,286	1,430	1,500	1,626	245
14.83	11.85	12.16	13.26	11.99	12.74	.09	.15	336	590	725	769	819	950	1,102	1,216	246
8.85	5.83	7.56	7.61	6.62	5.50	4.58	4.44	17,318	20,131	24,320	26,336	28,186	30,633	33,173	35,007	247
6.50	6.42	8.24	6.91	7.24	8.51	.09	.09	331	403	481	528	552	612	659	715	248
10.52	8.83	8.54	9.52	8.70	8.01	.12	.14	457	546	760	827	856	972	1,060	1,145	249
5.26	6.25	8.86	6.45	7.43	6.13	.50	.53	1,924	2,243	2,769	3,016	3,288	3,621	3,988	4,233	250
9.28	8.19	7.79	8.58	8.01	12.08	.07	.07	258	313	414	414	433	474	537	602	251
4.74	5.16	6.25	5.25	5.65	6.95	.05	.05	203	250	274	293	310	323	347	371	252
11.45	6.60	8.81	9.31	7.60	8.91	.44	.48	1,718	2,009	2,523	2,689	2,913	3,217	3,532	3,846	253
9.94	7.38	6.78	8.37	7.11	9.07	.38	.39	1,465	1,869	2,245	2,347	2,477	2,669	2,858	3,117	254
4.41	7.45	8.41	6.31	7.88	7.95	.07	.08	266	323	409	439	476	514	567	612	255
8.65	5.02	10.63	8.04	7.54	11.15	.13	.14	513	606	688	832	825	959	1,026	1,140	256
10.59	5.76	10.83	9.17	8.03	6.10	.61	.68	2,324	2,759	3,251	3,674	4,083	4,650	5,122	5,434	257
6.13	6.70	8.11	6.79	7.34	7.21	2.03	2.12	7,730	9,235	11,403	12,335	13,351	14,572	15,703	16,836	258
14.51	9.50	10.90	12.08	10.13	7.28	.41	.57	1,573	2,117	2,714	3,051	3,380	3,854	4,246	4,554	259
9.16	7.65	6.84	8.12	7.28	6.61	.12	.12	433	606	671	723	744	806	875	933	260
5.82	9.01	7.67	7.24	8.40	8.42	.04	.05	183	234	290	323	344	399	433	463	261
7.92	6.36	8.25	7.54	7.22	9.70	.08	.08	321	395	518	563	609	669	746	810	262
7.23	4.81	9.97	7.17	7.12	.00	.77	.79	2,937	3,491	3,892	4,559	5,218	5,818	6,255	6,257	263
6.12	3.66	8.90	6.06	6.01	7.48	.16	.14	602	660	746	815	889	967	1,064	1,143	264
5.80	6.00	9.05	6.67	7.38	7.66	.15	.16	572	675	811	877	1,011	1,110	1,162	1,250	265
3.98	4.83	12.35	6.28	8.19	9.92	.17	.19	658	775	873	982	1,118	1,284	1,422	1,562	266
6.31	7.23	8.22	7.06	7.68	9.22	.11	.12	439	536	667	723	763	846	907	991	267
4.51	4.32	7.59	5.22	5.79	3.98	.07	.06	266	310	343	389	412	437	475	494	268
8.22	**6.48**	**8.50**	**7.76**	**7.39**	**6.45**	**12.07**	**12.68**	**46,336**	**55,445**	**67,770**	**74,051**	**80,245**	**88,347**	**95,961**	**102,152**	269
4.70	**5.10**	**7.01**	**5.39**	**5.97**	**6.82**	**1.52**	**1.38**	**5,851**	**6,614**	**7,778**	**8,407**	**8,721**	**9,531**	**10,250**	**10,979**	270
.00	7.09	11.37	.00	9.01	10.82	.09	.11	343	399	517	553	647	705	801	887	271
.00	7.86	11.52	.00	9.51	12.95	.28	.37	1,085	1,407	1,708	1,875	2,044	2,301	2,609	2,947	272
.00	**7.68**	**11.48**	**.00**	**9.39**	**12.45**	**.37**	**.48**	**1,428**	**1,806**	**2,226**	**2,428**	**2,691**	**3,006**	**3,410**	**3,835**	273
.00	**6.75**	**8.81**	**.00**	**7.68**	**12.75**	**.12**	**.13**	479	576	710	741	796	865	960	1,082	274

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Broad Industrial Source, by SMSA's and Non-SMSA's, for Selected Years, 1965–70

Personal income by major type of payment, where earned, 1970						Earnings by broad industrial source, where earned, 1970										Line
Millions of dollars						Millions of dollars										
Total wages and salaries	Other labor income	Proprietors' income	Property income	Transfer payments	Less: Personal contributions for social insurance	Total earnings	Farm earnings	Government earnings	Manufacturing	Mining	Contract construction	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Services	
536,674	**30,814**	**66,869**	**112,984**	**79,558**	**27,950**	**634,357**	**19,116**	**112,099**	**176,075**	**6,582**	**38,627**	**44,943**	**105,496**	**33,210**	**96,343**	1
432,242	**25,391**	**41,478**	**88,020**	**57,751**	**22,402**	**499,111**	**4,554**	**83,466**	**141,226**	**3,021**	**31,319**	**37,620**	**86,264**	**29,661**	**80,879**	2
104,432	**5,423**	**25,391**	**24,964**	**21,807**	**5,548**	**135,246**	**14,562**	**28,633**	**34,849**	**3,561**	**7,308**	**7,323**	**19,232**	**3,549**	**15,464**	3
11,927	619	1,065	2,676	1,721	607	13,611	27	2,005	3,485	5	880	890	2,440	981	2,855	4
2,469	148	336	821	293	130	2,954	2	262	1,226	1	187	124	442	121	576	5
284	15	24	55	33	14	323	5	38	108	0	33	19	48	15	56	6
1,018	56	91	224	206	52	1,165	7	153	519	(5)	56	59	174	(5)	153	7
3,145	189	239	707	326	159	3,573	31	359	1,381	2	248	142	516	428	456	8
186	9	24	41	41	10	219	6	21	88	0	(5)	7	41	(5)	34	9
638	36	49	127	79	35	723	3	67	289	1	59	59	116	37	91	10
2,265	135	232	568	319	118	2,632	8	309	927	4	202	201	418	107	451	11
632	32	60	146	77	29	723	8	188	269	(5)	37	30	90	(5)	83	12
397	23	47	94	70	21	467	2	44	212	1	27	18	60	17	85	13
500	25	58	106	80	27	582	6	79	131	0	44	49	128	48	96	14
2,054	113	198	401	373	131	2,365	2	334	822	(5)	(5)	135	409	133	371	15
1,492	86	138	328	259	75	1,716	15	304	577	(5)	105	85	257	(5)	275	16
1,625	101	143	357	276	83	1,870	12	228	789	1	112	108	264	80	273	17
28,631	**1,588**	**2,705**	**6,650**	**4,153**	**1,490**	**32,924**	**134**	**4,390**	**10,825**	**21**	**2,154**	**1,925**	**5,403**	**2,108**	**5,854**	18
4,884	**228**	**693**	**1,210**	**927**	**254**	**5,805**	**189**	**1,304**	**1,682**	**13**	**413**	**271**	**837**	**193**	**864**	19
2,158	106	190	343	333	101	2,455	10	589	609	3	185	176	399	101	380	20
1,556	120	149	288	208	82	1,825	16	141	913	6	96	130	245	56	218	21
305	16	32	68	62	17	352	5	42	111	0	21	62	54	9	47	22
405	19	55	87	101	23	479	6	88	70	0	42	36	105	30	99	23
6,406	334	482	991	776	329	7,222	26	1,806	1,823	3	461	575	1,183	365	969	24
805	47	87	156	127	39	939	14	140	422	(5)	54	48	127	(5)	103	25
3,772	286	328	659	599	182	4,386	22	621	1,747	(5)	251	332	670	(5)	564	26
269	18	24	60	46	13	312	2	41	131	0	22	16	51	9	40	27
683	46	79	104	105	36	809	17	71	395	0	48	49	112	26	89	28
1,248	59	103	193	183	67	1,410	19	372	322	2	92	131	217	72	182	29

Table 2.—Per Capita Income, Major Types ot Payment, and Earnings by

Line		Per capita income, where received											
		Dollars						Percent of the national average		Rank in SMSA's		Percent increase	
		1965	1966	1967	1968	1969	1970	1959	1970	1959	1970	1929–70	1959–70
	Mideast—Continued												
30	Jersey City, N.J.	3,266	3,479	3,688	3,998	4,272	4,596	123	117	20	20	434	73
31	Johnstown, Pa.	2,057	2,195	2,291	2,459	2,682	2,892	73	74	240	244	411	84
32	Lancaster, Pa.	2,770	2,948	3,038	3,202	3,495	3,746	102	96	110	131	464	70
33	Long Branch-Asbury Park, N.J.	2,849	3,024	3,258	3,510	3,757	4,011	104	102	93	75	377	79
34	New Brunswick-Perth Amboy-Sayreville, N.J.	2,947	3,132	3,357	3,626	3,881	4,164	107	106	72	53	486	80
35	New York, N.Y.	3,768	3,995	4,328	4,727	5,063	5,361	137	137	3	2	290	81
36	Newark, N.J.	3,630	3,857	4,132	4,490	4,806	5,143	129	131	10	4	377	85
37	Paterson-Clifton-Passaic, N.J.	3,734	3,959	4,279	4,666	5,013	5,327	136	136	4	3	543	81
38	Philadelphia, Pa.-N.J.	3,044	3,276	3,510	3,761	4,052	4,263	116	109	35	43	344	71
39	Pittsburgh, Pa.	2,925	3,116	3,309	3,559	3,816	4,061	110	104	54	67	360	70
40	Poughkeepsie, N.Y.	3,391	3,216	3,330	3,630	4,009	4,358	99	111	131	33	406	104
41	Reading, Pa.	2,867	3,013	3,205	3,459	3,746	3,969	103	101	99	88	414	79
42	Rochester, N.Y.	3,238	3,481	3,694	3,947	4,272	4,493	121	115	25	24	373	72
34	Scranton, Pa.	2,321	2,443	2,640	2,784	3,033	3,231	84	82	204	218	417	78
44	Syracuse, N.Y.	2,737	2,954	3,123	3,283	3,525	3,736	101	95	116	136	329	71
45	Trenton, N.J.	3,196	3,446	3,693	3,951	4,246	4,451	122	114	22	25	413	69
46	Utica-Rome, N.Y.	2,540	2,754	2,935	3,178	3,448	3,689	98	94	141	147	388	75
47	Vineland-Millville-Bridgeton, N.J.	2,629	2,874	3,035	3,322	3,588	3,841	100	98	119	116	504	77
48	Washington, D.C.-Md.-Va.	3,357	3,543	3,735	4,050	4,358	4,717	112	120	21	15	328	79
49	Wilkes-Barre-Hazelton, Pa.	2,197	2,359	2,598	2,819	3,074	3,309	81	84	214	210	417	90
50	Williamsport, Pa.	2,476	2,750	3,026	3,204	3,410	3,662	92	93	165	152	456	84
51	Wilmington, Del.-N.J.-Md.	3,616	3,865	3,941	4,197	4,502	4,764	132	122	8	11	333	67
52	York, Pa.	2,615	2,789	3,016	3,307	3,664	3,986	98	102	135	83	540	87
53	**Sum of SMAS's**	3,282	3,489	3,739	4,050	4,354	4,635	120	118	-------	-------	342	78
54	**Non-SMSA area**	2,349	2,549	2,742	2,952	3,225	3,459	88	88	-------	-------	494	83
	Great Lakes:												
55	Akron, Ohio	2,896	3,078	3,261	3,542	3,829	3,988	111	102	53	82	404	67
56	Anderson, Ind.	3,005	3,236	3,367	3,622	3,886	3,926	108	100	68	95	551	69
57	Ann Arbor, Mich.	3,425	3,654	3,747	4,139	4,531	4,646	116	119	33	18	506	85
58	Appleton-Oshkosh, Wis.	2,759	2,980	3,088	3,338	3,567	3,724	100	95	122	140	439	72
59	Battle Creek, Mich.	2,980	3,210	3,458	3,775	3,871	3,922	102	100	109	96	370	78
60	Bay City, Mich.	2,700	2,855	3,003	3,274	3,484	3,531	92	90	168	175	519	78
61	Bloomington-Normal, Ill.	2,905	3,002	3,362	3,507	3,711	3,908	99	100	127	99	505	83
62	Canton, Ohio	2,764	2,957	3,093	3,324	3,637	3,801	102	97	108	119	359	72
63	Champaign-Urbana, Ill.	3,005	3,112	3,393	3,442	3,751	3,881	98	99	142	105	471	84
64	Chicago, Ill.	3,567	3,836	4,038	4,346	4,680	4,911	134	125	7	10	299	70
65	Cincinnati, Ohio-Ky.-Ind.	2,887	3,136	3,354	3,616	3,896	4,129	114	105	45	58	305	68
66	Cleveland, Ohio	3,378	3,548	3,717	4,048	4,385	4,496	123	115	19	23	331	69
67	Columbus, Ohio	2,760	2,947	3,147	3,455	3,700	3,900	108	99	66	101	351	68
68	Davenport-Rock Island-Moline, Iowa-Ill.	3,098	3,286	3,497	3,671	3,844	4,012	115	102	40	73	408	62
69	Dayton, Ohio	3,022	3,262	3,467	3,687	4,118	4,261	110	109	57	44	448	79
70	Decatur, Ill.	3,145	3,443	3,709	4,063	4,413	4,730	109	121	59	14	532	100
71	Detroit, Mich.	3,510	3,746	3,861	4,281	4,657	4,745	118	121	28	12	359	86
72	Evansville, Ind.-Ky.	2,716	2,927	3,141	3,333	3,645	3,800	89	97	178	120	521	96
73	Flint, Mich.	3,316	3,379	3,465	3,812	4,124	4,011	111	102	49	74	460	67
74	Fort Wayne, Ind.	3,151	3,431	3,557	3,812	4,122	4,268	107	109	70	42	403	84
75	Gary-Hammond-East Chicago, Ind.	3,008	3,152	3,235	3,487	3,794	3,892	110	99	55	104	392	63
76	Grand Rapids, Mich.	2,876	3,070	3,264	3,510	3,754	3,867	103	99	98	109	376	74
77	Green Bay, Wis.	2,452	2,640	2,867	3,128	3,286	3,414	94	87	156	197	413	67
78	Hamilton-Middletown, Ohio	2,724	2,912	3,126	3,277	3,464	3,641	104	93	91	154	418	62
79	Indianapolis, Ind.	3,183	3,418	3,552	3,822	4,099	4,184	114	107	43	49	389	70
80	Jackson, Mich.	2,962	3,256	3,399	3,677	4,019	4,134	104	105	92	56	435	84
81	Kalamazoo, Mich.	2,942	3,191	3,442	3,727	3,901	4,008	103	102	94	76	335	79
82	Kenosha, Wis.	3,054	2,930	2,847	3,007	3,228	3,594	130	92	9	163	322	27
83	La Crosse, Wis.	2,667	2,842	2,978	3,185	3,388	3,623	97	92	148	157	429	73
84	Lafayette-West Lafayette, Ind.	3,006	3,128	3,220	3,373	3,719	3,846	99	98	125	113	512	79
85	Lansing-East Lansing, Mich.	2,962	3,185	3,341	3,679	3,944	3,910	103	100	101	98	478	76
86	Lima, Ohio	2,602	2,939	3,053	3,395	3,744	3,864	90	99	176	110	563	99
87	Lorain-Elyria, Ohio	2,692	2,830	2,918	3,226	3,499	3,588	98	92	140	164	428	70
88	Madison, Wis.	2,821	3,080	3,236	3,517	3,695	3,907	107	100	71	100	386	68
89	Mansfield, Ohio	2,882	3,048	3,195	3,502	3,748	3,899	109	99	60	102	459	65
90	Milwaukee, Wis.	3,265	3,504	3,677	3,898	4,170	4,362	124	111	17	32	321	63
91	Muncie, Ind.	2,966	3,025	3,068	3,286	3,523	3,587	98	92	137	165	343	69
92	Muskegon-Muskegon Heights, Mich.	2,740	3,010	3,156	3,317	3,614	3,706	96	95	153	145	428	79
93	Peoria, Ill.	3,212	3,367	3,532	3,775	3,987	4,307	115	110	38	37	446	73
94	Racine, Ill.	2,991	3,212	3,375	3,559	3,835	4,001	113	102	47	78	390	64
95	Rockford, Ill.	3,394	3,620	3,805	3,979	4,169	4,269	117	109	30	41	374	68
96	Saginaw, Mich.	3,110	3,230	3,347	3,654	3,927	3,972	103	101	95	85	437	78
97	South Bend, Ind.	2,768	2,971	3,119	3,332	3,517	3,608	117	92	31	161	358	43
98	Springfield, Ill.	3,152	3,236	3,547	3,803	4,049	4,385	106	112	77	29	504	91
99	Springfield, Ohio	2,686	2,914	3,088	3,275	3,618	3,739	98	95	144	135	401	77
100	Steubenville-Weirton, Ohio-W. Va.	3,316	3,394	3,485	3,639	3,831	4,108	111	105	51	60	520	72
101	Terre Haute, Ind.	2,470	2,632	2,689	2,855	3,215	3,474	84	89	203	187	557	91
102	Toledo, Ohio-Mich.	2,898	3,107	3,274	3,607	3,900	4,073	108	104	67	65	357	75
103	Youngstown-Warren, Ohio	2,750	2,920	3,056	3,419	3,782	3,859	101	98	117	112	422	77
104	**Sum of SMSA's**	3,222	3,440	3,607	3,904	4,213	4,367	117	111	-------	-------	349	72
105	**Non-SMSA area**	2,405	2,602	2,728	2,947	3,179	3,307	82	84	-------	-------	610	88
	Plains:												
106	Cedar Rapids, Iowa	3,158	3,332	3,483	3,705	3,970	4,130	123	105	18	57	373	55
107	Columbia, Mo.	2,361	2,399	2,489	2,660	2,800	3,026	90	77	175	233	574	56
108	Des Moines, Iowa	3,130	3,370	3,554	3,777	4,077	4,376	126	112	13	30	334	61
109	Dubuque, Iowa	2,549	2,714	2,795	3,047	3,298	3,560	91	91	170	170	438	80
110	Duluth-Superior, Minn.-Wis.	2,453	2,599	2,731	2,919	3,120	3,463	88	88	185	191	441	81
111	Fargo-Moorehead, N. Dak.-Minn.	2,508	2,548	2,898	3,114	3,317	3,422	99	87	126	196	473	60

Broad Industrial Source, by SMSA's and Non-SMSA's, for Selected Years, 1965–70—Continued

Personal income by major type of payment, where earned, 1970 (Millions of dollars)						Earnings by broad industrial source, where earned, 1970 (Millions of dollars)										Line
Total wages and salaries	Other labor income	Proprietors' income	Property income	Transfer payments	Less: Personal contributions for social insurance	Total earnings	Farm earnings	Government earnings	Manufacturing	Mining	Contract construction	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Services	
2,158	128	128	246	284	111	2,415	0	315	990	(5)	98	353	337	(5)	240	30
510	41	63	62	113	28	614	12	79	211	63	29	44	86	15	75	31
818	49	130	134	110	43	997	57	89	453	4	60	51	146	24	108	32
926	38	132	252	183	49	1,095	9	306	167	1	82	59	176	40	247	33
1,691	132	112	310	189	86	1,934	6	224	909	4	119	144	294	42	189	34
42,266	2,124	4,063	11,095	6,083	2,033	48,454	20	6,960	10,048	45	2,266	4,573	8,940	5,318	10,189	35
6,641	422	642	1,545	783	347	7,705	5	857	2,463	9	474	749	1,231	531	1,371	36
4,129	255	483	1,078	511	219	4,867	4	468	1,796	(5)	309	284	975	(5)	813	37
14,110	843	1,400	2,809	2,073	740	16,353	55	2,553	5,223	16	1,038	1,054	2,756	960	2,666	38
6,665	476	639	1,435	1,039	356	7,780	14	807	2,900	108	522	612	1,226	335	1,249	39
662	43	64	152	83	31	769	9	124	360	3	39	31	89	20	93	40
816	61	89	123	120	43	967	16	82	450	11	48	60	131	38	129	41
2,835	177	247	538	359	135	3,259	52	350	1,598	8	163	132	422	117	408	42
511	26	54	80	110	28	592	3	84	216	4	27	49	111	20	77	43
1,687	104	171	248	265	81	1,962	24	297	607	4	123	158	353	101	291	44
1,014	53	88	264	126	52	1,155	4	235	364	0	51	60	145	44	248	45
898	45	94	120	159	41	1,038	22	289	341	(5)	48	56	127	(5)	112	46
330	20	42	53	54	17	392	17	44	169	4	19	34	51	15	36	47
10,463	329	618	1,522	1,273	582	11,410	15	5,044	443	13	691	637	1,581	547	2,395	48
736	44	74	161	163	40	854	3	122	327	19	53	63	137	31	98	49
278	16	31	63	47	15	325	5	35	144	1	19	21	49	11	39	50
1,696	141	124	396	168	77	1,961	22	296	837	1	155	93	238	77	234	51
922	55	96	143	119	48	1,073	32	102	473	5	127	56	150	22	102	52
120,372	**6,673**	**11,114**	**25,779**	**16,955**	**6,090**	**138,159**	**542**	**23,672**	**38,029**	**347**	**7,833**	**10,927**	**22,915**	**9,494**	**24,100**	53
12,138	**666**	**1,838**	**3,120**	**2,476**	**617**	**14,641**	**569**	**3,203**	**4,525**	**242**	**809**	**906**	**2,088**	**384**	**1,842**	54
1,927	134	165	320	226	104	2,226	7	210	1,028	3	127	165	341	65	275	55
374	22	39	68	45	19	435	7	36	257	(5)	(5)	15	50	(5)	43	56
807	73	67	173	72	39	947	6	253	394	(5)	42	28	90	(5)	111	57
722	45	92	141	83	37	859	34	105	370	3	58	41	120	30	96	58
409	26	43	89	59	22	478	7	73	205	0	19	26	59	30	56	59
230	23	33	61	41	12	286	8	31	114	1	17	22	51	6	38	60
258	15	43	66	35	14	317	22	52	56	(5)	(5)	27	47	53	41	61
1,003	80	99	203	126	54	1,182	6	91	579	4	72	71	174	38	146	62
452	11	45	107	48	22	508	16	253	43	1	30	19	69	11	66	63
24,809	1,421	1,928	5,049	2,600	1,314	28,158	27	3,161	9,191	59	1,785	2,230	5,399	1,749	4,521	64
3,953	273	382	890	481	216	4,608	11	505	1,700	4	275	387	803	241	676	65
6,665	508	614	1,338	752	357	7,787	11	579	3,102	21	511	536	1,425	392	1,202	66
2,763	148	231	406	298	152	3,142	20	579	851	8	227	217	546	219	470	67
986	64	111	252	128	55	1,161	27	157	442	3	79	73	198	46	133	68
2,827	175	219	429	274	149	3,221	26	664	1,342	4	157	129	419	90	386	69
428	27	38	96	51	24	493	6	53	201	1	33	56	64	17	62	70
14,085	1,532	1,153	2,400	1,537	714	16,771	11	1,869	7,291	11	925	933	2,646	722	2,342	71
634	38	72	116	82	32	744	7	68	285	16	52	49	127	28	111	72
1,343	225	122	243	180	68	1,690	10	158	907	(5)	73	60	263	(5)	179	73
929	84	76	165	82	47	1,088	8	72	468	2	75	81	190	60	132	74
1,879	188	154	254	188	94	2,220	12	147	1,180	(5)	212	160	254	(5)	203	75
1,469	91	153	311	182	76	1,713	21	157	684	1	113	103	330	63	239	76
383	21	45	73	46	20	449	14	32	160	0	29	45	95	12	61	77
579	39	53	120	71	32	671	3	87	322	(5)	51	25	83	(5)	74	78
3,352	230	330	584	350	168	3,912	47	537	1,285	8	252	297	717	273	493	79
391	43	40	90	52	20	475	8	55	204	1	23	51	63	12	57	80
587	42	52	127	63	29	681	5	92	313	1	47	28	94	19	81	81
277	38	35	50	40	15	350	7	48	179	0	18	13	39	6	41	82
204	10	28	39	30	11	243	7	39	69	(5)	15	19	46	(5)	44	83
316	18	30	53	31	14	364	9	95	108	(5)	23	15	48	(5)	46	84
1,004	112	104	201	126	49	1,220	25	287	436	1	74	38	161	51	144	85
447	42	67	91	57	25	556	25	55	234	1	48	30	83	18	60	86
629	75	59	98	75	34	763	9	69	408	1	53	32	88	18	.84	87
807	34	92	168	89	42	933	30	251	165	2	84	50	151	58	138	88
387	26	37	70	41	21	450	4	43	225	1	25	25	59	18	48	89
4,352	292	371	905	512	224	5,015	22	474	2,064	5	307	328	836	269	702	90
325	34	34	59	37	16	394	6	43	192	0	19	23	57	11	39	91
402	32	39	88	61	21	473	4	46	247	1	21	30	61	11	52	92
1,052	69	111	221	118	56	1,232	25	116	531	7	97	70	194	44	145	93
435	32	47	102	56	23	514	9	69	253	1	26	22	62	13	60	94
843	72	79	140	87	44	995	14	68	531	2	51	46	139	28	114	95
577	72	60	126	76	30	708	10	59	359	1	43	34	100	21	80	96
699	56	87	133	94	36	842	12	73	317	(5)	50	55	150	(5)	136	97
493	23	53	120	67	28	569	13	131	100	1	45	57	92	46	83	98
381	35	40	76	54	22	456	9	95	181	0	19	22	56	16	57	99
462	48	36	80	61	24	547	0	34	316	15	32	36	55	10	49	100
401	23	61	74	67	20	484	20	68	128	(5)	55	42	88	(5)	55	101
1,907	168	210	381	255	105	2,284	31	252	891	4	149	177	386	75	317	102
1,492	142	142	227	190	81	1,776	5	144	892	(5)	128	99	247	(5)	207	103
92,135	**7,030**	**8,221**	**17,670**	**10,376**	**4,828**	**107,387**	**682**	**12,634**	**41,799**	**217**	**6,700**	**7,136**	**17,912**	**5,164**	**14,995**	104
20,427	**1,298**	**4,231**	**4,918**	**3,740**	**1,107**	**25,955**	**1,966**	**4,440**	**9,124**	**466**	**1,332**	**1,407**	**3,682**	**645**	**2,778**	105
473	29	56	105	53	27	558	16	36	248	3	39	34	87	27	68	106
165	6	22	39	21	8	194	8	66	17	(5)	(5)	2	31	24	31	107
946	52	97	150	107	54	1,094	10	122	247	2	74	94	229	136	179	108
241	15	36	51	28	14	292	13	15	135	1	17	16	42	9	42	109
633	37	55	118	120	33	726	2	151	95	100	52	74	120	21	109	110
263	11	46	68	38	16	320	19	56	22	(5)	30	30	83	(5)	58	111

Table 2.—Per Capita Income, Major Types of Payment, and Earnings by

Line		Per capita income, where received											
		Dollars						Percent of the national average		Rank in SMSA's		Percent increase	
		1965	1966	1967	1968	1969	1970	1959	1970	1959	1970	1929–70	1959–70
	Plains—Continued												
112	Kansas City, Mo.-Kans	3,130	3,354	3,632	3,934	4,154	4,373	112	112	48	31	467	81
113	Lincoln, Nebr	2,918	2,985	3,195	3,430	3,806	4,028	109	103	63	71	416	71
114	Minneapolis-St. Paul, Minn	3,276	3,526	3,786	4,121	4,466	4,686	120	120	26	17	404	80
115	Omaha, Nebr.-Iowa	2,856	3,081	3,292	3,489	3,800	4,050	109	103	62	68	357	72
116	Rochester, Minn	3,063	3,277	3,476	3,758	3,952	4,115	99	105	132	59	626	93
117	Sioux City, Iowa-Nebr	2,797	3,000	3,118	3,375	3,546	3,706	105	95	83	146	358	63
118	Sioux Falls, S. Dak	2,247	2,409	3,033	3,352	3,583	3,742	83	95	206	133	498	108
119	Springfield, Mo	2,217	2,342	2,606	2,832	3,017	3,256	91	83	172	215	463	66
120	St. Joseph, Mo	2,534	2,729	3,054	3,239	3,450	3,753	106	96	80	130	433	64
121	St. Louis, Mo.-Ill	3,154	3,387	3,583	3,855	4,011	4,201	115	107	41	48	341	69
122	Topeka, Kans	2,840	2,921	3,355	3,607	3,865	4,091	106	104	75	61	454	78
123	Waterloo, Iowa	2,986	3,224	3,239	3,491	3,641	3,770	126	96	12	126	432	38
124	Wichita, Kans	2,938	3,215	3,344	3,573	3,671	3,787	115	97	39	125	354	52
125	**Sum of SMSA's**	**3,043**	**3,261**	**3,487**	**3,760**	**3,995**	**4,207**	**113**	**107**			**393**	**73**
126	**Non-SMSA area**	**2,250**	**2,445**	**2,533**	**2,715**	**2,985**	**3,141**	**73**	**80**			**630**	**98**
	Southeast:												
127	Albany, Ga	2,142	2,339	2,342	2,613	2,898	3,198	76	82	232	227	494	94
128	Alexandria, La	1,866	1,970	2,201	2,397	2,542	2,709	66	69	249	247	670	89
129	Asheville, N.C	2,278	2,438	2,571	2,762	3,023	3,223	80	82	217	221	623	87
130	Atlanta, Ga	2,919	3,114	3,320	3,598	4,003	4,290	104	109	88	39	536	90
131	Augusta, Ga.-S.C	2,554	2,873	2,930	3,160	3,405	3,265	78	83	221	212	632	94
132	Baton Rouge, La	2,443	2,681	2,980	3,251	3,340	3,492	98	89	134	182	524	64
133	Biloxi-Gulfport, Miss	2,195	2,489	2,474	2,936	3,302	3,230	75	82	237	220	590	100
134	Birmingham, Ala	2,458	2,614	2,786	3,011	3,279	3,443	89	88	179	192	526	78
135	Charleston, S.C	1,891	2,078	2,326	2,588	2,809	2,953	66	75	250	241	592	108
136	Charleston, W. Va	2,609	2,833	3,083	3,245	3,461	3,832	100	98	121	117	539	77
137	Charlotte, N.C	2,981	3,238	3,510	3,782	4,078	4,326	101	110	114	35	682	98
138	Chattanooga, Tenn.-Ga	2,464	2,726	2,880	3,090	3,404	3,634	85	93	196	155	457	98
139	Columbia, S.C	2,194	2,383	2,512	2,718	2,996	3,203	77	82	227	226	630	92
140	Columbus, Ga.-Ala	2,277	2,632	2,913	3,314	3,391	3,288	77	84	226	211	563	97
141	Daytona Beach, Fla	2,126	2,227	2,464	2,763	2,985	3,168	75	81	236	230	418	96
142	Durham, N.C	2,170	2,416	2,783	2,909	3,174	3,442	78	88	223	193	626	105
143	Fayetteville, N.C	2,066	2,252	2,687	2,908	3,147	3,173	73	81	238	229	760	101
144	Florence, Ala	2,019	2,153	2,286	2,425	2,736	2,914	67	74	246	243	944	101
145	Fort Lauderdale-Hollywood, Fla	2,555	2,694	2,997	3,303	3,743	4,075	98	104	138	64	684	92
146	Fort Myers, Fla	1,937	2,088	2,242	2,465	2,807	3,000	75	77	233	237	434	84
147	Fort Smith, Ark.-Okla	1,769	1,924	2,132	2,271	2,502	2,673	73	68	239	248	630	70
148	Gadsden, Ala	2,092	2,345	2,537	2,828	3,005	2,994	79	76	219	238	760	75
149	Gainsville, Fla	2,032	2,252	2,529	2,787	2,976	3,193	72	81	241	228	818	106
150	Gastonia, N.C	2,241	2,471	2,526	2,786	2,986	3,092	78	79	220	232	731	83
151	Greensboro-Winston-Salem-High Point, N.C	2,691	2,956	3,234	3,500	3,868	4,156	93	106	161	54	546	106
152	Greenville, S.C	2,380	2,706	2,837	3,047	3,267	3,483	76	89	230	184	836	111
153	Huntington-Ashland, W. Va.-Ky.-Ohio	2,443	2,620	2,792	2,930	3,191	3,503	85	89	194	181	613	90
154	Huntsville, Ala	2,402	2,495	2,559	2,824	3,075	3,249	81	83	212	216	1,184	85
155	Jacksonville, Fla	2,593	2,774	2,949	3,245	3,534	3,950	98	101	143	91	425	87
156	Jackson, Miss	2,282	2,488	2,539	2,806	3,023	3,209	83	82	207	225	595	79
157	Knoxville, Tenn	2,308	2,479	2,641	2,848	3,099	3,328	84	85	198	208	583	82
158	Lafayette, La	2,101	2,093	2,307	2,535	2,793	3,020	77	77	225	235	941	80
159	Lake Charles, La	2,259	2,407	2,726	2,997	3,120	3,331	93	85	162	207	756	65
160	Lakeland-Winter Haven, Fla	2,711	2,731	3,011	3,130	3,498	3,681	96	94	152	148	654	77
161	Lexington, Ky	2,704	2,926	3,188	3,400	3,649	3,817	90	97	174	118	387	97
162	Little Rock-North Little Rock, Ark	2,558	2,761	2,904	3,146	3,346	3,574	89	91	180	169	456	85
163	Louisville, Ky.-Ind	2,854	3,047	3,213	3,542	3,836	4,067	103	104	102	66	413	84
164	Lynchburg, Va	2,408	2,588	2,761	3,087	3,390	3,673	80	94	216	149	687	113
165	Macon, Ga	2,252	2,434	2,778	2,993	3,264	3,544	78	90	224	172	572	111
166	Melbourne-Titusville-Cocoa, Fla	3,330	3,845	4,134	4,498	4,285	3,893	102	99	112	103	497	77
167	Memphis, Tenn.-Ark	2,377	2,580	2,714	2,981	3,258	3,481	82	89	210	185	453	97
168	Miami, Fla	2,800	2,968	3,279	3,604	4,045	4,428	107	113	73	26	404	92
169	Mobile, Ala	2,169	2,324	2,323	2,498	2,680	2,924	78	75	222	242	486	74
170	Monroe, La	2,080	2,304	2,511	2,772	2,862	2,967	76	76	231	240	501	80
171	Montgomery, Ala	2,218	2,336	2,566	2,832	3,092	3,230	77	82	228	219	514	94
172	Nashville, Tenn	2,600	2,827	2,998	3,298	3,596	3,794	91	97	169	123	522	92
173	New Orleans, La	2,718	2,929	3,077	3,318	3,514	3,733	99	95	133	137	416	75
174	Newport News-Hampton, Va	2,728	2,864	3,022	3,180	3,404	3,709	96	95	150	143	512	78
175	Norfolk-Portsmouth, Va	2,508	2,706	2,915	3,210	3,350	3,490	85	89	195	183	470	90
176	Orlando, Fla	2,309	2,415	2,668	2,944	3,254	3,471	96	89	151	188	511	67
177	Owensboro, Ky	2,383	2,586	2,637	2,751	2,903	3,004	92	77	166	236	614	51
178	Parkersburg-Marietta, W. Va.-Ohio	2,497	2,701	2,982	3,124	3,247	3,427	86	87	191	194	595	84
179	Pensacola, Fla	2,370	2,468	2,650	2,905	3,221	3,356	89	86	184	204	578	75
180	Petersburg-Hopewell, Va	2,389	2,617	2,903	3,205	3,461	3,722	75	95	234	141	852	129
181	Pine Bluff, Ark	2,008	2,119	2,327	2,502	2,756	2,891	67	74	248	245	669	100
182	Raleigh, N.C	2,351	2,545	2,665	2,918	3,224	3,464	81	88	213	190	647	97
183	Richmond, Va	3,005	3,237	3,455	3,709	4,004	4,324	105	110	84	36	421	91
184	Roanoke, Va	2,807	2,972	3,273	3,626	3,952	4,277	98	109	136	40	631	101
185	Sarasota, Fla	2,333	2,493	2,739	3,054	3,466	3,707	85	95	197	144	541	103
186	Savannah, Ga	2,167	2,345	2,777	3,084	3,464	3,612	86	92	189	160	477	94
187	Shreveport, La	2,289	2,486	2,654	2,863	3,006	3,259	90	83	173	214	461	68
188	Spartanburg, S.C	2,252	2,546	2,672	2,863	3,173	3,409	71	87	242	198	930	121
189	Tallahassee, Fla	2,261	2,295	2,524	2,871	3,146	3,401	80	87	215	199	761	96
190	Tampa-St. Petersburg, Fla	2,313	2,452	2,671	2,920	3,217	3,525	89	90	181	178	493	83
191	Tuscaloosa, Ala	1,683	1,821	1,994	2,287	2,468	2,671	70	68	243	249	748	76
192	West Palm Beach, Fla	2,451	2,725	3,032	3,375	3,740	3,997	94	102	160	81	356	97
193	Wheeling, W. Va.-Ohio	2,327	2,533	2,752	2,970	3,199	3,475	88	89	186	186	418	82
194	Wilmington, N.C	2,053	2,198	2,372	2,639	2,968	3,220	68	82	244	222	489	118
195	**Sum of SMSA's**	**2,496**	**2,691**	**2,897**	**3,158**	**3,436**	**3,664**	**90**	**93**			**536**	**89**
196	**Non-SMSA area**	**1,693**	**1,859**	**2,024**	**2,221**	**2,426**	**2,617**	**57**	**67**			**899**	**113**

Broad Industrial Source, by SMSA's and Non-SMSA's, for Selected Years, 1965–70—Continued

Personal income by major type of payment, where earned, 1970						Earnings by broad industrial source, where earned, 1970										Line
Millions of dollars						Millions of dollars										
Total wages and salaries	Other labor income	Proprietors' income	Property income	Transfer payments	Less: Personal contributions for social insurance	Total earnings	Farm earnings	Government earnings	Manufacturing	Mining	Contract construction	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Services	
3,953	247	363	750	453	209	4,563	33	585	1,208	5	266	566	918	295	681	112
433	20	46	144	58	22	499	7	119	82	0	40	41	83	45	81	113
6,326	346	451	1,189	659	324	7,123	21	892	2,084	5	516	587	1,435	461	1,110	114
1,593	77	165	297	198	81	1,835	33	327	346	2	135	201	348	143	295	115
247	11	36	53	23	13	294	14	26	76	(5)	18	13	42	(5)	96	116
273	15	51	66	48	16	339	19	40	85	(5)	21	33	73	(5)	52	117
222	12	32	75	32	13	267	11	27	57	(5)	(5)	27	68	17	45	118
334	18	45	81	55	18	397	3	49	109	1	30	34	85	17	68	119
223	12	34	48	39	12	269	10	31	89	(5)	19	21	51	(5)	35	120
7,082	480	585	1,455	901	368	8,148	28	995	2,826	35	504	724	1,450	402	1,174	121
437	20	35	123	60	22	491	1	124	81	0	35	61	79	36	74	122
346	21	47	71	49	20	414	14	44	180	1	24	23	65	12	51	123
1,028	61	134	184	145	55	1,223	14	173	373	27	71	76	217	64	204	124
25,218	**1,491**	**2,336**	**5,067**	**3,087**	**1,325**	**29,046**	**278**	**3,879**	**8,360**	**184**	**1,919**	**2,658**	**5,506**	**1,767**	**4,453**	125
13,010	**601**	**5,816**	**4,390**	**3,196**	**738**	**19,426**	**3,978**	**4,058**	**2,938**	**245**	**1,046**	**1,060**	**3,185**	**541**	**2,261**	126
204	8	20	30	25	9	233	4	70	48	(5)	19	11	42	(5)	26	127
206	8	32	47	42	10	246	11	80	31	2	17	15	42	12	35	128
335	17	39	57	48	18	392	5	64	128	0	22	24	65	15	68	129
4,671	264	341	779	388	231	5,276	2	685	1,104	(5)	311	628	1,312	(5)	797	130
681	29	57	74	72	28	767	8	262	232	(5)	36	32	92	(5)	77	131
723	55	64	181	82	37	842	2	138	216	4	127	44	139	46	125	132
315	10	25	63	37	12	350	0	178	28	1	23	20	45	12	41	133
1,826	126	158	329	268	102	2,110	10	232	631	59	128	209	410	130	299	134
682	26	60	93	78	32	768	7	305	124	(5)	56	46	109	(5)	93	135
635	45	59	107	94	32	739	0	93	187	44	56	92	129	33	103	136
1,377	72	109	173	105	71	1,559	17	107	339	(5)	141	198	394	(5)	228	137
337	52	85	175	104	46	974	5	99	413	(5)	57	42	161	(5)	132	138
820	33	67	78	80	36	920	7	295	135	(5)	64	67	157	(5)	124	139
633	19	35	74	61	21	687	3	340	(5)	(5)	(5)	27	77	26	63	140
260	11	62	121	97	14	332	10	60	46	0	23	14	69	24	84	141
464	27	50	80	59	24	540	9	104	142	(5)	37	25	70	(5)	118	142
547	12	31	69	36	13	590	9	366	55	(5)	24	18	63	(5)	40	143
230	17	33	43	40	13	280	14	66	108	(5)	15	11	34	(5)	24	144
1,236	59	130	645	291	61	1,424	11	136	172	3	259	94	328	115	297	145
174	8	28	64	50	9	211	5	22	12	1	35	16	55	23	39	146
274	16	33	56	63	15	323	5	39	104	(5)	25	23	58	(5)	48	147
194	16	24	30	33	11	233	4	27	110	0	12	13	31	7	29	148
228	7	27	57	34	12	261	13	115	25	0	17	9	39	11	30	149
351	18	26	50	38	18	395	2	30	223	0	13	34	48	9	37	150
1,871	117	172	384	172	97	2,160	28	182	916	(5)	136	156	356	(5)	262	151
777	40	64	133	80	40	881	2	78	359	(5)	73	46	144	(5)	135	152
610	46	62	104	109	33	719	0	87	263	5	47	72	123	22	98	153
542	21	49	75	62	29	613	26	203	106	(5)	18	13	68	(5)	164	154
1,605	68	103	200	219	74	1,776	2	488	198	(5)	(5)	166	364	165	243	155
592	30	73	97	79	33	695	17	110	97	10	62	57	148	67	124	156
974	60	93	158	140	52	1,127	4	207	397	22	60	55	196	33	152	157
230	11	30	54	28	12	271	5	34	15	54	22	27	57	10	48	158
301	32	47	72	47	16	380	12	48	114	15	58	25	50	10	46	159
480	24	139	146	90	24	643	106	88	114	30	43	26	113	30	87	160
495	26	76	74	56	27	598	20	91	153	1	51	39	99	32	112	161
836	43	77	144	116	45	956	7	187	196	(5)	(5)	88	185	(5)	142	162
2,468	169	225	446	286	130	2,863	6	321	1,089	5	195	222	480	151	390	163
345	21	29	56	38	17	395	4	52	182	0	22	20	51	17	47	164
548	20	50	97	67	27	617	8	241	99	(5)	40	31	90	(5)	77	165
604	28	44	207	73	29	676	9	106	172	0	30	20	78	22	237	166
1,963	97	206	312	245	102	2,266	32	409	503	2	129	190	501	123	375	167
3,895	186	362	917	573	190	4,443	41	619	536	13	364	662	924	329	942	168
764	38	80	146	123	42	881	12	188	209	1	61	83	154	37	132	169
218	12	31	55	40	12	260	5	40	56	2	22	24	58	11	41	170
467	19	51	76	65	24	536	17	163	68	(5)	36	32	103	(5)	83	171
1,502	79	160	288	171	80	1,741	15	249	457	2	114	110	329	152	311	172
2,718	147	264	551	370	142	3,129	2	437	469	179	224	416	645	210	543	173
864	32	52	101	81	36	949	1	429	233	0	44	31	91	22	96	174
1,906	58	111	200	207	80	2,075	7	1,078	158	(5)	117	128	288	(5)	227	175
1,016	46	169	161	158	49	1,231	92	196	189	(5)	122	75	253	(5)	217	176
165	11	31	22	26	9	206	7	21	68	5	15	19	33	7	31	177
337	25	34	63	50	18	396	1	48	171	3	38	20	59	12	44	178
596	25	47	92	83	25	667	6	274	(5)	(5)	44	27	90	(5)	70	179
331	17	17	50	31	12	365	5	163	107	0	12	12	34	6	26	180
149	8	35	33	33	9	192	20	29	45	0	9	26	29	7	27	181
606	26	63	95	61	31	694	22	149	114	(5)	(5)	45	144	62	112	182
1,662	96	119	327	188	84	1,877	5	319	447	2	131	167	374	163	265	183
527	25	42	112	71	28	595	2	85	142	1	38	84	122	32	88	184
228	10	40	113	81	12	278	3	34	28	0	39	13	63	25	70	185
499	25	48	80	65	24	572	0	126	135	(5)	41	69	97	(5)	79	186
651	33	94	125	98	32	779	18	157	119	(5)	55	78	148	(5)	133	187
430	21	39	64	51	22	490	7	47	218	(5)	26	25	66	(5)	84	188
254	6	17	62	32	13	277	2	137	13	0	19	7	49	15	35	189
2,145	103	247	663	536	107	2,495	14	420	425	(5)	215	210	560	(5)	471	190
218	12	24	32	38	12	253	4	66	78	1	16	12	34	9	32	191
805	39	154	304	156	40	997	90	104	200	0	110	39	183	65	195	192
417	31	48	81	73	22	496	2	50	136	58	46	36	75	21	72	193
240	12	34	38	32	13	287	7	46	79	(5)	17	33	50	(5)	43	194
56,754	**2,952**	**5,545**	**11,085**	**7,623**	**2,832**	**65,252**	**862**	**12,519**	**14,733**	**604**	**4,755**	**5,447**	**12,128**	**3,882**	**10,163**	195
33,953	**1,713**	**7,133**	**6,414**	**6,991**	**1,728**	**42,800**	**4,080**	**8,971**	**12,776**	**1,313**	**2,211**	**2,054**	**5,626**	**1,082**	**4,465**	196

Table 2.—Per Capita Income, Major Types of Payment, and Earnings by

Line		Per capita income, where received											
		Dollars						Percent of the national average		Rank in SMSA's		Percent increase	
		1965	1966	1967	1968	1969	1970	1959	1970	1959	1970	1929–70	1959–70
	Southwest:												
197	Abilene, Tex	2,307	2,504	2,804	2,939	3,193	3,581	91	91	171	167	793	83
198	Albuquerque, N. Mex	2,497	2,617	2,794	2,976	3,200	3,532	105	90	82	174	539	55
199	Amarillo, Tex	2,661	3,090	3,172	2,906	3,199	3,758	105	96	86	129	289	66
200	Austin, Tex	2,224	2,333	2,623	2,971	3,165	3,310	83	84	208	209	474	85
201	Beaumont-Port Arthur-Orange, Tex	2,607	2,892	3,118	3,257	3,519	3,763	97	96	147	127	482	80
202	Brownsville-Harlingen-San Benito, Tex	1,674	1,800	1,787	2,056	2,163	2,371	56	60	251	252	553	95
203	Bryan-College Station, Tex	2,110	2,250	2,471	2,729	2,725	2,808	67	72	247	246	836	94
204	Corpus Christi, Tex	2,285	2,446	2,609	2,702	2,938	3,212	79	82	218	224	595	87
205	Dallas, Tex	2,975	3,175	3,468	3,792	4,121	4,247	114	108	42	47	452	72
206	El Paso, Tex	1,914	2,247	2,388	2,612	2,821	2,982	84	76	201	239	383	64
207	Fort Worth, Tex	2,684	2,908	3,255	3,538	3,677	3,717	103	95	100	142	425	67
208	Galveston-Texas City, Tex	2,411	2,542	2,773	2,952	3,036	3,398	94	87	158	201	327	67
209	Houston, Tex	2,765	2,944	3,242	3,440	3,737	4,039	108	103	65	70	379	73
210	Killeen-Temple, Tex	2,244	2,425	3,631	3,183	3,475	3,745	87	96	188	132	893	100
211	Laredo, Tex	1,332	1,499	1,760	1,912	2,195	2,474	52	63	252	251	611	120
212	Lawton, Okla	2,447	2,760	3,021	3,296	3,550	3,759	88	96	187	128	772	97
213	Lubbock, Tex	2,489	2,601	2,808	2,978	3,192	3,530	93	90	163	176	625	75
214	McAllen-Pharr-Edinburg, Tex	1,287	1,396	1,474	1,720	1,792	1,973	46	50	253	253	576	97
215	Midland, Tex	3,578	3,786	4,141	4,458	4,423	4,593	118	117	29	21	343	81
216	Odessa, Tex	2,731	2,907	3,143	3,453	3,472	3,614	98	92	139	159	436	71
217	Oklahoma City, Okla	2,678	2,891	3,094	3,376	3,545	3,794	97	97	149	124	372	82
218	Phoenix, Ariz	2,501	2,712	2,943	3,203	3,529	3,800	92	97	167	121	496	91
219	San Angelo, Tex	2,369	2,543	2,739	3,007	3,196	3,557	82	91	209	171	474	101
220	San Antonio, Tex	2,111	2,370	2,507	2,759	3,024	3,218	77	82	229	223	439	94
221	Sherman-Denison, Tex	2,340	2,422	2,525	2,905	3,318	3,524	81	90	211	180	735	100
222	Texarkana, Tex.-Ark	2,262	2,561	2,998	3,450	3,557	3,525	67	90	245	179	799	142
223	Tucson, Ariz	2,287	2,511	2,745	2,976	3,293	3,586	93	91	164	166	471	78
224	Tulsa, Okla	2,899	3,100	3,244	3,482	3,682	3,873	111	99	52	107	427	62
225	Tyler, Tex	2,447	2,613	2,806	3,126	3,361	3,614	84	92	202	158	820	99
226	Waco, Tex	2,275	2,435	2,621	2,972	3,183	3,471	84	89	200	189	525	91
227	Wichita Falls, Tex	2,577	3,074	3,270	3,494	3,804	3,962	89	101	177	89	552	105
228	**Sum of SMSA's**	**2,529**	**2,738**	**2,988**	**3,224**	**3,478**	**3,705**	**95**	**95**			**464**	**80**
229	**Non-SMSA area**	**2,061**	**2,208**	**2,328**	**2,559**	**2,744**	**2,970**	**75**	**76**			**753**	**84**
	Rocky Mountain:												
230	Billings, Mont	2,537	2,707	2,961	3,137	3,278	3,535	109	90	61	173	374	50
231	Boise City, Idaho	2,551	2,693	2,848	3,023	3,340	3,631	99	93	124	156	410	69
232	Cheyenne, Wyo	2,820	2,931	3,441	3,555	3,727	3,986	103	102	96	84	395	79
233	Colorado Springs, Colo	2,650	2,797	3,002	3,165	3,385	3,578	99	91	129	168	353	68
234	Denver, Colo	2,896	3,115	3,296	3,571	3,917	4,255	116	109	34	45	351	69
235	Great Falls, Mont	2,776	2,993	3,037	3,242	3,501	3,742	106	95	79	134	348	64
236	Ogden, Utah	2,482	2,568	2,682	2,875	3,097	3,361	95	86	155	203	440	64
237	Provo-Orem, Utah	1,874	1,880	2,020	2,353	2,366	2,487	75	63	235	250	603	54
238	Pueblo, Colo	2,410	2,566	2,635	2,880	3,084	3,371	86	86	192	202	457	82
239	Salt Lake City, Utah	2,529	2,608	2,722	2,922	3,153	3,425	98	87	145	195	381	63
240	**Sum of SMSA's**	**2,678**	**2,834**	**2,997**	**3,236**	**3,504**	**3,790**	**105**	**97**			**382**	**68**
241	**Non-SMSA area**	**2,332**	**2,455**	**2,560**	**2,728**	**2,969**	**3,180**	**87**	**81**			**535**	**70**
	Far West:												
242	Anaheim-Santa Ana-Garden Grove, Calif	3,045	3,242	3,436	3,702	3,968	4,147	116	106	32	55	455	65
243	Bakersfield, Calif	2,848	3,004	3,141	3,401	3,441	3,600	102	92	106	162	449	63
244	Eugene-Springfield, Oreg	2,498	2,493	2,600	2,843	2,972	3,142	101	80	113	231	541	43
245	Fresno, Calif	2,663	2,835	3,142	3,505	3,673	3,931	100	100	120	94	539	81
246	Las Vegas, Nev	3,061	3,186	3,302	3,687	4,119	4,411	125	113	14	27	503	63
247	Los Angeles-Long Beach, Calif	3,576	3,865	4,087	4,422	4,746	4,980	135	127	5	8	370	71
248	Modesto, Calif	2,715	2,917	2,984	3,266	3,446	3,665	99	93	128	151	442	71
249	Oxnard-Simi Valley-Ventura, Calif	2,429	2,502	2,483	2,756	2,867	3,022	108	77	64	234	252	30
250	Portland, Oreg.-Wash	3,060	3,267	3,480	3,749	4,004	4,175	110	107	58	51	387	76
251	Reno, Nev	3,649	3,820	3,925	4,157	4,537	4,930	144	126	1	9	366	58
252	Richland-Kennewick, Wash	3,266	3,422	3,527	3,631	3,829	3,970	111	101	50	87	488	65
253	Riverside-San Bernadino-Ontario, Calif	2,447	2,561	2,715	2,947	3,148	3,351	100	85	123	205	412	55
254	Sacramento, Calif	2,964	3,064	3,211	3,454	3,644	3,877	110	99	56	106	378	63
255	Salem, Oreg	2,350	2,510	2,717	2,895	3,091	3,262	84	83	199	213	518	79
256	Salinas-Seaside-Monterey, Calif	3,050	3,410	3,260	3,806	4,020	4,535	122	116	23	22	383	72
257	San Diego, Calif	2,775	3,031	3,296	3,617	3,820	4,003	106	102	78	77	399	75
258	San Francisco-Oakland, Calif	3,829	4,107	4,391	4,743	5,084	5,410	137	138	2	1	310	82
259	San Jose, Calif	2,998	3,252	3,464	3,843	4,108	4,248	115	108	37	46	432	71
260	Santa Barbara-Santa Maria-Lompoc, Calif	2,699	2,864	2,918	3,137	3,340	3,528	120	90	27	177	194	36
261	Santa Cruz, Calif	2,665	2,891	2,994	3,335	3,543	3,732	102	95	107	138	446	69
262	Santa Rosa, Calif	2,826	3,019	3,202	3,461	3,713	3,949	103	101	103	92	491	78
263	Seattle-Everett, Wash	3,251	3,670	3,978	4,243	4,451	4,394	124	112	16	28	365	64
264	Spokane, Wash	2,782	3,014	3,297	3,571	3,860	3,971	101	101	115	86	401	82
265	Stockton, Calif	2,965	3,156	3,618	3,939	4,079	4,294	108	110	69	38	464	85
266	Tacoma, Wash	2,516	2,725	2,967	3,290	3,507	3,795	96	97	154	122	415	83
267	Vallejo-Fairfield-Napa, Calif	2,858	3,060	3,163	3,469	3,701	3,946	103	101	97	93	603	77
268	Yakima, Wash	2,469	2,770	2,898	3,066	3,358	3,401	86	87	193	200	378	84
269	**Sum of SMSA's**	**3,236**	**3,478**	**3,693**	**4,003**	**4,266**	**4,474**	**122**	**114**			**356**	**70**
270	**Non-SMSA area**	**2,602**	**2,767**	**2,861**	**3,115**	**3,304**	**3,464**	**99**	**88**			**463**	**62**
	Alaska and Hawaii:												
271	Anchorage, Alaska	3,496	3,677	4,126	4,306	4,671	4,982	135	127	6	7	100	71
272	Honolulu, Hawaii	3,034	3,325	3,559	3,939	4,324	4,740	104	121	90	13	100	111
273	**Sum of SMSA's**	**3,130**	**3,399**	**3,680**	**4,019**	**4,401**	**4,794**	**110**	**122**			**100**	**102**
274	**Non-SMSA area**	**2,752**	**2,922**	**3,123**	**3,377**	**3,635**	**4,052**	**95**	**103**			**100**	**98**

1. U.S. totals shown for 1965 and 1966 do not agree with totals shown in the State personal income series (August 1971 SURVEY).
2. The BEA definition of SMSA's in New England differs from that of the Office of Management and Budget.
3. Included in the Boston SMSA are Brockton, Lawrence, Haverhill, and Lowell SMSA's and the non-SMSA portions of Essex, Middlesex, and Plymouth counties.

Broad Industrial Source, by SMSA's and Non-SMSA's, for Selected Years, 1965–70—Continued

Personal income by major type of payment, where earned, 1970 (Millions of dollars)						Earnings by broad industrial source, where earned, 1970 (Millions of dollars)										Line
Total wages and salaries	Other labor income	Proprietors' income	Property income	Transfer payments	Less: Personal contributions for social insurance	Total earnings	Farm earnings	Government earnings	Manufacturing	Mining	Contract construction	Transportation, communications, and public utilities	Wholesale and retail trade	Finance, insurance, and real estate	Services	
240	9	62	69	39	12	311	22	87	30	12	16	19	52	14	59	197
798	32	60	163	112	36	889	0	233	70	2	63	63	161	55	241	198
324	16	67	104	48	19	406	13	67	49	11	22	45	102	23	74	199
710	25	60	150	84	35	795	5	292	99	1	59	29	130	46	134	200
836	102	84	139	104	44	1,022	4	100	432	(5)	91	90	132	(5)	125	201
195	8	57	42	43	11	260	31	63	25	1	13	17	56	10	39	202
107	3	14	27	17	5	125	6	54	11	(5)	9	4	19	(5)	16	203
595	34	89	147	80	30	718	26	156	114	43	58	52	133	31	103	204
4,963	274	426	880	445	257	5,663	33	530	1,424	97	354	537	1,302	489	888	205
804	32	71	99	96	35	907	21	324	143	1	43	81	152	35	106	206
2,001	125	183	387	227	105	2,308	13	338	834	26	109	139	397	111	340	207
377	32	44	92	52	20	453	1	80	144	4	45	40	55	27	56	208
5,793	374	487	1,192	530	302	6,654	26	546	1,545	371	692	577	1,380	383	1,122	209
457	8	31	81	36	10	495	11	344	28	0	13	14	41	8	36	210
114	4	22	25	22	5	139	12	50	6	1	3	12	32	5	18	211
301	5	16	72	22	6	322	4	236	(5)	(5)	6	8	29	(5)	22	212
372	16	100	115	49	20	488	51	99	50	1	32	36	112	27	78	213
192	8	67	51	50	11	267	47	62	18	8	10	12	61	8	37	214
188	8	36	62	16	10	232	5	23	11	81	10	13	35	11	41	215
224	11	28	56	22	12	263	0	33	36	48	24	19	57	9	37	216
1,786	87	181	293	228	97	2,054	16	556	316	75	122	165	367	138	298	217
2,596	136	302	461	344	123	3,034	97	517	683	3	240	194	571	210	510	218
148	6	33	47	25	7	187	14	53	22	2	7	17	33	8	29	219
2,025	68	171	362	277	91	2,263	15	991	230	15	105	95	373	132	306	220
192	9	24	49	31	10	225	4	51	73	3	12	15	29	7	31	221
233	12	29	59	42	13	274	8	77	72	1	12	19	42	8	34	222
830	39	79	224	135	38	948	2	264	81	71	99	56	147	47	179	223
1,314	80	147	262	167	70	1,541	14	153	379	143	84	172	277	76	239	224
224	15	29	62	35	12	269	2	36	85	11	13	18	46	13	43	225
328	16	47	88	57	18	390	9	82	92	1	21	24	70	22	68	226
326	9	50	98	41	13	385	8	167	(5)	(5)	13	20	66	(5)	52	227
29,592	**1,600**	**3,096**	**5,956**	**3,478**	**1,477**	**34,288**	**520**	**6,664**	**7,135**	**1,069**	**2,401**	**2,603**	**6,457**	**2,010**	**5,359**	228
8,380	**418**	**2,810**	**2,368**	**2,028**	**434**	**11,609**	**1,871**	**2,789**	**1,445**	**857**	**605**	**676**	**1,616**	**309**	**1,370**	229
194	13	32	51	28	12	239	7	33	34	(5)	17	26	62	(5)	44	230
279	14	37	56	36	18	329	5	60	43	1	31	30	80	27	51	231
147	6	18	40	21	7	171	6	67	9	1	12	25	23	8	19	232
617	15	46	129	62	19	678	8	355	50	1	41	27	75	25	96	233
3,795	181	319	727	435	193	4,295	13	838	808	74	322	387	859	281	705	234
201	9	27	51	27	10	237	7	71	24	0	21	19	46	13	36	235
308	11	24	68	46	18	342	4	169	39	0	13	25	43	8	39	236
226	16	23	53	35	12	265	5	47	83	4	15	15	32	5	58	237
271	16	23	59	53	15	310	3	88	88	0	18	23	41	10	39	238
1,443	77	123	221	169	77	1,643	9	370	260	(5)	91	161	328	(5)	246	239
7,479	**358**	**672**	**1,456**	**912**	**380**	**8,509**	**66**	**2,097**	**1,438**	**168**	**582**	**739**	**1,589**	**483**	**1,333**	240
4,098	**199**	**1,320**	**1,041**	**804**	**245**	**5,616**	**943**	**1,221**	**655**	**346**	**356**	**387**	**826**	**162**	**691**	241
3,380	187	305	554	530	184	3,871	17	550	1,317	21	274	138	666	220	654	242
789	33	175	103	164	48	997	161	269	78	71	49	58	150	36	112	243
452	22	56	88	80	25	530	2	89	170	3	35	39	97	16	76	244
893	39	249	279	220	57	1,181	209	226	144	9	60	77	230	50	163	245
899	32	65	127	80	35	996	2	169	44	1	97	73	147	41	421	246
24,663	1,422	2,553	4,613	3,638	1,407	28,638	84	4,069	8,330	130	1,415	1,961	5,179	1,767	5,653	247
429	20	83	92	111	26	533	68	105	126	0	34	23	91	14	67	248
740	31	102	157	150	43	873	77	269	132	21	55	38	138	28	106	249
2,827	164	346	616	432	155	3,336	31	481	799	(5)	(5)	321	718	(5)	551	250
436	17	50	69	46	20	504	1	92	26	3	44	47	91	33	168	251
247	13	41	45	39	14	301	22	55	(5)	(5)	24	16	37	(5)	82	252
2,456	113	340	440	601	146	2,908	139	852	511	(5)	175	179	449	(5)	461	253
2,203	75	228	319	440	136	2,505	65	1,050	238	1	159	164	386	103	331	254
377	16	65	84	81	20	458	30	132	85	(5)	29	25	74	(5)	58	255
782	20	147	127	98	30	949	138	440	62	6	28	40	117	21	91	256
3,808	142	320	784	578	185	4,271	41	1,621	692	7	267	206	580	181	656	257
11,361	627	1,083	2,832	1,654	651	13,071	39	2,823	2,202	26	812	1,563	2,305	1,008	2,265	258
3,201	190	263	604	432	175	3,654	33	479	1,431	1	225	178	533	133	633	259
616	25	92	142	118	35	733	26	165	103	12	44	32	122	30	196	260
221	10	55	66	74	14	287	35	46	52	1	24	15	51	10	51	261
400	15	60	95	116	25	476	10	142	60	3	29	25	95	31	79	262
4,339	245	454	902	598	237	5,038	9	732	1,468	(5)	314	435	960	(5)	751	263
705	34	106	198	139	39	845	13	196	121	2	57	77	173	50	155	264
716	31	134	249	160	44	880	104	232	156	1	44	65	144	28	100	265
1,148	38	95	152	163	45	1,281	5	575	196	1	66	61	175	58	142	266
695	20	52	134	124	38	767	19	432	(5)	(5)	27	34	85	(5)	83	267
277	12	77	62	78	15	365	63	66	53	1	17	19	80	14	48	268
69,061	**3,592**	**7,594**	**13,932**	**10,941**	**3,847**	**80,247**	**1,441**	**16,356**	**18,718**	**361**	**4,614**	**5,906**	**13,873**	**4,577**	**14,155**	269
6,729	**269**	**1,470**	**1,405**	**1,556**	**389**	**8,468**	**887**	**2,339**	**1,600**	**74**	**448**	**476**	**1,266**	**212**	**1,080**	270
756	26	44	45	37	31	826	0	355	41	50	82	71	105	27	84	271
2,244	81	150	380	188	102	2,474	28	899	146	0	280	207	375	148	384	272
3,000	**107**	**194**	**426**	**226**	**133**	**3,301**	**29**	**1,254**	**188**	**50**	**362**	**278**	**480**	**175**	**467**	273
813	**32**	**82**	**98**	**90**	**37**	**926**	**79**	**308**	**104**	**5**	**88**	**86**	**106**	**22**	**113**	274

4. The independent city of Colonial Heights, Va. is included in Richmond SMSA. This differs from OMB's definition which includes Colonial Heights with the Petersburg SMSA.
5. Data not shown to avoid disclosure.
6. Total includes forestry, fisheries, agricultural services, and rest of the world.

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

EXAMPLES OF AVAILABLE UNPUBLISHED DATA FOR LOCAL AREAS

Tables 5.00 and 5.01—Personal Income by Major Sources and Earnings by Broad Industrial Sector, Denver, Colo. SMSA

	Table 5.00 (thousands of dollars)					Table 5.01 (percent of the United States)				
	1966	1967	1968	1969	1970	1966	1967	1968	1969	1970
Total personal income	**3,504,345**	**3,790,939**	**4,256,744**	**4,743,605**	**5,264,844**	**0.6036**	**0.6061**	**0.6217**	**0.6360**	**0.6590**
Total wage and salary disbursements	2,487,916	2,706,400	3,040,477	3,415,553	3,794,676	.6362	.6454	.6600	.6762	.7071
Other labor income	102,229	110,803	135,328	156,668	181,496	.4917	.4996	.5337	.5560	.5890
Proprietors income	301,690	297,090	316,015	316,415	319,298	.5087	.4780	.4921	.4721	.4775
Farm proprietors income	6,032	606	6,938	658	376	.0375	.0041	.0473	.0039	.0024
Nonfarm proprietors income	295,658	296,484	309,077	315,757	318,922	.6840	.6266	.6240	.6283	.6250
Property income	488,451	524,745	590,256	674,472	726,747	.5867	.5799	.6044	.6372	.6432
Transfer payments	236,178	284,400	324,498	358,198	435,267	.5378	.5488	.5449	.5432	.5471
Less; personal contributions for social insurance	112,119	132,499	149,830	177,701	192,640	.6289	.6480	.6594	.6781	.6892
Total earnings	**2,891,835**	**3,114,293**	**3,491,820**	**3,888,636**	**4,295,470**	**.6137**	**.6184**	**.6346**	**.6478**	**.6771**
Farm earnings	13,795	10,934	17,636	13,188	13,297	.0731	.0621	.1002	.0665	.0696
Total nonfarm earnings	2,878,040	3,103,359	3,474,184	3,875,448	4,282,173	.6363	.6385	.6522	.6677	.6960
Government earnings	556,768	608,041	690,955	757,649	837,705	.7357	.7286	.7415	.7467	.7473
Total Federal	270,760	299,607	349,267	384,460	412,863	.8237	.8333	.8787	.9061	.9070
Federal civilian	182,550	220,203	240,033	260,472	298,485	.9079	1.0121	.9937	1.0093	1.0447
Military	88,210	79,404	109,234	123,988	114,378	.6911	.5594	.7005	.7460	.6748
State and local	286,008	308,434	341,688	373,189	424,842	.6681	.6493	.6394	.6321	.6381
Private nonfarm earnings	2,321,272	2,495,318	2,783,229	3,117,799	3,444,468	.6163	.6198	.6333	.6509	.6846
Manufacturing	549,567	589,323	644,753	738,039	808,359	.3884	.3978	.3989	.4228	.4591
Mining	38,772	42,146	49,461	61,581	74,330	.7607	.7884	.8832	1.0523	1.1293
Contract construction	210,728	217,771	255,935	285,307	322,300	.7347	.7298	.7782	.7704	.8344
Trans, communication, and public utilities	271,329	287,711	319,012	350,787	386,883	.8202	.8206	.8396	.8416	.8608
Wholesale and retail trade	590,287	626,125	706,196	782,812	858,701	.7476	.7466	.7763	.7938	.8140
Finance, insurance, and real estate	192,643	218,532	244,799	265,000	281,332	.8266	.8477	.8471	.8529	.8471
Services	462,727	508,315	557,315	627,509	704,609	.7161	.6953	.6972	.7100	.7314
Other	5,219	5,395	5,758	6,764	7,954	.3688	.3700	.3686	.3768	.4263

Tables 5.02 and 5.03.—Personal Income by Major Sources and Earnings by Broad Industrial Sector, Denver, Colo. SMSA

	Table 5.02 (percent change)					Table 5.03 (percent of total personal income)				
	1967-66	1968-67	1969-68	1970-69	1970-66	1966	1967	1968	1969	1970
Total personal income	**8**	**12**	**11**	**11**	**50**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Total wage and salary disbursements	9	12	12	11	53	71.00	71.39	71.43	72.00	72.08
Other labor income	8	22	16	16	78	2.92	2.92	3.18	3.30	3.45
Proprietors income	−2	6	0	1	6	8.61	7.84	7.42	6.67	6.06
Farm proprietors income	−90	1045	−91	−43	−94	.17	.02	.16	.01	.01
Nonfarm proprietors income	0	4	2	1	8	8.44	7.82	7.26	6.66	6.06
Property income	7	12	14	8	49	13.94	13.84	13.87	14.22	13.80
Transfer payments	20	14	10	22	84	6.74	7.50	7.62	7.55	8.27
Less: personal contributions for social insurance	18	13	19	8	72	3.20	3.50	3.52	3.75	3.66
Total earnings	**8**	**12**	**11**	**10**	**49**	**82.52**	**82.15**	**82.03**	**81.98**	**81.59**
Farm earnings	−21	61	−25	1	−4	.39	.29	.41	.28	.25
Total nonfarm earnings	8	12	12	10	49	82.13	81.86	81.62	81.70	81.34
Government earnings	9	14	10	11	50	15.89	16.04	16.23	15.97	15.91
Total Federal	11	17	10	7	52	7.73	7.90	8.21	8.10	7.84
Federal civilian	21	9	9	15	64	5.21	5.81	5.64	5.49	5.67
Military	−10	38	14	−8	30	2.52	2.09	2.57	2.61	2.17
State and local	8	11	9	14	49	8.16	8.14	8.03	7.87	8.07
Private nonfarm earnings	7	12	12	10	48	66.24	65.82	65.38	65.73	65.42
Manufacturing	7	9	14	10	47	15.68	15.55	15.15	15.56	15.35
Mining	9	17	25	21	92	1.11	1.11	1.16	1.30	1.41
Contract construction	3	18	11	13	53	6.01	5.74	6.01	6.01	6.12
Trans, communication, and public utilities	6	11	10	10	43	7.74	7.59	7.49	7.39	7.35
Wholesale and retail trade	6	13	11	10	45	16.84	16.52	16.59	16.50	16.31
Finance, insurance, and real estate	13	12	8	6	46	5.50	5.76	5.75	5.59	5.34
Services	10	10	13	12	52	13.20	13.41	13.09	13.23	13.38
Other	3	7	17	18	52	.15	.14	.14	.14	.15

Tables 5.04 and 5.06.—Location Quotient of Earnings by Broad Industrial Sector, Denver, Colo. SMSA

	Table 5.04 (percent of total earnings)					Table 5.06 (ratio)				
	1966	1967	1968	1969	1970	1966	1967	1968	1969	1970
Total earnings	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**
Farm earnings	.48	.35	.51	.34	.31	.1200	.1003	.1594	.1027	.1030
Total nonfarm earnings	99.52	99.65	99.49	99.66	99.69	1.0367	1.0325	1.0278	1.0307	1.0278
Government earnings	19.25	19.52	19.79	19.48	19.50	1.1986	1.1780	1.1682	1.1527	1.1036
Total Federal	9.36	9.62	10.00	9.89	9.61	1.3410	1.3473	1.3850	1.3989	1.3384
Federal civilian	6.31	7.07	6.87	6.70	6.95	1.4778	1.6366	1.5649	1.5581	1.5444
Military	3.05	2.55	3.13	3.19	2.66	1.1255	.9043	1.1060	1.1516	.9963
State and local	9.89	9.90	9.79	9.60	9.89	1.0880	1.0498	1.0082	.9756	.9419
Private nonfarm earnings	80.27	80.12	79.71	80.18	80.19	1.0041	1.0023	.9980	1.0049	1.0110
Manufacturing	19.00	18.92	18.46	18.98	18.82	.6327	.6433	.6285	.6527	.6780
Mining	1.34	1.35	1.42	1.58	1.73	1.2407	1.2736	1.3922	1.6289	1.6635
Contract construction	7.29	6.99	7.33	7.34	7.50	1.1970	1.1807	1.2258	1.1896	1.2315
Trans, communication, and public utilities	9.38	9.24	9.14	9.02	9.01	1.3362	1.3276	1.3227	1.2997	1.2726
Wholesale and retail trade	20.41	20.10	20.22	20.13	19.99	1.2178	1.2072	1.2232	1.2252	1.2020
Finance, insurance, and real estate	6.66	7.02	7.01	6.81	6.55	1.3455	1.3711	1.3352	1.3147	1.2500
Services	16.00	16.32	15.96	16.14	16.40	1.1670	1.1240	1.0984	1.0965	1.0797
Other	.18	.17	.16	.17	.19	.6000	.5862	.5714	.5667	.6552

NOTE.—Data are available for selected years, 1929–1965, and for every year thereafter until 1970.

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THE STATISTICS here update series published in the 1971 edition of BUSINESS STATISTICS, biennial statistical supplement to the SURVEY OF CURRENT BUSINESS. That volume (available from the Superintendent of Documents for $3.00) provides a description of each series, references to sources of earlier figures, and historical data as follows: For all series, monthly or quarterly, 1967 through 1970 (1960–70 for major quarterly series), annually, 1947–70; for selected series, monthly or quarterly, 1947–70 (where available). Series added or significantly revised after the 1971 BUSINESS STATISTICS went to press are indicated by an asterisk (*) and a dagger (†), respectively; certain revisions for 1970 issued too late for inclusion in the 1971 volume appear in the monthly SURVEY beginning with the September 1971 issue. Also, unless otherwise noted, revised monthly data for periods not shown herein corresponding to revised annual data are available upon request.

The sources of the data are given in the 1971 edition of BUSINESS STATISTICS; they appear in the main descriptive note for each series, and are also listed alphabetically on pages 189–90. Statistics originating in Government agencies are not copyrighted and may be reprinted freely. Data from private sources are provided through the courtesy of the compilers, and are subject to their copyrights.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1969	1970	1971	1969				1970				1971				1972
	Annual total			I	II	III	IV	I	II	III	IV	I	II	III	IV	I
				Seasonally adjusted quarterly totals at annual rates												

GENERAL BUSINESS INDICATORS—Quarterly Series

NATIONAL INCOME AND PRODUCT																
Gross national product, total bil. $	929.1	974.1	1,046.8	906.4	921.8	940.2	948.0	956.0	968.5	983.5	988.4	1,020.8	1,040.0	1,053.4	1,072.9	r1,103.6
Personal consumption expenditures, total do	579.6	615.8	662.1	564.3	575.8	584.1	594.2	604.0	613.8	620.9	624.7	644.9	657.4	668.8	677.2	r 691.8
Durable goods, total ♀ do	89.9	88.6	100.5	89.5	90.6	89.4	90.3	88.6	90.7	90.4	84.9	96.6	99.1	102.8	103.6	r 107.6
Automobiles and parts do	40.4	37.1	46.2	40.1	39.9	40.4	41.0	37.8	39.1	38.8	32.7	43.8	45.3	48.2	47.6	r 48.7
Furniture and household equipment do	36.3	37.4	39.6	35.6	37.0	36.2	36.2	37.3	37.6	37.0	37.6	38.8	39.4	39.6	40.8	r 43.6
Nondurable goods, total ♀ do	247.6	264.7	278.6	241.5	246.4	249.4	253.1	259.4	262.9	265.5	270.9	273.2	277.8	280.2	283.3	r 288.0
Clothing and shoes do	50.3	52.6	57.0	48.5	50.6	51.0	51.1	51.6	52.1	52.4	54.2	55.4	57.0	57.4	58.0	r 59.0
Food and beverages do	122.5	131.8	136.5	120.4	121.9	122.9	124.8	128.9	131.4	132.4	134.3	134.4	136.3	137.3	138.1	r 140.7
Gasoline and oil do	21.1	22.9	24.4	20.2	20.8	21.5	21.9	22.5	22.6	22.9	23.5	23.8	23.8	24.5	25.4	r 25.4
Services, total ♀ do	242.1	262.5	282.9	233.4	238.9	245.2	250.8	256.1	260.2	265.0	268.9	275.0	280.5	285.8	290.3	r 296.2
Household operation do	33.7	36.1	39.2	32.8	33.0	34.1	35.0	35.1	35.7	36.7	36.9	37.7	38.9	39.9	40.5	41.2
Housing do	84.0	91.2	99.7	81.4	83.0	84.7	86.9	88.7	90.3	91.8	94.1	96.5	98.7	100.7	102.8	104.8
Transportation do	16.5	17.9	19.1	16.2	16.4	16.6	16.8	17.5	17.6	18.1	18.3	18.6	19.0	19.2	19.6	20.0
Gross private domestic investment, total do	137.8	135.3	151.6	134.3	137.0	141.8	138.0	131.2	134.1	138.6	137.3	143.3	152.9	150.8	159.4	r 168.3
Fixed investment do	130.4	132.5	149.3	127.6	130.2	131.4	132.3	130.8	132.1	133.5	133.6	140.2	148.3	152.0	157.0	r 167.7
Nonresidential do	98.6	102.1	108.7	95.0	96.6	100.7	102.2	100.8	102.1	104.8	100.8	104.7	108.3	109.3	112.6	r 118.7
Structures do	34.5	36.8	38.2	33.1	33.0	36.0	36.0	36.1	36.6	37.3	37.1	36.7	38.5	38.7	39.0	r 39.8
Producers' durable equipment do	64.1	65.4	70.5	61.8	63.6	64.7	66.2	64.7	65.6	67.5	63.7	68.1	69.8	70.6	73.6	r 78.9
Residential structures do	31.8	30.4	40.6	32.7	33.6	30.7	30.1	30.0	29.9	28.7	32.8	35.4	40.0	42.7	44.4	49.0
Nonfarm do	31.2	29.7	40.1	32.1	33.1	30.1	29.5	29.4	29.3	28.1	32.2	35.0	39.5	42.1	43.8	48.4
Change in business inventories do	7.4	2.8	2.2	6.6	6.8	10.4	5.7	.4	2.1	5.1	3.7	3.1	4.6	−1.2	2.4	.6
Nonfarm do	7.3	2.5	1.7	6.5	6.7	10.3	5.5	.1	1.8	4.7	3.3	2.9	4.1	−2.0	2.0	.1
Net exports of goods and services do	2.0	3.6	.0	1.4	1.2	2.8	2.7	3.5	4.2	4.0	2.7	4.7	.1	.0	−4.6	r−6.2
Exports do	55.6	62.9	65.3	48.0	56.9	58.3	59.2	61.5	63.2	63.7	63.2	66.2	66.5	68.2	60.4	r 69.2
Imports do	53.6	59.3	65.3	46.6	55.7	55.5	56.6	58.0	59.0	59.7	60.5	61.5	66.4	68.2	65.0	r 75.4
Govt. purchases of goods and services, total do	209.7	219.4	233.0	206.5	207.8	211.5	213.0	217.3	216.5	220.1	223.7	227.9	229.6	233.8	240.8	r 249.6
Federal do	99.2	97.2	97.6	99.2	97.7	100.3	99.5	100.2	96.8	96.1	95.9	96.4	96.0	97.6	100.3	r 104.9
National defense do	78.4	75.4	71.4	78.3	77.5	79.4	78.4	78.9	75.1	74.2	73.2	72.6	71.4	70.2	71.4	r 75.8
State and local do	110.6	122.2	135.5	107.3	110.1	111.2	113.5	117.1	119.7	124.0	127.9	131.6	133.6	136.2	140.5	r 144.8
By major type of product:																
Final sales, total do	921.7	971.3	1,044.5	899.8	915.0	929.8	942.3	955.6	966.5	978.4	984.7	1,017.7	1,035.4	1,054.6	1,070.4	r1,103.0
Goods, total do	449.9	465.5	492.0	441.3	447.7	452.3	458.3	461.5	466.6	469.8	464.0	482.4	486.2	497.4	502.0	r 516.8
Durable goods do	180.9	180.8	193.7	179.1	179.6	181.3	183.4	181.5	183.7	184.9	173.1	189.4	190.6	196.4	198.4	r 207.9
Nondurable goods do	269.0	284.7	298.3	262.2	268.0	271.0	274.9	279.9	282.9	284.9	290.9	293.1	295.5	301.0	303.6	r 308.8
Services do	377.4	410.3	443.3	364.0	371.9	383.0	390.6	400.8	406.2	413.7	420.6	432.3	441.0	446.3	453.6	r 465.0
Structures do	94.4	95.5	109.2	94.5	95.3	94.5	93.4	93.4	93.7	94.9	100.1	102.9	108.2	110.8	114.7	r 121.3
Change in business inventories do	7.4	2.8	2.2	6.6	6.8	10.4	5.7	.4	2.1	5.1	3.7	3.1	4.6	−1.2	2.4	.6
Durable goods do	4.5	−.6	.4	3.8	4.7	6.5	3.0	−1.8	−2.0	4.7	−3.4	3.5	2.3	−2.5	−1.8	r.2
Nondurable goods do	2.9	3.4	1.9	2.8	2.1	4.0	2.8	2.2	4.0	.4	7.1	−.4	2.3	1.3	4.3	r.3
GNP in constant (1958) dollars																
Gross national product, total bil. $	724.7	720.0	739.4	721.4	724.2	727.8	725.2	719.8	721.1	723.3	715.9	729.7	735.8	740.7	751.3	r 761.6
Personal consumption expenditures, total do	469.3	475.9	491.8	465.7	469.0	469.9	472.6	474.4	477.1	477.9	474.2	484.8	489.4	494.3	498.9	r 505.1
Durable goods do	84.8	81.4	89.5	85.2	85.6	84.0	84.4	82.3	83.8	82.8	76.6	85.9	87.8	91.2	93.0	r 95.5
Nondurable goods do	202.7	207.3	211.4	201.6	202.8	203.0	203.4	205.7	206.5	207.3	209.7	210.0	211.5	211.6	212.7	r 214.3
Services do	181.8	187.2	190.9	178.9	180.6	182.9	184.8	186.4	186.8	187.9	187.9	188.9	190.1	191.4	193.2	195.3
Gross private domestic investment, total do	109.6	102.2	108.5	108.4	109.4	112.4	108.2	101.0	102.7	104.0	101.2	104.3	110.0	106.7	112.9	r 116.5
Fixed investment do	103.2	99.9	106.3	102.8	103.5	103.2	103.3	100.7	100.7	100.1	98.1	101.8	105.9	107.2	110.5	r 116.2
Nonresidential do	80.1	78.6	79.3	78.6	79.1	81.1	81.7	79.3	79.4	80.1	75.5	77.7	79.1	78.9	81.5	r 84.8
Residential structures do	23.1	21.3	27.0	24.1	24.4	22.1	21.6	21.4	21.3	20.0	22.6	24.1	26.7	28.3	29.0	31.4
Change in business inventories do	6.4	2.3	2.1	5.7	5.8	9.2	4.9	.3	2.0	3.9	3.1	2.5	4.1	−.5	2.4	.3
Net exports of goods and services do	.1	2.4	−.1	−.5	−.3	.6	.6	1.7	2.6	3.2	2.1	3.0	−.5	.1	−3.0	r−4.1
Govt. purchases of goods and services, total do	145.6	139.4	139.2	147.8	146.1	144.8	143.8	142.6	138.7	138.2	138.3	137.6	137.0	139.6	142.6	r 144.1
Federal do	73.8	65.4	62.2	76.3	73.9	73.2	71.6	69.4	65.3	63.8	63.2	61.3	60.7	62.7	64.0	r 64.2
State and local do	71.9	74.0	77.0	71.4	72.1	71.6	72.2	73.2	73.4	74.3	75.2	76.3	76.3	76.8	78.6	r 79.9

r Revised. p Preliminary. ♀ Includes data not shown separately.

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Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1969	1970	1971	1969			1970				1971				1972	
	Annual total			II	III	IV	I	II	III	IV	I	II	III	IV	I	II

GENERAL BUSINESS INDICATORS—Quarterly Series—Continued

NATIONAL INCOME AND PRODUCT—Con.																
Quarterly Data Seasonally Adjusted at Annual Rates																
National income, total—bil. $	763.7	795.9	851.1	758.9	771.7	778.2	785.8	793.4	802.2	802.1	831.7	847.3	855.2	870.1	p 898.7	
Compensation of employees, total—do	565.5	601.9	641.9	559.1	573.6	583.6	593.2	598.5	606.5	609.3	627.3	638.0	645.6	656.6	r 679.9	
Wages and salaries, total—do	509.6	541.4	574.2	503.7	516.9	525.8	534.7	538.5	545.2	547.2	561.4	571.0	577.3	587.0	r 607.3	
Private—do	405.5	426.6	450.4	402.0	410.4	417.7	422.5	424.4	429.4	429.9	440.3	448.4	452.3	460.3	r 475.6	
Military—do	19.0	19.4	18.6	18.4	20.0	19.6	20.2	19.5	19.2	18.6	19.2	18.6	18.0	18.6	19.9	
Government civilian—do	85.1	95.5	105.2	83.4	86.5	88.5	92.1	94.5	96.6	98.6	101.8	104.0	106.9	108.1	111.8	
Supplements to wages and salaries—do	56.0	60.5	67.7	55.3	56.7	57.8	58.5	60.0	61.3	62.1	65.9	67.0	68.3	69.6	72.6	
Proprietors' income, total ♀—do	67.0	66.9	68.3	67.1	67.1	67.2	68.0	67.6	66.0	65.9	66.4	67.2	69.2	70.5	r 71.2	
Business and professional ♀—do	50.3	51.0	52.1	50.5	50.5	49.8	50.2	51.0	51.4	51.5	51.6	51.9	52.3	52.5	52.6	
Farm—do	16.8	15.8	16.3	16.6	16.6	17.4	17.8	16.6	14.5	14.4	14.8	15.2	17.0	18.1	18.7	
Rental income of persons—do	22.6	23.3	24.3	22.6	22.7	22.9	23.0	23.2	23.4	23.7	23.8	24.2	24.5	24.6	24.8	
Corporate profits and inventory valuation adjustment, total—bil. $	78.6	70.8	81.0	80.7	78.0	73.3	69.8	71.5	73.0	69.0	79.5	82.5	80.0	82.0	p 86.0	
By broad industry groups:																
Financial institutions—do	12.1	12.8	14.0	12.3	12.2	12.0	11.3	12.1	13.5	14.0	14.2	13.7	14.2	14.0	p 14.1	
Nonfinancial corporations, total—do	66.5	58.1	67.0	68.4	65.8	61.3	58.5	59.4	59.5	54.9	65.3	68.9	65.8	68.1	p 71.9	
Manufacturing, total—do	36.0	29.5	34.4	36.9	34.8	33.0	31.1	31.5	30.6	25.0	34.4	35.0	33.0	34.6		
Nondurable goods industries—do	17.5	16.6	18.0	18.0	17.0	16.9	16.7	16.5	16.8	16.2	17.2	18.1	18.1	18.3		
Durable goods industries—do	18.4	13.0	16.4	18.9	17.8	16.1	14.3	14.9	13.8	8.8	17.2	17.0	14.8	16.2		
Transportation, communication, and public utilities—bil. $	10.0	8.0	8.5	10.4	9.8	9.1	8.2	7.8	7.9	8.1	8.4	8.5	8.5	8.8		
All other industries—do	20.6	20.5	24.1	21.0	21.2	19.2	19.2	20.1	20.9	21.9	22.5	25.3	24.3	24.7		
Corporate profits before tax, total—do	84.2	75.4	85.4	86.9	81.2	80.0	75.6	75.8	78.5	71.6	83.0	86.9	85.8	86.0	p 91.6	
Corporate profits tax liability—do	39.7	34.1	37.8	41.0	38.2	37.7	34.1	34.5	35.6	32.3	38.3	39.1	37.5	36.4	p 39.3	
Corporate profits after tax—do	44.5	41.2	47.6	45.9	43.0	42.3	41.5	41.3	42.9	39.2	44.8	47.8	48.2	49.7	p 52.3	
Dividends—do	24.4	25.0	25.5	24.2	24.7	24.9	25.0	24.9	25.2	25.0	25.6	25.4	25.7	25.3	25.8	
Undistributed profits—do	20.0	16.2	22.1	21.6	18.3	17.4	16.6	16.4	17.7	14.3	19.2	22.4	22.5	24.4	p 26.5	
Inventory valuation adjustment—do	−5.5	−4.5	−4.4	−6.3	−3.2	−6.7	−5.8	−4.2	−5.5	−2.6	−3.5	−4.4	−5.8	−4.0	-5.6	
Net interest—do	29.9	33.0	35.6	29.4	30.2	31.1	31.8	32.6	33.4	34.2	34.8	35.4	35.9	36.4	36.9	
DISPOSITION OF PERSONAL INCOME																
Quarterly Data Seasonally Adjusted at Annual Rates																
Personal income, total—bil. $	750.3	803.6	857.0	743.1	759.3	772.2	784.3	803.8	809.8	816.7	833.5	853.4	864.6	876.7	r 900.1	
Less: Personal tax and nontax payments—do	116.2	115.9	115.8	117.2	116.1	117.8	116.7	118.0	113.5	115.2	111.6	113.8	116.0	121.7	r 135.7	
Equals: Disposable personal income—do	634.2	687.8	741.3	625.9	643.2	654.5	667.6	685.7	696.2	701.5	722.0	739.6	748.5	755.0	r 764.3	
Less: Personal outlays ⊕—do	596.3	633.7	680.7	592.4	600.9	611.4	621.5	631.5	638.9	643.0	663.3	676.0	687.6	696.0	r 710.8	
Equals: Personal saving §—do	37.9	54.1	60.5	33.4	42.3	43.1	46.2	54.2	57.4	58.5	58.6	63.6	61.0	59.0	r 53.5	
NEW PLANT AND EQUIPMENT EXPENDITURES																
Unadjusted quarterly or annual totals:																
All industries—bil. $	75.56	79.71	81.21	18.81	19.25	21.46	17.47	20.33	20.26	21.66	17.68	20.60	20.14	22.79	1 19.56	1 22.49
Manufacturing—do	31.68	31.95	29.99	7.82	8.16	9.12	7.14	8.15	7.99	8.66	6.69	7.55	7.31	8.44	7.03	8.16
Durable goods industries ¶—do	15.96	15.80	14.15	3.98	4.03	4.59	3.59	4.08	3.87	4.26	3.11	3.52	3.40	4.12	3.43	4.01
Nondurable goods industries ¶—do	15.72	16.15	15.84	3.84	4.12	4.53	3.56	4.07	4.12	4.40	3.58	4.03	3.91	4.32	3.60	4.15
Nonmanufacturing—do	43.88	47.76	51.22	10.99	11.10	12.34	10.32	12.18	12.27	12.99	10.99	13.06	12.83	14.35	12.53	14.33
Mining—do	1.86	1.89	2.16	.48	.47	.49	.45	.47	.46	.50	.49	.54	.55	.59	.53	.54
Railroad—do	1.86	1.78	1.67	.44	.49	.55	.42	.47	.46	.43	.34	.47	.42	.45	.45	.42
Air transportation—do	2.51	3.03	1.88	.66	.53	.64	.73	.80	.74	.76	.34	.60	.39	.56	.52	.78
Other transportation—do	1.68	1.23	1.38	.46	.40	.44	.28	.31	.30	.33	.28	.36	.37	.37	.35	.35
Public utilities—do	11.61	13.14	15.30	2.99	3.03	3.23	2.54	3.28	3.58	3.74	3.11	3.83	4.07	4.29	3.60	4.31
Electric—do	8.94	10.65	12.86	2.22	2.23	2.61	2.15	2.59	2.79	3.12	2.70	3.20	3.35	3.60	3.15	3.60
Gas and other—do	2.67	2.49	2.44	.77	.80	.62	.39	.69	.78	.63	.41	.63	.71	.69	.45	.72
Communication—do	8.30	10.10	10.77	2.00	2.11	2.39	2.14	2.59	2.56	2.81	2.50	2.81	2.62	2.84		
Commercial and other—do	16.05	16.59	18.05	3.97	4.07	4.60	3.76	4.26	4.16	4.42	3.94	4.44	4.42	5.26	2 7.08	2 7.92
Seas. adj. qtrly. totals at annual rates:																
All industries—do				73.94	77.84	77.84	78.22	80.22	81.88	78.63	79.32	81.61	80.75	83.18	1 87.54	1 89.09
Manufacturing—do				31.16	33.05	32.39	32.44	32.43	32.15	30.98	30.46	30.12	29.19	30.35	31.92	32.52
Durable goods industries ¶—do				15.98	16.53	15.88	16.40	16.32	15.74	14.92	14.21	14.06	13.76	14.61	15.62	15.98
Nondurable goods industries ¶—do				15.18	16.52	16.50	16.05	16.11	16.40	16.05	16.25	16.06	15.43	15.74	16.30	16.54
Nonmanufacturing—do				42.78	44.80	45.46	45.78	47.79	49.73	47.66	48.86	51.50	51.56	52.82	55.62	56.57
Mining—do				1.88	1.89	1.85	1.92	1.84	1.86	1.94	2.04	2.08	2.23	2.30	2.22	2.12
Railroad—do				1.76	2.06	1.94	1.74	1.88	1.96	1.56	1.46	1.88	1.72	1.64	1.90	1.67
Air transportation—do				2.22	2.23	2.80	2.94	2.88	3.24	3.08	1.29	2.28	1.68	2.26	2.02	2.96
Other transportation—do				1.66	1.65	1.63	1.37	1.12	1.22	1.22	1.33	1 40	1.48	1.33	1.67	1.35
Public utilities—do				11.68	11.48	11.80	12.14	12.72	13.84	13.68	14.64	14.91	15.87	15.74	16.90	16.78
Electric—do				8.71	8.98	9.36	9.77	10.15	11.34	11.20	12.16	12.61	13.56	13.01	14.17	14.18
Gas and other—do				2.97	2.50	2.44	2.37	2.57	2.50	2.48	2.48	2.30	2.30	2.74	2.73	2.60
Communication—do				7.92	8.71	8.76	9.14	10.38	10.62	10.20	10.70	11.21	10.73	10.44		
Commercial and other—do				15.67	16.78	16.67	16.52	16.98	17.00	15.97	17.39	17.72	17.85	19.10	2 30.90	2 31.70
U.S. BALANCE OF INTERNATIONAL PAYMENTS ♂																
Quarterly Data Are Seasonally Adjusted (Credits +; debits −)																
Exports of goods and services (excl. transfers under military grants)—mil. $	55,600	62,903	p 65,932	14,222	14,574	14,811	15,374	15,806	15,930	15,795	16,539	16,628	17,087	p 15,678		
Merchandise, adjusted, excl. military—do	36,490	41,980	p 42,769	9,490	9,602	9,888	10,241	10,582	10,696	10,461	11,016	10,706	11,475	p 9,572	p 11,810	
Transfers under U.S. military agency sales contracts—mil. $	1,515	1,480	p 1,942	329	442	336	274	447	327	433	510	547	468	p 417		
Receipts of income on U.S. investments abroad—mil. $	10,539	11,409	p 12,711	2,585	2,716	2,767	2,925	2,790	2,855	2,839	2,904	3,248	2,975	p 3,584		
Other services—do	7,056	8,034	p 8,510	1,818	1,814	1,820	1,934	1,986	2,052	2,062	2,109	2,127	2,169	p 2,105		
Imports of goods and services—do	−53,589	−59,311	p −65,234	−13,926	−13,866	−14,142	−14,493	−14,761	−14,935	−15,125	−15,389	−16,622	−17,031	p −16,192	p −13,445	
Merchandise, adjusted, excl. military—do	−35,830	−39,870	p −45,648	−9,566	−9,278	−9,397	−9,728	−9,831	−9,992	−10,319	−10,768	−11,767	−12,015	p −11,008		
Direct defense expenditures—do	−4,856	−4,851	p −4,796	−1,187	−1,221	−1,251	−1,182	−1,255	−1,211	−1,203	−1,174	−1,214	−1,190	p −1,218		
Payments of income on foreign investments in the U.S.—mil. $	−4,564	−5,167	p −4,763	−1,078	−1,242	−1,315	−1,348	−1,322	−1,284	−1,213	−1,115	−1,072	−1,273	p −1,303		
Other services—do	−8,339	−9,425	p −10,027	−2,095	−2,125	−2,179	−2,235	−2,353	−2,448	−2,390	−2,332	−2,569	−2,553	p −2,573		
Balance on goods and services, total—do	2,011	3,592	p 699	296	708	669	881	1,045	995	670	1,150	6	56	p −514	p −900	
Merchandise—do	660	2,110	p −2,879	−76	324	491	513	751	704	142	248	−1,061	−540	p −1,526	p −1,635	

r Revised. p Preliminary. 1 Estimates (corrected for systematic biases) for Jan.–Mar. and Apr.–June 1972 based on expected capital expenditures of business. Expected expenditures for the year 1972 appear on p. 20 of the Mar. 1972 SURVEY. 2 Includes communication. ♀ Includes inventory valuation adjustment. ⊕ Personal outlays comprise personal consumption expenditures, interest paid by consumers, and personal transfer payments to foreigners. §Personal saving is excess of disposable income over personal outlays.

¶Data for individual durable and nondurable goods industries components appear in the Mar., June, Sept., and Dec. issues of the SURVEY. ♂More complete details appear in the quarterly reviews in the Mar., June, Sept., and Dec. issues of the SURVEY.

GENERAL BUSINESS INDICATORS—Quarterly Series—Continued

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1969	1970	1971	1969			1970				1971				1972	
	Annual total			II	III	IV	I	II	III	IV	I	II	III	IV p	I p	II
U.S. BALANCE OF INTERNATIONAL PAYMENTS—Con.																
Quarterly Data Are Seasonally Adjusted																
Unilateral transactions (excl. military grants), net mil. $	−2,910	−3,148	−3,474	−839	−693	−749	−756	−753	−803	−836	−770	−838	−927	−939		
Balance on current account do	−899	444	−2,774	−543	15	−80	125	292	192	−166	380	−832	−871	−1,453		
Long-term capital, net:																
U.S. Government do	−1,930	−2,029	−2,382	−541	−704	−205	−453	−590	−312	−673	−683	−632	−523	−542		
Private do	−50	−1,453	−4,128	−935	−381	641	−969	−272	−220	7	−1,009	−1,793	−1,797	472		
Balance on current account and long-term capital mil. $	−2,879	−3,038	−9,284	−2,019	−1,070	356	−1,297	−570	−340	−832	−1,312	−3,257	−3,191	−1,523		
Nonliquid short-term private capital flows, net do	−602	−545	−2,529	−372	−210	−27	−115	−140	−115	−175	−381	−409	−1,008	−731		
Allocation of special drawing rights (SDR) do		867	717				217	217	217	216	180	179	179	179	178	
Errors and omissions, net do	−2,603	−1,104	−10,878	−628	−717	−166	−59	−375	−437	−233	−1,012	−2,313	−5,283	−2,270		
Net liquidity balance do	−6,084	−3,821	−21,973	−3,019	−1,996	163	−1,254	−868	−675	−1,024	−2,525	−5,800	−9,303	−4,345	−3,219	
Liquid private capital flows, net do	8,786	−6,000	−7,794	4,678	1,317	221	−1,610	−536	−1,400	−2,454	−3,025	53	−2,882	−1,940	−275	
Official reserve transactions balance do	2,702	−9,821	−29,767	1,659	−679	384	−2,864	−1,404	−2,075	−3,478	−5,550	−5,747	−12,185	−6,285	−3,494	
Changes in:																
Liabilities to foreign official agencies do	−517	7,619	27,617	−985	1,880	−85	3,020	99	1,736	2,765	5,077	5,256	11,173	6,111	2,786	
U.S. official reserve assets, net do	−1,187	2,477	2,348	−299	−686	−154	264	805	584	824	682	659	1,194	−187	429	
Liquidity balance, excluding SDR do	−6,958	−4,721	−23,977	−3,287	−2,366	164	−1,629	−745	−1,154	−1,194	−3,224	−6,061	−10,221	−4,471	−3,773	

GENERAL BUSINESS INDICATORS—Monthly Series

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr. p
PERSONAL INCOME, BY SOURCE																
Seasonally adjusted, at annual rates:																
Total personal income bil. $	803.6	832.4	838.3	843.0	848.6	868.6	857.7	866.1	869.9	871.2	874.9	883.9	892.8	901.8	r 905.6	909.7
Wage and salary disbursements, total do	541.4	560.6	564.8	567.7	572.0	573.2	572.9	579.2	579.8	581.3	584.8	594.8	603.0	610.6	r 613.2	617.2
Commodity-producing industries, total do	200.7	201.8	203.3	204.4	206.1	206.4	205.0	205.3	206.7	207.4	208.1	211.4	213.2	216.4	r 218.8	220.5
Manufacturing do	158.3	158.5	159.2	159.6	161.1	161.4	160.2	160.2	161.1	162.0	162.2	165.3	165.8	169.2	r 171.6	173.3
Distributive industries do	129.1	135.2	136.5	137.2	138.3	138.1	138.0	140.0	140.7	140.9	141.6	144.7	146.3	149.4	r 148.6	149.8
Service industries do	96.7	102.4	103.3	103.9	105.0	105.7	106.3	107.4	107.7	108.1	108.7	109.9	111.4	112.3	r 113.5	114.1
Government do	114.8	121.2	121.6	122.1	122.6	123.0	123.6	126.6	124.7	124.9	126.4	128.8	132.0	132.5	132.3	132.8
Other labor income do	30.8	32.6	32.8	33.1	33.4	33.7	33.9	34.1	34.3	34.4	34.6	34.8	35.0	35.2	35.4	35.7
Proprietors' income:																
Business and professional do	51.0	51.5	51.7	51.8	51.9	52.1	52.2	52.3	52.3	52.4	52.5	52.6	52.5	52.6	52.7	52.8
Farm do	15.8	14.8	14.9	15.1	15.2	15.3	16.1	17.0	17.8	18.0	18.1	18.1	18.3	18.7	r 19.0	18.6
Rental income of persons do	23.3	23.5	24.0	24.1	24.2	24.3	24.4	24.5	24.5	24.5	24.6	24.6	24.7	24.8	24.8	24.9
Dividends do	25.0	25.7	25.5	25.5	25.6	25.2	25.6	25.7	25.7	25.7	25.7	24.3	25.8	25.9	25.8	25.9
Personal interest income do	64.7	66.6	66.4	66.6	66.7	66.9	67.4	68.1	68.8	68.7	68.6	68.4	68.7	68.8	r 68.7	69.1
Transfer payments do	79.6	87.8	89.1	89.8	90.5	109.0	96.2	96.5	97.9	97.4	97.6	98.2	98.7	99.4	r 100.3	100.0
Less personal contributions for social insurance bil. $	28.0	30.7	30.9	30.9	31.0	31.1	31.1	31.4	31.4	31.4	31.6	32.0	33.9	34.2	r 34.4	34.5
Total nonagricultural income do	781.4	810.8	816.6	821.1	826.5	846.5	834.8	842.4	845.3	846.4	850.1	859.2	867.9	876.4	r 879.8	884.2
FARM INCOME AND MARKETINGS																
Cash receipts from farming, including Government payments, total mil. $	52,948	3,366	3,472	3,435	3,402	3,672	6,146	4,662	4,850	6,177	6,017	5,406	4,733	3,907	3,821	
Farm marketings and CCC loans, total do	49,231	3,344	3,458	3,360	3,387	3,653	3,986	4,306	4,794	6,105	5,978	5,075	4,682	3,890	r 3,808	3,466
Crops do	19,636	1,077	1,001	918	912	1,175	1,598	1,702	2,127	3,426	3,475	2,586	2,105	1,171	r 1,042	930
Livestock and products, total ♀ do	29,595	2,267	2,457	2,442	2,475	2,478	2,388	2,604	2,667	2,679	2,503	2,489	2,577	2,719	r 2,766	2,536
Dairy products do	6,523	525	587	581	618	583	567	554	544	557	535	573	580	534	r 617	614
Meat animals do	18,497	1,433	1,540	1,527	1,521	1,548	1,454	1,672	1,751	1,752	1,614	1,541	1,668	1,864	r 1,803	1,602
Poultry and eggs do	4,303	284	308	308	309	327	348	361	356	354	339	352	304	296	r 325	293
Indexes of cash receipts from marketings and CCC loans, unadjusted:																
All commodities 1967=100	115	94	97	94	95	103	112	121	135	172	168	143	132	109	r 107	97
Crops do	106	70	65	60	59	76	104	111	138	223	226	168	137	76	r 68	61
Livestock and products do	122	112	122	121	122	123	118	129	132	133	124	123	127	135	r 137	125
Indexes of volume of farm marketings, unadjusted:																
All commodities 1967=100	104	81	83	80	80	90	103	110	121	155	156	131	116	88	r 85	78
Crops do	103	64	53	45	44	66	102	110	131	210	224	166	136	70	r 59	47
Livestock and products do	104	95	106	106	106	108	103	110	112	113	105	104	101	101	r 106	100
INDUSTRIAL PRODUCTION																
Federal Reserve Board Index of Quantity Output																
Unadjusted, total index 1967=100	p 106.7	106.1	106.0	106.5	107.3	109.7	102.1	105.5	109.8	109.8	107.2	103.9	r 106.2	r 109.5	r 110.2	111.3
By market groupings:																
Final products do	p 104.4	103.4	103.0	102.9	102.7	107.2	101.6	105.6	110.0	109.3	105.6	100.7	r 103.9	r 106.6	r 106.4	107.1
Consumer goods do	p 110.3	113.2	112.9	113.6	113.5	119.3	111.9	118.4	123.1	122.9	117.3	109.9	r 115.4	r 118.3	r 117.6	118.4
Automotive products do	p 99.9	125.1	125.3	121.9	127.2	130.5	94.9	102.0	128.6	135.8	123.7	102.4	120.6	r 126.4	r 125.2	134.7
Home goods and clothing do	p 104.7	104.9	105.9	106.9	106.9	110.6	100.2	109.3	112.6	115.7	108.9	100.7	r 108.0	r 113.0	r 111.6	111.5
Equipment do	p 96.2	89.6	89.1	88.0	87.6	90.4	87.1	87.6	91.8	90.3	89.2	87.8	r 87.6	r 90.2	r 90.7	91.2
Materials do	p 107.8	108.3	108.4	109.0	110.8	110.9	99.2	102.3	106.8	107.6	107.0	106.0	r 108.1	r 111.9	r 113.0	114.5
By industry groupings:																
Manufacturing do	p 105.2	104.3	104.4	105.0	106 0	108.3	99.7	103.1	108.1	109.2	106.2	101.9	r 104.2	r 108.2	r 109.1	109.9
Durable manufactures do	p 101.5	100.2	100.6	100.4	101.7	102.7	93.2	93.6	100.6	101.6	98.9	95.8	r 98.4	r 102.7	r 103.7	104.8
Nondurable manufactures do	p 110.6	110.2	109.8	111.7	112.1	116.3	109.2	116.8	119.0	120.1	116.8	r 110.6	r 112.6	r 116.1	r 116.7	117.4
Mining and utilities do	p 118.0	119.7	119.4	117.9	117.0	120.7	121.9	124.2	123.8	114.9	115.3	119.2	r 121.0	r 120.9	r 120.0	120.0

r Revised. p Preliminary. ♀ Includes data for items not shown separately.

GENERAL BUSINESS INDICATORS—Continued

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970 p	1971 p	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr. p
INDUSTRIAL PRODUCTION—Continued																
Federal Reserve Index of Quantity Output—Con.																
Seasonally adjusted, total index 1967=100	106.7	106.4	105.5	106.2	107.0	107.2	106.1	105.3	106.2	106.4	107.0	107.6	r 108.4	r 109.2	r 109.8	110.9
By market groupings:																
Products, total do	106.0	106.2	104.5	105.5	105.9	106.1	106.8	106.2	106.2	106.9	107.6	107.5	108.1	r 108.7	108.9	109.6
Final products do	104.4	104.4	102.5	103.6	103.9	104.5	104.9	105.0	104.6	105.3	105.9	105.6	r 105.9	r 106.6	r 106.5	107.6
Consumer goods do	110.3	115.5	112.7	114.6	115.7	116.1	116.0	116.0	115.0	116.9	118.2	117.9	r 118.3	r 118.5	r 118.3	119.4
Durable consumer goods do	104.8	114.3	111.6	112.2	117.2	116.1	115.8	115.8	113.6	115.3	115.5	116.4	r 117.1	r 118.8	r 117.6	121.1
Automotive products do	99.9	119.4	117.8	113.7	123.1	121.2	120.1	121.1	118.0	119.6	119.6	119.8	116.5	r 119.2	r 118.2	125.4
Autos do	86.6	108.3	112.2	103.2	108.3	107.9	107.9	108.5	108.0	107.8	109.2	109.4	102.8	106.4	104.6	114.3
Auto parts and allied goods do	125.6	140.8	128.6	133.9	151.4	146.8	143.6	145.2	153.4	142.2	139.7	139.6	143.0	r 144.1	r 144.3	146.8
Home goods ♀ do	107.6	111.5	108.2	111.4	113.9	113.3	113.5	112.9	111.1	112.9	113.4	114.7	r 117.4	r 118.7	r 117.3	118.5
Appliances, TV, and radios do	103.4	111.2	107.9	116.4	120.7	116.9	115.0	112.1	105.7	110.7	113.4	116.0	r 123.3	r 122.2	113.4	-------
Carpeting and furniture do	108.4	112.9	108.3	110.7	111.7	113.6	114.8	114.7	116.1	115.3	117.3	116.0	r 118.0	r 120.6	122.0	-------
Nondurable consumer goods do	112.5	116.0	113.1	115.5	115.1	116.1	116.1	116.1	115.6	117.5	119.3	118.5	r 118.8	r 118.3	r 118.5	118.7
Clothing do	101.2	101.4	96.9	101.0	102.6	101.9	102.4	100.3	102.5	103.5	103.6	104.9	r 105.6	102.4	-------	-------
Consumer staples do	115.4	119.8	117.4	119.4	118.5	119.9	119.8	120.2	119.1	121.2	123.5	122.1	r 122.3	r 122.5	r 123.0	123.2
Consumer foods and tobacco do	110.6	113.2	111.8	112.7	113.2	113.5	112.0	112.6	110.4	113.9	117.2	114.6	r 115.3	r 115.1	r 114.8	114.8
Nonfood staples do	120.4	126.8	123.2	126.4	124.2	126.5	128.0	128.4	128.2	128.9	130.1	130.0	r 129.7	r 130.3	r 131.5	132.1
Equipment do	96.2	88.9	88.4	88.1	87.8	88.2	89.3	89.6	90.2	89.0	88.8	88.5	r 88.5	r 89.8	r 90.1	91.2
Business equipment do	101.1	96.0	95.0	95.1	94.4	95.0	96.3	96.8	97.8	97.4	97.0	96.6	r 97.2	r 98.5	r 99.1	100.4
Industrial equipment ♀ do	98.8	92.3	92.4	92.4	90.9	90.9	91.8	92.0	92.4	92.6	93.2	92.8	r 92.3	r 93.3	r 93.6	94.7
Building and mining equipment do	95.9	92.9	92.4	91.2	91.5	88.8	88.9	96.4	96.6	95.5	95.2	94.0	r 98.0	r 99.6	r 100.3	96.1
Manufacturing equipment do	91.9	81.4	81.3	82.1	79.5	80.1	81.1	79.9	80.5	81.1	81.3	81.0	r 80.0	r 80.6	r 80.5	83.3
Commercial, transit, farm eq ♀ do	103.7	100.1	98.0	98.2	98.4	99.6	101.5	102.2	103.8	102.8	101.3	100.8	r 102.9	r 104.5	r 105.4	106.8
Commercial equipment do	110.6	108.4	106.6	107.1	107.6	107.6	109.9	109.9	112.0	111.0	109.1	106.9	r 109.0	r 111.5	r 112.5	113.7
Transit equipment do	94.4	89.0	87.2	87.3	87.3	90.5	88.4	90.2	90.2	90.4	88.6	92.1	94.1	r 93.8	r 94.3	96.0
Defense and space equipment do	87.9	77.1	77.5	76.5	76.9	77.1	77.7	77.9	77.7	75.1	75.3	74.9	74.1	r 75.3	75.3	76.0
Intermediate products do	111.9	112.8	112.0	112.4	113.5	112.4	113.8	110.7	112.5	113.0	114.0	114.7	r 115.9	r 116.7	r 117.5	117.2
Construction products do	110.6	113.0	112.6	113.4	115.5	113.5	115.3	109.4	111.3	112.7	112.9	115.1	r 115.7	r 115.2	r 117.5	116.9
Misc. intermediate products do	113.0	112.5	111.4	111.6	111.9	111.6	112.7	111.7	113.4	113.4	114.9	114.4	r 116.0	r 117.8	117.6	-------
Materials do	107.8	106.8	107.1	107.5	108.9	109.0	105.3	104.0	106.2	105.6	106.0	107.6	r 109.0	r 110.3	r 111.6	113.1
Durable goods materials ♀ do	103.4	100.8	101.9	102.2	104.8	103.0	98.7	94.9	98.7	100.4	99.5	100.1	r 103.1	r 104.8	r 106.5	107.9
Consumer durable parts do	96.5	101.4	103.2	102.8	105.1	104.8	98.8	100.4	100.7	101.8	99.4	99.2	r 104.0	r 105.8	r 109.3	111.2
Equipment parts do	95.1	86.5	86.4	86.0	88.9	87.1	87.0	82.1	86.0	86.9	86.0	87.6	r 88.5	r 90.2	r 89.7	92.2
Nondurable goods materials ♀ do	112.5	113.8	112.0	112.7	112.8	115.5	112.3	114.8	114.7	114.6	116.0	116.6	r 116.0	r 116.9	r 118.0	118.9
Textile, paper, and chem. materials do	113.0	116.1	111.9	113.2	113.7	117.5	113.4	117.8	118.8	118.8	121.7	122.9	r 120.9	r 121.4	r 122.9	123.4
Fuel and power, industrial do	117.0	116.3	121.1	121.0	119.7	121.1	119.7	117.2	119.3	99.4	105.0	117.6	r 117.4	r 117.8	r 118.4	121.6
By industry groupings:																
Manufacturing, total do	105.2	104.8	103.2	104.4	105.7	105.6	104.9	103.6	104.9	105.4	105.3	105.4	r 106.6	r 107.8	r 108.2	109.3
Durable manufactures do	101.5	98.9	98.3	99.1	100.5	100.1	99.4	96.6	98.5	99.1	98.0	98.2	r 99.7	r 101.3	r 101.5	103.5
Primary and fabricated metals do	108.1	104.0	105.8	108.6	111.5	108.3	104.2	93.8	99.5	100.9	98.7	100.0	r 103.9	r 104.6	r 106.3	109.3
Primary metals do	106.9	100.9	106.6	108.7	114.3	108.1	98.2	81.0	93.9	95.7	91.4	93.6	r 102.4	r 101.8	r 104.3	107.3
Iron and steel do	105.3	96.5	105.2	109.1	112.9	105.3	99.0	66.2	85.9	88.7	81.9	85.5	95.2	94.6	r 98.0	102.5
Nonferrous metals do	109.8	108.7	109.8	108.2	115.8	111.3	96.0	106.8	109.0	108.3	109.9	111.1	r 116.0	r 114.3	115.6	-------
Fabricated metal products do	109.4	107.3	104.9	108.5	108.5	108.5	110.8	108.0	105.7	106.9	106.9	107.1	r 105.7	r 107.7	r 108.7	111.5
Machinery and allied goods ♀ do	97.6	94.2	93.0	92.7	93.8	94.4	94.7	94.5	95.2	95.3	94.6	94.1	r 94.7	r 96.6	r 96.3	97.8
Machinery do	100.5	95.5	94.0	94.2	95.3	95.2	97.4	95.6	96.3	97.0	96.3	96.6	r 97.4	r 98.6	r 98.0	98.8
Nonelectrical machinery do	99.6	93.0	91.1	91.4	90.9	91.6	94.9	94.1	95.0	95.3	93.3	92.5	r 93.8	r 95.6	r 94.5	95.5
Electrical machinery do	101.4	98.3	97.1	97.4	100.2	99.2	100.2	97.3	97.8	98.9	99.6	101.2	r 101.5	r 102.1	r 102.0	102.5
Transportation equipment do	90.3	91.3	91.3	89.5	90.9	91.7	88.5	91.1	91.7	92.4	91.6	89.8	r 90.7	r 93.4	r 94.4	97.6
Motor vehicles and parts do	96.9	111.6	112.2	108.4	110.2	111.7	106.7	111.6	111.8	112.9	113.4	111.7	r 113.0	r 116.5	r 117.9	123.0
Aerospace and misc. trans. eq do	83.9	71.8	71.2	71.4	72.3	72.4	71.0	71.5	72.4	72.6	70.7	68.7	69.3	r 71.0	r 71.7	73.0
Instruments do	110.8	108.5	105.5	106.7	108.0	108.5	110.9	109.1	110.5	111.2	110.4	109.3	r 111.1	r 114.4	r 113.7	115.4
Lumber, clay, and glass do	106.3	111.3	110.8	113.0	112.3	111.0	111.2	110.4	111.1	112.7	113.0	114.3	r 115.0	r 117.5	r 117.1	118.7
Lumber and products do	106.3	113.4	110.3	112.5	110.0	111.0	115.4	113.1	113.9	117.3	117.9	120.7	r 121.1	r 118.7	119.0	-------
Clay, glass, and stone products do	106.3	110.1	111.1	113.3	113.7	111.1	108.7	108.8	109.4	109.9	110.1	110.5	r 111.5	r 116.6	116.0	-------
Furniture and miscellaneous do	108.8	110.1	105.6	109.5	109.9	111.3	113.5	111.3	112.0	112.1	111.5	112.7	r 113.8	r 115.3	r 116.6	117.8
Furniture and fixtures do	99.4	98.7	95.0	98.7	97.6	100.9	99.9	99.6	100.8	100.3	101.6	100.4	r 101.2	r 104.2	106.4	-------
Miscellaneous manufactures do	117.3	120.5	115.4	119.3	121.2	120.7	126.1	122.0	122.2	122.6	120.5	123.9	r 125.1	r 125.2	125.9	-------
Nondurable manufactures do	110.6	113.3	110.4	112.1	113.3	113.7	113.0	113.8	114.2	114.6	115.9	115.9	r 116.7	r 117.5	r 117.8	117.9
Textiles, apparel, and leather do	100.2	100.7	97.3	99.8	101.5	102.4	100.2	100.1	102.5	102.2	101.6	102.8	r 102.0	r 100.9	r 101.4	102.3
Textile mill products do	106.3	108.6	105.3	106.3	107.5	113.2	108.5	110.5	111.0	110.1	110.2	112.0	r 108.9	106.7	108.2	-------
Apparel products do	97.8	97.8	94.0	97.3	99.7	97.1	97.0	96.0	99.5	100.0	99.5	99.7	r 99.8	99.9	-------	-------
Leather products do	90.8	87.3	85.4	89.9	89.8	89.3	86.7	84.1	87.6	87.2	82.9	86.8	r 89.3	r 86.8	85.5	-------
Paper and printing do	107.8	107.8	104.6	106.9	106.9	106.0	106.8	108.2	108.3	109.0	110.6	110.8	r 111.3	r 112.5	r 112.4	111.8
Paper and products do	113.3	116.0	111.0	114.4	115.1	113.4	115.5	117.8	116.4	116.1	119.5	120.0	r 112.4	r 123.0	123.1	-------
Printing and publishing do	104.1	102.2	100.2	101.8	101.4	101.0	101.0	101.7	102.9	104.3	104.5	104.7	r 103.9	r 105.4	r 105.3	103.8
Chemicals, petroleum, and rubber do	118.2	124.3	120.5	122.4	124.2	125.3	124.0	126.2	127.3	126.5	127.8	127.8	r 129.7	r 132.1	r 132.9	133.2
Chemicals and products do	120.2	125.8	121.0	123.4	123.7	126.8	125.0	127.6	129.7	128.2	130.7	130.3	r 131.1	r 134.4	r 134.3	133.7
Petroleum products do	112.6	115.7	116.3	115.8	112.7	115.0	114.8	115.8	113.7	115.7	116.0	118.3	r 119.3	r 118.7	118.8	-------
Rubber and plastics products do	115.7	125.9	122.7	124.5	135.4	129.1	128.0	129.9	129.6	129.0	127.6	126.6	r 133.2	r 134.7	138.4	-------
Foods and tobacco do	110.8	113.4	112.2	112.9	113.6	113.7	113.8	112.8	111.1	113.2	115.6	114.3	r 115.6	r 115.4	r 115.1	115.2
Foods do	111.7	114.6	113.8	114.1	114.6	115.4	115.2	114.0	111.9	114.3	117.0	115.8	r 116.4	r 116.4	r 116.0	116.2
Tobacco products do	100.0	97.7	90.3	96.9	100.3	92.1	96.6	98.2	100.3	98.5	98.2	93.8	103.8	102.5	-------	-------
Mining and utilities do	118.0	119.6	120.2	120.6	119.0	120.7	120.3	120.0	120.3	116.1	118.7	121.4	r 120.6	r 121.3	r 121.6	122.9
Mining do	109.7	107.0	111.4	110.4	108.6	108.9	105.7	106.5	106.0	97.7	102.3	107.8	r 107.3	r 106.8	r 107.6	109.4
Metal mining do	131.3	121.4	135.1	124.7	122.6	117.3	93.5	104.8	109.7	117.1	136.7	137.7	r 128.9	r 131.0	130.1	-------
Stone and earth minerals do	98.8	93.2	95.6	94.2	92.4	96.4	90.2	91.4	90.1	91.7	93.4	92.7	r 93.8	r 92.0	92.1	-------
Coal, oil and gas do	109.2	107.5	111.4	111.4	109.6	109.9	109.2	108.9	108.0	96.7	100.2	107.0	r 107.1	106.6	107.8	110.7
Coal do	105.8	99.0	116.2	115.5	110.2	109.4	109.4	109.4	109.7	29.1	55.7	112.4	r 106.3	99.6	r 104.1	113.9
Oil and gas extraction do	109.7	108.9	110.6	110.8	109.6	110.0	109.2	108.8	107.7	107.3	107.2	106.1	107.2	107.7	r 108.4	110.3
Crude oil do	109.4	108.3	112.7	111.9	109.5	109.8	107.8	107.0	104.7	105.4	105.0	104.2	104.0	104.2	105.5	-------
Utilities do	128.5	135.4	131.5	133.2	132.1	135.6	138.7	137.0	138.4	139.3	139.6	138.3	137.4	r 139.6	139.1	140.1
Electric do	130.8	138.0	133.6	135.5	133.8	138.3	142.0	139.7	141.5	142.3	142.3	141.9	141.2	r 144.3	r 144.0	145.3
Gas do	121.0	127.0	124.3	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

r Revised. p Preliminary.
♀ Includes data for items not shown separately. †Revised data (unadj. and seas. adj.) for 1968-70 for mfg. and trade sales and invent., total; retail inventories; retail sales, totals and major groups; and invent.-sales ratios for mfg. and trade, total and retail trade, total, durable and nondurable appear on p. 55 ff. of the Dec. 1971 SURVEY. See also note marked "†" on p. S-11.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
GENERAL BUSINESS INDICATORS—Continued																
BUSINESS SALES §																
Mfg. and trade sales (unadj.), total †—mil. $	1,275,315	1,371,134	113,995	114,346	114,961	120,859	110,405	113,309	117,802	118,592	118,740	123,590	109,489	r115,173	125,059	
Mfg. and trade sales (seas. adj.), total †—do	[1]1,275,315	[1]1,371,134	112,740	113,155	114,303	115,531	114,727	115,064	115,660	114,687	117,374	116,964	120,587	r120,743	122,558	
Manufacturing, total—do	[1]653,145	[1]694,927	57,790	57,680	58,352	58,988	58,418	57,804	57,892	57,439	59,061	59,074	61,350	r61,865	62,535	
Durable goods industries—do	352,189	378,596	31,616	31,308	31,850	32,650	32,123	31,464	31,543	31,166	32,106	31,858	33,573	r34,013	34,460	
Nondurable goods industries—do	300,956	316,331	26,174	26,372	26,502	26,338	26,295	26,340	26,349	26,273	26,955	27,216	27,777	r27,852	28,075	
Retail trade, total †—do	[1]375,527	[1]408,850	33,274	33,578	33,502	33,827	33,688	34,655	35,219	34,964	35,574	34,896	34,886	r35,345	36,402	
Durable goods stores—do	114,288	131,814	10,613	10,747	10,576	10,782	10,747	11,298	11,833	11,695	11,885	11,334	11,475	r11,457	12,044	
Nondurable goods stores—do	261,239	277,036	22,661	22,831	22,926	23,045	22,941	23,357	23,386	23,269	23,689	23,562	23,411	r23,888	24,358	
Merchant wholesalers, total—do	[1]246,643	[1]267,357	21,676	21,897	22,449	22,716	22,621	22,605	22,549	22,284	22,739	22,994	24,351	r23,533	23,621	
Durable goods establishments—do	111,778	122,420	9,736	9,887	10,350	10,510	10,365	10,471	10,425	10,398	10,583	10,629	11,225	r10,696	10,973	
Nondurable goods establishments—do	134,865	144,937	11,940	12,010	12,099	12,206	12,256	12,134	12,124	11,886	12,156	12,365	13,126	r12,837	12,648	
BUSINESS INVENTORIES §																
Mfg. and trade inventories, book value, end of year or month (unadj.), total †—mil. $	172,222	178,176	176,940	178,262	178,696	177,715	176,784	175,995	177,257	179,513	180,649	178,176	179,006	r180,538	182,244	
Mfg. and trade inventories, book value, end of year or month (seas. adj.), total †—mil. $	173,635	179,939	175,536	176,275	177,046	177,403	177,652	178,157	178,924	179,468	179,407	179,939	180,467	r180,860	181,115	
Manufacturing, total—do	100,476	100,549	100,502	100,420	100,647	100,536	100,194	100,063	100,266	100,740	100,793	100,549	100,876	r101,033	101,119	
Durable goods industries—do	65,152	64,242	65,082	65,033	65,079	64,825	64,692	64,523	64,563	64,494	64,399	64,242	64,722	r64,769	64,858	
Nondurable goods industries—do	35,324	36,307	35,420	35,387	35,568	35,711	35,502	35,540	35,703	36,246	36,394	36,307	36,154	r36,264	36,261	
Retail trade, total ††—do	46,555	50,474	48,246	48,809	49,259	49,534	49,592	50,299	50,844	50,800	50,377	50,474	50,542	50,646	50,890	
Durable goods stores—do	20,490	23,124	21,704	22,056	22,509	22,679	22,707	23,313	23,769	23,652	23,306	23,124	22,930	22,958	23,025	
Nondurable goods stores—do	26,065	27,350	26,542	26,753	26,750	26,855	26,885	26,986	27,075	27,148	27,071	27,350	27,612	27,688	27,865	
Merchant wholesalers, total—do	26,604	28,916	26,788	27,046	27,140	27,333	27,866	27,795	27,814	27,928	28,237	28,916	29,049	r29,181	29,106	
Durable goods establishments—do	15,565	17,254	15,780	16,025	16,128	16,197	16,581	16,526	16,666	16,786	16,899	17,254	17,287	r17,354	17,277	
Nondurable goods establishments—do	11,039	11,662	11,008	11,021	11,012	11,136	11,285	11,269	11,148	11,142	11,338	11,662	11,762	r11,827	11,829	
BUSINESS INVENTORY-SALES RATIOS																
Manufacturing and trade, total †—ratio	1.60	1.55	1.56	1.56	1.55	1.54	1.55	1.55	1.55	1.56	1.53	1.54	1.50	1.50	1.48	
Manufacturing, total—do	1.82	1.74	1.74	1.74	1.72	1.70	1.72	1.73	1.73	1.75	1.71	1.70	1.64	1.63	1.62	
Durable goods industries—do	2.20	2.05	2.06	2.08	2.04	1.99	2.01	2.05	2.05	2.07	2.01	2.02	1.93	1.90	1.88	
Materials and supplies—do	.64	.61	.60	.62	.61	.60	.62	.63	.61	.61	.59	.60	.57	.56	.55	
Work in process—do	1.00	.91	.91	.91	.90	.87	.88	.90	.90	.92	.89	.89	.86	.85	.84	
Finished goods—do	.55	.53	.55	.55	.53	.51	.52	.53	.53	.54	.52	.52	.50	.50	.49	
Nondurable goods industries—do	1.37	1.35	1.35	1.34	1.34	1.36	1.35	1.35	1.36	1.38	1.35	1.33	1.30	1.30	1.29	
Materials and supplies—do	.50	.50	.49	.49	.49	.50	.49	.49	.50	.51	.50	.49	.48	r.49	.48	
Work in process—do	.20	.19	.19	.19	.19	.20	.20	.19	.20	.20	.19	.19	.19	.19	.19	
Finished goods—do	.66	.66	.67	.66	.66	.66	.66	.66	.66	.68	.66	.65	.63	.63	.62	
Retail trade, total ††—do	1.47	1.44	1.45	1.45	1.47	1.46	1.47	1.45	1.44	1.45	1.42	1.45	1.45	r1.43	1.40	
Durable goods stores—do	2.17	2.04	2.05	2.05	2.13	2.10	2.11	2.06	2.01	2.02	1.96	2.04	2.00	r2.00	1.91	
Nondurable goods stores—do	1.16	1.16	1.17	1.17	1.17	1.17	1.17	1.16	1.16	1.17	1.14	1.16	1.18	1.16	1.14	
Merchant wholesalers, total—do	1.23	1.23	1.24	1.24	1.21	1.20	1.23	1.23	1.23	1.25	1.24	1.26	1.19	1.24	1.23	
Durable goods establishments—do	1.61	1.60	1.62	1.62	1.56	1.54	1.60	1.58	1.60	1.61	1.60	1.62	1.54	1.62	1.57	
Nondurable goods establishments—do	.92	.92	.92	.92	.91	.91	.92	.93	.92	.94	.93	.94	.90	.92	.94	
MANUFACTURERS' SALES, INVENTORIES, AND ORDERS																
Manufacturers' export sales:																
Durable goods industries:																
Unadjusted, total—mil. $	20,122	21,583	2,017	1,708	1,803	1,752	1,521	1,714	1,951	1,793	1,853	2,083	1,788	1,967	2,303	
Seasonally adj., total—do			1,898	1,681	1,741	1,706	1,707	1,893	1,979	1,785	1,819	1,887	1,900	2,029	2,158	
Shipments (not seas. adj.), total—do	653,145	694,927	59,383	58,379	58,709	62,142	53,478	56,321	60,282	60,146	59,366	57,364	57,129	r62,174	64,234	
Durable goods industries, total ♀—do	352,189	378,596	32,898	32,003	32,536	34,949	28,485	29,709	32,627	32,617	32,288	31,223	31,079	r34,374	r35,992	[2]36,114
Stone, clay, and glass products—do	17,746	20,987	1,616	1,754	1,772	1,905	1,765	1,944	1,925	1,942	1,853	1,674	1,732	r1,890	2,006	
Primary metals—do	55,740	58,546	5,270	5,694	5,814	5,810	4,923	3,843	4,237	4,430	4,618	4,478	4,837	5,223	r5,577	[2]5,849
Blast furnaces, steel mills—do	25,733	27,563	2,576	2,880	2,860	3,000	2,775	1,410	1,629	1,796	2,026	2,026	2,231	r2,403	2,627	
Fabricated metal products—do	41,920	42,676	3,596	3,548	3,623	3,800	3,223	3,688	3,802	3,686	3,604	3,429	3,269	r3,606	3,707	
Machinery, except electrical—do	56,135	59,484	5,230	4,956	4,923	5,383	4,486	4,680	5,334	5,114	4,862	5,172	5,001	r5,529	5,783	
Electrical machinery—do	50,819	53,876	4,479	4,218	4,304	4,759	4,045	4,400	4,845	4,761	4,728	4,917	4,615	r4,990	5,171	
Transportation equipment—do	81,173	90,471	8,475	7,554	7,803	8,657	5,852	6,443	7,626	7,901	8,047	7,173	7,379	r8,434	r8,540	[2]8,455
Motor vehicles and parts—do	45,113	58,063	5,455	4,895	4,979	5,298	3,520	3,923	5,188	5,385	5,354	4,406	5,086	r5,756	5,869	
Instruments and related products—do	12,153	11,823	959	960	976	1,034	926	984	1,088	1,050	1,015	1,004	910	r955	1,004	
Nondurable goods industries, total ♀—do	300,956	316,331	26,485	26,376	26,173	27,193	24,993	26,612	27,655	27,529	27,078	26,141	26,050	r27,800	28,370	
Food and kindred products—do	99,767	105,336	8,672	8,570	8,606	8,961	8,470	8,720	9,251	9,169	9,239	9,206	8,767	r9,231	9,374	
Tobacco products—do	5,464	5,865	465	463	484	533	506	513	520	501	506	487	494	r500	510	
Textile mill products—do	22,297															
Paper and allied products—do	25,192	26,220	2,211	2,148	2,153	2,300	2,045	2,289	2,299	2,267	2,215	2,145	2,287	r2,426	2,481	
Chemicals and allied products—do	48,763	51,662	4,291	4,537	4,454	4,549	4,058	4,329	4,673	4,368	4,270	3,978	4,330	r4,580	4,756	
Petroleum and coal products—do	26,604	27,968	2,275	2,323	2,282	2,382	2,327	2,320	2,347	2,381	2,341	2,328	2,367	r2,445	2,443	
Rubber and plastics products—do	17,502	18,907	1,563	1,618	1,647	1,690	1,501	1,624	1,649	1,679	1,563	1,534	1,571	r1,687	1,750	
Shipments (seas. adj.), total—do			57,790	57,680	58,352	58,988	58,418	57,804	57,892	57,439	59,061	59,074	61,350	r61,865	62,535	
By industry group:																
Durable goods industries, total ♀—do			31,616	31,308	31,850	32,650	32,123	31,464	31,543	31,166	32,106	31,858	33,573	34,013	r34,594	[2]35,231
Stone, clay, and glass products—do			1,659	1,728	1,713	1,762	1,793	1,831	1,758	1,772	1,892	1,849	2,040	r2,048	2,059	
Primary metals—do			5,014	5,385	5,501	5,404	5,312	3,991	4,270	4,421	4,825	4,804	5,003	5,154	r5,294	[2]5,465
Blast furnaces, steel mills—do			2,401	2,667	2,641	2,750	2,940	1,457	1,706	1,901	2,212	2,205	2,233	r2,344	2,449	
Fabricated metal products—do			3,534	3,459	3,591	3,550	3,437	3,679	3,680	3,547	3,683	3,589	3,587	r3,566	3,642	
Machinery, except electrical—do			4,936	4,794	4,855	5,015	4,937	4,983	5,186	5,064	4,981	5,137	5,573	r5,314	5,446	
Electrical machinery—do			4,340	4,348	4,501	4,476	4,434	4,513	4,523	4,568	4,607	4,912	5,044	r4,937	5,000	
Transportation equipment—do			8,018	7,340	7,388	8,011	7,749	7,915	7,620	7,262	7,467	6,872	7,595	8,218	r8,084	[2]8,206
Motor vehicles and parts—do			5,132	4,730	4,576	4,647	5,195	5,303	5,153	4,732	4,853	4,397	5,052	r5,559	5,522	
Instruments and related products—do			967	1,007	1,007	982	1,022	969	989	992	962	945	1,032	r1,009	1,014	

r Revised. [1] Based on data not seasonally adjusted. [2] Advance estimate; total mfrs. shipments for Apr. 1972 do not reflect revisions for selected components. §The term "business" here includes only manufacturing and trade; business inventories as shown on p. S-1 cover data for all types of producers, both farm and nonfarm. Unadjusted data for manufacturing are shown below and on p. S-6; those for wholesale and retail trade on pp. S-11 and S-12. †See corresponding note on p. S-4 and note marked "‡" on p. S-11. ‡See corresponding note on p. S-12. ♀Includes data for items not shown separately.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

GENERAL BUSINESS INDICATORS—Continued

MANUFACTURERS' SALES, INVENTORIES, AND ORDERS—Continued																
Shipments (seas. adj.)—Continued																
By industry group:																
Nondurable goods industries, total ♀ mil. $			26,174	26,372	26,502	26,338	26,295	26,340	26,349	26,273	26,955	27,216	27,777	r 27,852	28,075	
Food and kindred products do			8,747	8,882	8,795	8,699	8,739	8,683	8,667	8,690	9,122	9,227	9,339	r 9,421	9,458	
Tobacco products do			479	471	471	495	491	488	503	511	502	486	553	r 532	526	
Textile mill products do																
Paper and allied products do			2,173	2,137	2,171	2,219	2,187	2,270	2,211	2,166	2,194	2,202	2,451	r 2,431	2,440	
Chemicals and allied products do			4,192	4,290	4,315	4,363	4,330	4,305	4,459	4,266	4,360	4,406	4,572	r 4,582	4,635	
Petroleum and coal products do			2,344	2,368	2,295	2,287	2,344	2,293	2,308	2,373	2,328	2,327	2,405	r 2,470	2,520	
Rubber and plastics products do			1,499	1,538	1,604	1,582	1,637	1,682	1,637	1,592	1,583	1,637	1,700	r 1,666	1,679	
By market category:																
Home goods and apparel do	161,247	1 65,233	5,489	5,516	5,583	5,437	5,295	5,322	5,299	5,326	5,692	5,779	5,540	r 5,500	5,648	
Consumer staples do	1128,970	1 136,080	11,290	11,431	11,274	11,286	11,218	11,279	11,332	11,302	11,787	11,926	11,975	r 12,148	12,189	
Equipment and defense prod., excl. auto do	199,238	1 101,740	8,479	8,217	8,555	9,134	8,336	8,484	8,509	8,531	8,422	8,555	9,121	r 8,804	8,982	
Automotive equipment do	153,590	1 64,963	5,700	5,283	5,136	5,226	5,749	5,889	5,733	5,279	5,438	4,985	5,614	r 6,186	6,169	
Construction materials and supplies do	153,344	1 61,325	4,941	5,019	5,116	5,171	5,154	5,334	5,188	5,146	5,355	5,298	5,624	r 5,610	5,681	
Other materials and supplies do	1256,756	1 265,586	21,891	22,214	22,688	22,734	22,666	21,496	21,831	21,855	22,367	22,531	23,476	r 23,617	23,866	
Supplementary series:																
Household durables do	125,713	1 28,755	2,379	2,435	2,396	2,407	2,328	2,419	2,397	2,367	2,562	2,689	2,581	2,625	r 2,757	2 2,848
Defense products (old series) do	146,603	1 44,205	3,771	3,594	3,820	4,338	3,548	3,584	3,431	3,511	3,587	3,585	3,567	3,601	r 3,581	2 3,625
Defense products (new series) do	124,308	1 23,266	1,887	1,825	2,006	2,589	2,010	2,077	1,765	1,768	1,839	1,712	1,785	1,815	r 1,767	2 1,871
Producers' capital goods industries do	171,159	1 76,089	6,181	5,973	6,203	6,396	6,304	6,435	6,652	6,592	6,477	6,741	7,189	6,940	r 7,112	2 7,024
Inventories, end of year or month:																
Book value (unadjusted), total do	100,135	100,214	100,956	101,257	101,626	100,734	99,826	99,754	99,381	99,957	100,104	100,214	100,980	r101,530	101,559	
Durable goods industries, total do	64,781	63,878	65,412	65,649	65,790	65,046	64,482	64,426	64,090	63,962	63,894	63,878	64,537	r 65,024	65,182	
Nondurable goods industries, total do	35,354	36,336	35,544	35,608	35,836	35,688	35,344	35,328	35,291	35,995	36,210	36,336	36,443	r 36,506	36,377	
Book value (seasonally adjusted), total do	100,476	100,549	100,502	100,420	100,647	100,536	100,194	100,063	100,266	100,740	100,793	100,549	100,876	r101,033	101,119	
By industry group:																
Durable goods industries, total ♀ do	65,152	64,242	65,082	65,033	65,079	64,825	64,692	64,523	64,563	64,494	64,399	64,242	64,722	r 64,769	64,858	
Stone, clay, and glass products do	2,278	2,263	2,267	2,265	2,269	2,280	2,293	2,302	2,293	2,296	2,272	2,263	2,234	r 2,235	2,220	
Primary metals do	9,139	9,195	9,498	9,333	9,236	9,170	8,821	8,953	9,230	9,283	9,201	9,195	9,407	r 9,459	9,554	
Blast furnaces, steel mills do	4,854	4,800	5,138	5,040	4,985	4,815	4,464	4,635	4,875	4,875	4,784	4,800	5,026	5,071	5,153	
Fabricated metal products do	6,972	7,084	7,122	7,140	7,283	7,410	7,510	7,519	7,403	7,372	7,191	7,084	7,194	r 7,183	7,123	
Machinery, except electrical do	14,072	13,539	13,932	13,879	13,837	13,854	13,831	13,745	13,686	13,690	13,698	13,539	13,474	r 13,425	13,343	
Electrical machinery do	10,186	9,861	10,020	10,005	9,930	9,973	9,920	9,885	9,902	9,851	9,870	9,861	9,799	r 9,823	9,882	
Transportation equipment do	14,133	13,639	13,813	13,942	14,035	13,668	13,796	13,570	13,493	13,425	13,515	13,639	13,787	r 13,850	13,947	
Motor vehicles and parts do	4,115	3,845	3,996	4,076	4,193	4,289	4,233	4,015	3,854	3,831	3,861	3,845	3,872	r 3,938	3,984	
Instruments and related products do	2,417	2,417	2,374	2,365	2,379	2,358	2,327	2,356	2,369	2,388	2,426	2,417	2,482	2,494	2,477	
By stage of fabrication:																
Materials and supplies ♀ do	19,056	19,133	18,996	19,359	19,570	19,696	19,932	19,709	19,306	19,106	19,070	19,133	19,149	r 19,037	18,978	
Primary metals do	3,309	3,575	3,373	3,358	3,330	3,420	3,403	3,436	3,519	3,471	3,453	3,575	3,660	r 3,682	3,690	
Machinery (elec. and nonelec.) do	6,326	6,330	6,431	6,504	6,495	6,490	6,570	6,496	6,376	6,284	6,344	6,330	6,388	r 6,357	6,316	
Transportation equipment do	3,251	2,858	3,037	3,164	3,285	3,151	3,166	3,012	2,814	2,862	2,864	2,858	2,651	r 2,678	2,694	
Work in process ♀ do	29,233	28,484	28,811	28,594	28,547	28,329	28,177	28,214	28,532	28,541	28,626	28,484	28,831	r 28,878	29,019	
Primary metals do	3,168	2,986	3,213	3,166	3,126	3,068	2,960	3,024	3,112	3,123	3,084	2,986	3,087	r 3,092	3,165	
Machinery (elec. and nonelec.) do	11,210	10,503	10,754	10,703	10,678	10,758	10,605	10,555	10,602	10,619	10,631	10,503	10,322	r 10,335	10,338	
Transportation equipment do	9,406	9,435	9,338	9,343	9,333	9,112	9,243	9,158	9,290	9,187	9,260	9,435	9,776	r 9,810	9,898	
Finished goods ♀ do	16,863	16,625	17,275	17,080	16,962	16,800	16,583	16,600	16,725	16,847	16,703	16,625	16,742	r 16,854	16,861	
Primary metals do	2,662	2,634	2,912	2,809	2,780	2,682	2,458	2,493	2,599	2,689	2,664	2,634	2,660	r 2,685	2,699	
Machinery (elec. and nonelec.) do	6,722	6,567	6,767	6,677	6,594	6,579	6,576	6,579	6,610	6,638	6,593	6,567	6,563	r 6,556	6,571	
Transportation equipment do	1,476	1,346	1,438	1,435	1,417	1,405	1,387	1,400	1,389	1,376	1,391	1,346	1,360	r 1,362	1,355	
Nondurable goods industries, total ♀ do	35,324	36,307	35,420	35,387	35,568	35,711	35,502	35,540	35,703	36,246	36,394	36,307	36,154	r 36,264	36,261	
Food and kindred products do	8,765	9,192	8,858	8,756	8,894	8,966	8,791	8,818	8,909	9,201	9,169	9,192	9,124	r 9,227	9,268	
Tobacco products do	2,191	2,321	2,215	2,214	2,190	2,180	2,142	2,129	2,185	2,221	2,262	2,321	2,334	r 2,312	2,323	
Textile mill products do	3,398															
Paper and allied products do	2,769	2,780	2,718	2,725	2,738	2,731	2,744	2,711	2,740	2,772	2,817	2,780	2,752	r 2,739	2,740	
Chemicals and allied products do	6,758	6,758	6,746	6,745	6,799	6,808	6,786	6,729	6,691	6,730	6,697	6,758	6,690	r 6,684	6,698	
Petroleum and coal products do	2,418	2,433	2,348	2,351	2,375	2,402	2,397	2,471	2,459	2,474	2,484	2,433	2,406	r 2,378	2,331	
Rubber and plastics products do	2,165	2,170	2,147	2,142	2,131	2,131	2,153	2,095	2,064	2,124	2,129	2,170	2,186	r 2,171	2,193	
By stage of fabrication:																
Materials and supplies do	13,026	13,458	12,897	12,927	12,918	13,058	12,989	13,027	13,048	13,271	13,382	13,458	13,470	r 13,532	13,504	
Work in process do	5,055	5,174	5,092	5,090	5,155	5,143	5,144	5,108	5,167	5,188	5,215	5,174	5,266	r 5,262	5,407	
Finished goods do	17,243	17,675	17,431	17,370	17,495	17,510	17,369	17,405	17,488	17,787	17,797	17,675	17,418	r 17,470	17,350	
By market category:																
Home goods and apparel do	10,492	10,892	10,498	10,518	10,561	10,628	10,660	10,726	10,839	10,911	11,028	10,892	10,870	r 10,939	10,927	
Consumer staples do	13,450	14,094	13,634	13,593	13,723	13,774	13,599	13,659	13,842	13,953	13,932	14,094	14,082	r 14,158	14,146	
Equip. and defense prod., excl. auto do	26,056	25,434	25,868	25,881	25,808	25,371	25,479	25,372	25,398	25,296	25,372	25,434	25,525	r 25,576	25,554	
Automotive equipment do	5,288	5,059	5,127	5,214	5,322	5,428	5,396	5,198	5,028	5,022	5,044	5,059	5,089	r 5,147	5,183	
Construction materials and supplies do	7,817	8,013	7,934	7,933	7,973	8,025	8,085	8,200	8,169	8,201	8,098	8,013	8,069	r 8,036	8,005	
Other materials and supplies do	37,373	37,057	37,441	37,281	37,260	37,310	36,975	36,908	36,990	37,357	37,319	37,057	37,241	r 37,177	37,304	
Supplementary series:																
Household durables do	4,914	4,914	4,824	4,829	4,850	4,895	4,935	4,917	4,938	4,959	4,958	4,914	4,950	r 4,888	4,904	
Defense products (old series) do	12,034	11,430	11,937	11,922	11,805	11,273	11,308	11,191	11,295	11,277	11,302	11,430	11,555	r 11,473	11,503	
Defense products (new series) do	6,493	5,743	6,008	6,108	6,067	5,507	5,488	5,282	5,412	5,514	5,565	5,743	5,816	r 5,896	6,039	
Producers' capital goods industries do	17,569	17,336	17,381	17,438	17,440	17,507	17,546	17,501	17,461	17,435	17,450	17,336	17,245	r 17,370	17,343	
New orders, net (not seas. adj.), total do	646,388	692,686	59,297	57,433	56,428	60,001	53,835	56,453	60,019	60,177	59,470	57,739	58,681	r 63,414	64,888	
Durable goods industries, total do	345,332	376,235	32,761	31,032	30,280	32,805	28,834	29,916	32,432	32,544	32,327	31,586	32,553	35,398	r 36,454	2 36,447
Nondurable goods industries, total do	301,056	316,451	26,536	26,401	26,148	27,196	25,001	26,537	27,587	27,633	27,143	26,153	26,128	r 28,016	28,461	
New orders, net (seas. adj.), total do	1646,388	1692,686	57,699	56,597	57,028	57,009	58,255	58,085	57,322	57,490	59,576	59,408	62,996	r 62,514	63,228	
By industry group:																
Durable goods industries, total ♀ do	345,332	376,235	31,472	30,228	30,601	30,666	31,955	31,758	31,026	31,126	32,564	32,138	35,099	34,505	r 35,095	2 35,415
Primary metals do	55,031	57,576	5,155	4,882	4,800	4,536	4,434	4,184	4,517	4,488	4,809	4,848	5,221	5,248	r 5,515	2 5,519
Blast furnaces, steel mills do	25,696	26,859	2,494	2,290	2,079	1,945	2,030	1,701	2,020	1,953	2,246	2,246	2,370	r 2,454	2,541	
Fabricated metal products do	42,555	41,928	3,576	3,419	3,532	3,462	3,489	3,577	3,520	3,353	3,644	3,585	3,613	r 3,611	3,901	
Machinery, except electrical do	54,847	59,687	4,985	4,599	4,809	5,122	4,823	5,072	5,105	5,292	5,154	5,154	5,732	r 5,512	5,583	
Electrical machinery do	50,629	54,043	4,291	4,310	4,409	4,333	4,827	4,584	4,628	4,737	4,725	4,757	4,743	r 4,898	5,060	
Transportation equipment do	76,554	89,318	7,627	7,032	6,958	7,065	8,062	7,923	7,130	6,970	7,575	7,233	9,032	8,404	r 7,881	2 8,238
Aircraft, missiles, and parts do	23,284	22,596	1,827	1,853	1,623	1,968	2,404	1,985	1,348	1,639	2,142	2,039	2,146	r 1,744	1,806	
Nondurable goods industries, total do	301,056	316,451	26,227	26,369	26,427	26,343	26,300	26,327	26,296	26,364	27,012	27,270	27,897	r 28,009	28,167	
Industries with unfilled orders ⊕ do	79,840	84,538	7,047	6,913	6,973	7,082	7,022	7,201	7,006	7,192	7,179	7,267	7,630	r 7,702	7,725	
Industries without unfilled orders ¶ do	221,216	231,913	19,180	19,456	19,454	19,261	19,278	19,126	19,290	19,172	19,833	20,003	20,267	20,307	20,442	

r Revised. 1 Based on data not seasonally adjusted. 2 Advance estimate; total mfrs. new orders for Apr. 1972 do not reflect revisions for selected components. ♀ Includes data for items not shown separately. ⊕ Includes textile mill products, leather and products, paper and allied products, and printing and publishing industries; unfilled orders for other nondurable goods industries are zero.

¶ For these industries (food and kindred products, tobacco manufactures, apparel and other textile products, petroleum and coal products, chemicals and allied products, and rubber and plastics products) sales are considered equal to new orders.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
GENERAL BUSINESS INDICATORS—Continued																
MANUFACTURERS' SALES, INVENTORIES, AND ORDERS—Continued																
New orders, net (seas. adj.)—Continued																
By market category:																
Home goods and apparel, mil. $	[2] 61,236	[2] 65,422	5,531	5,516	5,682	5,365	5,360	5,361	5,275	5,369	5,817	5,689	5,571	r 5,489	5,802	----
Consumer staples, do	[2]128,981	[2] 136,123	11,303	11,440	11,273	11,266	11,223	11,282	11,321	11,315	11,797	11,937	11,989	r 12,146	12,195	----
Equip. and defense prod., excl. auto, do	[2] 95,944	[2] 101,169	8,163	8,013	8,037	8,298	8,871	8,509	7,974	8,493	8,689	8,685	10,223	r 9,019	8,761	----
Automotive equipment, do	[2] 52,909	[2] 65,388	5,762	5,228	5,234	5,184	5,781	5,863	5,774	5,355	5,488	5,104	5,689	r 6,415	6,158	----
Construction materials and supplies, do	[2] 53,871	[2] 60,691	5,020	4,952	5,066	5,077	5,306	5,209	5,006	5,004	5,337	5,283	5,669	r 5,596	6,005	----
Other materials and supplies, do	[2]253,447	[2]263,893	21,920	21,448	21,736	21,819	21,714	21,861	21,972	21,954	22,448	22,710	23,855	r 23,849	24,307	----
Supplementary series:																
Household durables, do	[2] 25,740	[2] 28,913	2,421	2,433	2,483	2,338	2,401	2,457	2,379	2,398	2,672	2,589	2,615	2,601	2,883	[1] 2,900
Defense products (old series), do	[2] 42,865	[2] 42,476	3,275	3,496	3,233	3,628	4,246	3,634	3,018	3,249	3,947	3,687	3,790	3,452	r 3,482	[1] 3,497
Defense products (new series), do	[2] 23,455	[2] 23,532	1,580	1,500	1,573	1,678	2,900	2,154	1,467	1,953	2,110	2,010	3,124	1,780	r 1,752	[1] 1,882
Producers' capital goods industries, do	[2] 69,530	[2] 76,685	6,219	5,677	6,193	6,237	6,146	6,551	6,425	6,806	6,565	6,835	8,110	7,242	r 7,238	[1] 7,252
Unfilled orders, end of year or month (unadjusted), total, mil. $	80,268	78,027	82,659	81,713	79,432	77,294	77,646	77,773	77,513	77,546	77,656	78,027	79,586	r 80,825	81,479	----
Durable goods industries, total, do	77,263	74,900	79,583	78,612	76,356	74,211	74,559	74,763	74,568	74,499	74,542	74,900	76,379	77,399	r 77,859	[1] 78,192
Nondur. goods ind. with unfilled orders⊕, do	3,005	3,127	3,076	3,101	3,076	3,083	3,087	3,010	2,945	3,047	3,114	3,127	3,207	r 3,426	3,514	----
Unfilled orders, end of year or month (seasonally adjusted), total, mil. $	80,527	78,222	82,156	81,073	79,749	77,775	77,615	77,898	77,325	77,375	77,888	78,222	79,868	r 80,519	81,213	----
By industry group:																
Durable goods industries, total ♀, do	77,485	75,057	79,056	77,976	76,727	74,748	74,584	74,879	74,362	74,323	74,776	75,057	76,583	77,078	r 77,573	[1] 77,573
Primary metals, do	6,687	5,708	8,121	7,618	6,917	6,049	5,173	5,366	5,612	5,680	5,664	5,708	5,927	6,022	r 6,243	[1] 6,297
Blast furnaces, steel mills, do	3,727	3,011	4,979	4,602	4,040	3,235	2,325	2,569	2,883	2,936	2,970	3,011	3,148	r 3,258	3,351	----
Fabricated metal products, do	11,218	10,461	11,094	11,054	10,995	10,909	10,960	10,859	10,698	10,505	10,465	10,461	10,488	r 10,534	10,793	----
Machinery, except electrical, do	14,505	14,696	14,518	14,323	14,277	14,385	14,269	14,360	14,279	14,504	14,676	14,696	14,853	r 15,052	15,190	----
Electrical machinery, do	14,469	14,629	14,199	14,161	14,069	13,925	14,320	14,393	14,500	14,669	14,784	14,629	14,329	r 14,291	14,349	----
Transportation equipment, do	25,490	24,305	25,982	25,674	25,244	24,297	24,610	24,618	24,128	23,838	23,945	24,305	25,742	25,928	r 25,724	[1] 25,756
Aircraft, missiles, and parts, do	19,504	17,613	18,705	18,562	18,044	17,369	17,840	17,895	17,461	17,237	17,422	17,613	17,944	r 17,717	17,622	----
Nondur. goods ind. with unfilled orders⊕, do	3,042	3,165	3,100	3,097	3,022	3,027	3,031	3,019	2,963	3,052	3,112	3,165	3,285	r 3,441	3,535	----
By market category:																
Home goods, apparel, consumer staples, do	1,992	2,236	2,033	2,042	2,140	2,048	2,120	2,163	2,129	2,184	2,318	2,236	2,282	r 2,269	2,429	----
Equip. and defense prod., incl. auto, do	43,409	43,201	44,080	43,821	43,401	42,525	43,091	43,091	42,594	42,633	42,947	43,201	44,375	r 44,817	44,584	----
Construction materials and supplies, do	10,737	10,098	10,639	10,572	10,522	10,430	10,580	10,456	10,274	10,132	10,114	10,098	10,144	r 10,130	10,454	----
Other materials and supplies, do	24,389	22,687	25,404	24,638	23,686	22,772	21,824	22,188	22,328	22,426	22,509	22,687	23,067	r 23,303	23,746	----
Supplementary series:																
Household durables, do	1,639	1,806	1,655	1,653	1,740	1,672	1,747	1,786	1,769	1,800	1,907	1,806	1,842	1,819	r 1,943	[1] 1,999
Defense products (old series), do	26,078	24,325	25,182	25,084	24,497	23,787	24,486	24,535	24,122	23,862	24,223	24,325	24,547	24,397	r 24,298	[1] 24,172
Defense products (new series), do	19,506	19,634	19,920	19,595	19,122	18,211	19,101	19,177	18,880	19,065	19,336	19,634	20,972	20,937	r 20,923	[1] 20,934
Producers' capital goods industries, do	22,574	23,156	23,492	23,196	23,186	23,028	22,867	22,986	22,759	22,972	23,058	23,156	24,075	24,378	r 24,503	[1] 24,733
BUSINESS INCORPORATIONS♂																
New incorporations (50 States and Dist. Col.):																
Unadjusted⊙, number	264,209	287,547	25,752	24,389	23,899	26,266	24,898	23,698	22,748	23,977	22,799	26,051	25,715	p 24,300	----	----
Seasonally adjusted⊙, do	----	----	23,220	22,770	24,168	24,691	25,073	25,142	23,278	25,050	25,828	25,529	24,685	p 24,702	----	----
INDUSTRIAL AND COMMERCIAL FAILURES♂																
Failures, total, number	10,748	10,326	1,042	989	912	935	786	848	741	759	819	730	750	880	986	----
Commercial service, do	1,392	1,464	156	126	139	137	106	108	117	110	131	93	95	130	116	----
Construction, do	1,687	1,545	154	159	134	118	109	131	114	119	125	101	130	118	146	----
Manufacturing and mining, do	2,035	1,932	196	167	171	199	156	169	140	142	129	126	139	121	194	----
Retail trade, do	4,650	4,428	444	440	385	410	340	345	304	313	353	353	305	425	445	----
Wholesale trade, do	984	957	92	97	83	71	75	95	66	75	81	57	81	86	85	----
Liabilities (current), total, thous. $	1,887,754	1,916,929	224,646	153,796	249,489	165,840	147,028	155,555	115,847	144,702	128,998	111,322	101,619	191,331	220,662	----
Commercial service, do	298,736	356,923	95,547	19,252	46,032	16,122	39,055	27,515	24,983	15,912	16,533	18,170	15,776	36,057	26,578	----
Construction, do	231,533	222,357	18,128	23,788	23,881	24,406	8,593	13,205	20,267	13,288	11,601	12,473	18,261	24,946	26,815	----
Manufacturing and mining, do	817,841	712,611	47,949	53,873	62,175	85,082	62,851	65,460	38,580	54,706	63,619	44,742	36,515	77,847	113,437	----
Retail trade, do	360,603	444,086	38,132	41,368	104,367	29,952	22,523	34,071	20,178	40,771	23,026	27,953	19,374	28,604	42,284	----
Wholesale trade, do	179,041	180,952	24,890	15,515	13,034	10,278	14,006	15,304	11,839	20,025	14,219	7,984	11,693	23,877	11,548	----
Failure annual rate (seasonally adjusted) No. per 10,000 concerns	[2] 43.8	[2] 41.7	43.9	42.9	42.8	44.3	39.6	43.6	40.1	38.1	41.6	37.5	35.7	40.8	41.2	----
COMMODITY PRICES																
PRICES RECEIVED AND PAID BY FARMERS																
Prices received, all farm products, 1910–14=100	280	285	282	282	286	288	286	287	282	287	290	295	304	310	304	304
Crops ♀, do	226	244	242	244	251	258	250	244	235	240	245	247	251	250	242	254
Commercial vegetables, do	294	329	353	351	351	347	331	297	269	302	381	353	359	338	284	331
Cotton, do	183	208	178	188	192	196	202	228	228	233	242	246	255	255	235	264
Feed grains and hay, do	177	185	201	199	199	205	195	174	167	157	157	168	173	173	173	174
Food grains, do	162	167	170	171	174	176	165	158	155	161	161	165	165	166	166	168
Fruit, do	237	271	253	257	284	329	288	295	271	298	264	258	260	260	261	264
Tobacco, do	604	626	614	614	614	614	614	623	638	640	654	665	670	663	663	663
Livestock and products ♀, do	326	321	317	315	316	314	317	323	323	328	329	336	349	362	357	347
Dairy products, do	345	354	352	345	339	334	339	347	359	370	369	371	369	365	362	354
Meat animals, do	405	401	393	393	401	401	403	409	403	412	413	421	453	481	468	459
Poultry and eggs, do	151	132	134	134	129	128	130	134	132	124	127	138	130	130	138	122
Prices paid:																
All commodities and services, do	336	352	348	349	351	354	353	355	355	355	357	357	360	363	r 364	365
Family living items, do	366	382	377	377	381	383	383	386	387	387	387	389	391	395	395	396
Production items, do	314	331	327	329	330	333	332	333	333	333	335	335	338	340	341	342
All commodities and services, interest, taxes, and wage rates (parity index), 1910–14=100	390	410	405	407	410	412	410	412	412	414	415	416	420	423	423	427
Parity ratio §, do	72	70	70	69	70	70	70	70	68	69	70	71	72	73	72	71

r Revised. p Preliminary. [1] Advance estimate; total mfrs. unfilled orders for Apr. 1972 do not reflect revisions for selected components. [2] Based on unadjusted data.
⊕See corresponding note on p. S–6. ♀Includes data for items not shown separately.
♂Compiled by Dun & Bradstreet, Inc. (failures data for 48 States and Dist. of Col.).
⊙Revisions for Jan.–Dec. 1970 will be shown later.
§Ratio of prices received to prices paid (parity index).

COMMODITY PRICES—Continued

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
CONSUMER PRICES																
(U.S. Department of Labor Indexes)																
Unadjusted indexes:																
All items 1967=100	116.3	121.3	119.8	120.2	120.8	121.5	121.8	122.1	122.2	122.4	122.6	123.1	123.2	123.8	124.0	124.3
Special group indexes:																
All items less shelter do	114.4	119.3	118.0	118.6	119.2	119.8	120.0	120.2	120.2	120.3	120.4	120.9	120.9	121.5	121.8	122.1
All items less food do	116.7	122.1	120.6	120.9	121.6	122.2	122.4	122.7	123.1	123.5	123.7	123.9	124.0	124.2	124.5	124.9
All items less medical care do	116.1	120.9	119.4	119.8	120.4	121.1	121.4	121.6	121.7	122.1	122.3	122.7	122.8	123.4	123.6	123.9
Commodities do	113.5	117.4	116.1	116.6	117.2	117.9	118.1	118.2	118.1	118.4	118.5	118.9	118.7	119.4	119.7	119.9
Nondurables do	114.0	117.7	116.4	116.9	117.4	118.1	118.3	118.6	118.7	118.8	118.9	119.5	119.2	120.3	120.6	120.7
Nondurables less food do	113.1	117.0	115.7	116.0	116.6	116.9	116.7	117.2	118.2	118.7	118.7	118.8	118.1	118.4	118.9	119.1
Durables ♀ do	111.8	116.5	115.2	115.7	116.6	117.4	117.5	116.9	116.4	117.1	117.4	117.2	117.3	117.1	117.3	117.7
Commodities less food do	112.5	116.8	115.5	115.8	116.6	117.1	117.0	117.1	117.4	118.0	118.1	118.1	117.7	117.8	118.2	118.5
Services do	121.6	128.4	126.6	126.8	127.5	128.2	128.8	129.4	129 8	130.0	130.4	130.8	131.5	131.8	132.0	132.4
Services less rent do	123.7	130.9	128.9	129.1	129.8	130.6	131.2	131.9	132.3	132.5	132.9	133.3	134.1	134.4	134.7	135.0
Food ♀ do	114.9	118.4	117.0	117.8	118.2	119.2	119.8	120.0	119.1	118.9	119.0	120.3	120.3	122.2	122.4	122.4
Meats, poultry, and fish do	116.5	116.9	115.6	115.7	115.8	117.4	118.0	118.7	119.1	118.4	118.1	118.9	120.7	126.3	126.8	125.9
Dairy products do	111.8	115.3	114.2	114.6	115.1	115.7	116.0	116.0	116.1	116.0	115.9	116.1	116.4	116.9	117.3	117.4
Fruits and vegetables do	113.4	119.1	116.0	120.0	121.4	125.1	126.0	123.6	116.6	115.6	117.8	124.4	120.9	123.9	121.4	122.1
Housing do	118.9	124.3	122.4	122.5	123.2	124.0	124.5	125.1	125.5	125.9	126.4	126.8	127.3	127.6	127.9	128.2
Shelter ♀ do	123.6	128.8	126.7	126.5	127.2	128.3	128.8	129.5	130.1	130.6	131.3	131.6	132.3	132.5	132.7	133.0
Rent do	110.1	115.2	113.9	114.4	114.7	115.2	115.4	115.8	116.1	116.4	116.6	116.9	117.1	117.5	117.7	118.1
Homeownership do	128.5	133.7	131.2	130.9	131.6	133.0	133.5	134.4	135.1	135.7	136.7	137.0	137.8	138.0	138.2	138.5
Fuel and utilities ♀ do	107.6	115.1	113.8	114.1	114.4	114.6	115.5	116.3	116.3	116.3	116.8	117.9	118.7	119.3	119.6	119.9
Fuel oil and coal do	110.1	117.5	117.4	117.3	117.2	117.4	117.5	117.8	117.8	117.8	118.1	118.1	118.7	118.7	118.7	118.6
Gas and electricity do	107.3	114.7	113.3	113.9	114.4	114.6	114.7	115.7	115.7	115.7	116.2	118.2	119.0	119.4	119.7	120.2
Household furnishings and operation do	113.4	118.1	116.4	117.0	118.1	118.7	118.9	119.1	119.4	119.5	119.5	119.6	119.5	119.6	120.1	120.5
Apparel and upkeep do	116.1	119.8	118.6	119.1	120.2	120.1	119.3	119.0	120.6	121.6	121.9	121.8	120.2	120.7	121.3	121.8
Transportation do	112.7	118.6	117.8	118.1	118.8	119.6	119.5	119.3	118.6	119.3	118.8	118.6	119.0	118.3	118.4	118.6
Private do	111.1	116.6	115.9	116.2	117.0	117.6	117.4	117.3	116.4	117.2	116.6	116.3	116.4	115.7	115.9	116.1
New cars do	107.6	112.0	114.3	113.8	113.9	113.9	113.8	109.3	105.6	109.1	109.6	110.4	112.2	111.9	111.7	111.7
Used cars do	104.3	110.2	106.8	109.8	112.8	114.1	113.5	112.5	111.6	111.7	110.2	107.2	105.3	103.0	103.9	106.4
Public do	128.5	137.7	136.0	136.4	136.4	139.0	139.0	139.1	139.3	139.3	139.3	139.7	143.4	143.5	142.3	142.7
Health and recreation ♀ do	116.2	122.2	120.6	121.2	121.6	122.1	122.6	123.1	123.6	123.5	123.7	123.9	124.3	124.7	125.0	125.5
Medical care do	120.6	128.4	126.8	127.5	128.1	128.6	129.3	130.0	130.4	129.6	129.7	130.1	130.5	131.0	131.4	131.7
Personal care do	113.2	116.8	115.8	116.3	116.5	116.8	117.1	117.5	117.6	117.9	117.9	117.9	118.1	118.4	118.7	119.1
Reading and recreation do	113.4	119.3	117.7	118.4	118.9	119.3	119.6	119.7	120.5	120.5	120.8	121.1	121.4	121.5	121.7	122.3
WHOLESALE PRICES♂																
(U.S. Department of Labor Indexes)																
Spot market prices, basic commodities:																
22 Commodities 1967=100	[1] 113.4	108.0	109.3	109.7	108.8	108.1	108.3	108.3	107.4	106.7	105.8	106.7	110.3	112.4	114.4	115.6
9 Foodstuffs do	[1] 112.6	109.3	111.6	109.0	109.1	111.1	113.8	111.3	107.3	105.5	104.3	106.4	109.7	111.3	110.4	110.1
13 Raw industrials do	[1] 113.8	107.1	107.8	110.2	108.6	106.1	104.7	106.1	107.5	107.4	106.9	106.8	110.7	113.0	117.2	119.5
All commodities do	110.4	113.9	113.0	113.3	113.8	114.3	114.6	114.9	114.5	114.4	114.5	115.4	116.3	117.3	117.4	117.5
By stage of processing:																
Crude materials for further processing do	112.2	115.0	114.3	115.2	115.8	116.9	116.6	115.2	113.9	114.3	114.3	117.0	120.2	123.1	123.1	123.0
Intermediate materials, supplies, etc do	109.8	114.0	112.6	113.1	113.6	114.0	114.8	115.6	115.4	115.0	115.0	115.4	115.9	116.7	117.2	117.7
Finished goods ⊙ do	110.4	113.5	112.9	112.9	113.5	113.8	113.8	114.1	113.6	113.8	114.0	115.0	115.5	116.3	116.1	115.8
Consumer finished goods do	109.9	112.7	112.1	112.0	112.7	113.1	113.0	113.3	112.7	112.9	113.1	114.2	114.7	115.6	115.3	114.8
Producer finished goods do	111.9	116.6	116.0	116.1	116.3	116.5	116.8	117.1	116.9	117.1	117.0	117.8	118.4	118.8	119.0	119.3
By durability of product:																
Durable goods do	112.4	117.0	115.5	116.1	116.5	116.7	117.5	118.4	118.2	118.2	118.1	118.6	119.2	120.0	120.4	120.7
Nondurable goods do	108.9	111.7	111.1	111.2	111.8	112.5	112.4	112.4	111.7	111.6	111.8	113.0	114.1	115.3	115.2	115.1
Total manufactures do	110.2	113.8	112.7	113.0	113.5	113.8	114.5	114.9	114.7	114.5	114.5	115.1	115.7	116.5	116.7	116.9
Durable manufactures do	112.0	117.0	115.5	116.1	116.5	116.7	117.5	118.5	118.3	118.3	118.3	118.8	119.3	120.1	120.4	120.8
Nondurable manufactures do	108.2	110.5	109.9	109.9	110.5	110.8	111.4	111.2	111.0	110.6	110.7	111.3	112.0	112.8	112.9	112.9
Farm prod., processed foods and feeds do	111.6	113.8	113.4	113.3	114.3	115.4	115.0	114.6	113.0	113.0	113.6	115.9	117.4	119.6	119.1	118.3
Farm products ♀ do	111.0	112.9	113.0	113.0	114.0	116.0	113.4	113.2	110.5	111.3	112.2	115.8	117.8	120.7	119.7	119.1
Fruits and vegetables, fresh and dried do	111.6	120.1	125.3	120.8	127.5	136.1	109.3	115.9	103.6	115.8	127.1	126.3	124.9	127.5	112.8	117.6
Grains do	98.8	100.9	108.4	106.8	107.2	109.4	102.5	92.8	89.0	88.3	87.8	95.3	94.1	93.0	93.8	96.0
Live poultry do	99.6	100.3	100.1	99.5	101.3	108.1	121.1	100.8	102.8	93.5	92.3	87.2	94.3	105.4	107.6	94.1
Livestock do	116.7	118.3	114.9	116.9	119.0	118.9	121.3	121.3	119.1	120.9	121.0	124.7	132.2	139.6	136.7	133.8
Foods and feeds, processed ♀ do	112.0	114.3	113.7	113.5	114.5	114.9	116.0	115.4	114.6	114.1	114.4	115.9	117.2	118.8	118.6	117.7
Beverages and beverage materials do	112.9	115.8	115.3	115.6	115.7	115.7	115.9	116.1	116.0	116.4	116.6	116.4	116.4	116.4	116.8	116.7
Cereal and bakery products do	107.6	111.4	111.5	111.5	111.5	111.5	111.5	111.4	111.3	111.3	111.5	111.6	112.2	112.4	112.6	112.8
Dairy products do	111.2	115.4	115.0	115.5	116.2	116.1	116.2	115.4	115.4	116.4	116.3	117.4	117.3	117.5	118.0	117.5
Fruits and vegetables, processed do	110.4	114.3	111.9	113.0	114.0	115.4	115.9	116.2	115.7	115.3	115.4	115.8	116.0	116.1	116.7	118.3
Meats, poultry, and fish do	115.8	116.0	112.9	113.3	116.4	116.7	119.6	117.7	117.5	116.9	117.1	120.4	125.4	130.5	127.3	123.6
Industrial commodities do	110.0	114.0	112.8	113.3	113.7	113.9	114.5	115.1	115.0	115.0	114.9	115.3	115.9	116.5	116.9	117.3
Chemicals and allied products ♀ do	102.2	104.2	104.5	104.5	104.3	104.4	104.4	104.3	104.3	104.2	103.8	103.4	103.4	103.5	103.4	104.1
Agric. chemicals and chem. prod do	88.4	92.2	93.9	94.1	93.8	94.1	93.4	91.0	91.0	90.4	90.3	90.3	90.3	90.2	90.6	92.2
Chemicals, industrial do	100.9	102.0	102.2	101.9	101.5	102.2	102.4	102.4	102.4	102.4	101.7	101.1	101.4	101.4	101.0	101.5
Drugs and pharmaceuticals do	101.1	102.4	102.6	102.0	101.9	102.3	102.6	102.7	102.6	102.6	102.4	102.5	102.3	102.2	102.5	102.4
Fats and oils, inedible do	133.3	133.5	144.3	143.0	138.8	132.0	130.8	134.2	132.9	129.0	125.3	115.9	111.3	110.7	103.5	112.2
Prepared paint do	112.4	115.6	115.1	115.9	115.9	115.9	115.9	115.9	115.9	115.9	115.9	115.9	116.2	117.3	117.9	118.3
Fuels and related prod., and power ♀ do	105.9	114.2	112.8	113.0	114.2	114.4	114.4	114.8	115.3	114.8	114.7	115.0	116.0	116.1	116.5	116.9
Coal do	150.0	181.8	176.0	184.0	182.8	182.5	182.9	182.9	182.9	182.9	182.9	190.2	192.7	192.6	192.6	191.2
Electric power do	104.8	113.6	111.1	112.3	112.6	113.0	113.5	115.3	116.4	116.3	116.2	116.3	118.9	120.0	120.0	120.5
Gas fuels do	103.3	108.0	109.4	105.9	106.9	107.5	107.7	107.2	108.4	108.8	108.8	107.9	110.0	110.2	110.9	112.5
Petroleum products, refined do	101.1	106.8	105.9	105.3	107.4	107.4	107.2	107.3	107.3	106.3	106.2	106.1	106.1	105.5	106.3	106.6
Furniture and household durables ♀ do	107.5	109.9	109.6	109.7	109.9	109.8	110.0	110.2	110.2	110.2	110.2	110.2	110.2	110.8	110.9	111.0
Appliances, household do	105.3	107.2	107.0	107.1	107.1	107.1	107.0	107.4	107.6	107.5	107.6	107.4	106.9	107.5	107.4	107.5
Furniture, household do	111.6	114.8	114.0	114.1	115.0	115.2	115.3	115.5	115.6	115.6	115.4	115.5	116.0	116.7	116.8	116.9
Home electronic equipment do	93.6	93.8	93.7	93.7	93.7	93.6	93.9	94.0	93.8	93.8	93.4	93.4	93.3	92.9	93.0	92.8

[r] Revised. [p] Preliminary. [1] Computed by BEA. ♀ Includes data for items not shown separately. ♂ For actual wholesale prices of individual commodities, see respective commodities. ⊙ Goods to users, incl. raw foods and fuels.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

COMMODITY PRICES—Continued

WHOLESALE PRICES♂—Continued																
(*U.S. Department of Labor Indexes*—Continued)																
All commodities—Continued																
Industrial commodities—Continued																
Hides, skins, and leather products ♀ 1967=100	110.1	114.0	112.5	114.0	114.4	114.2	114.2	114.4	114.7	114.7	115.1	116.2	117.8	119.1	123.0	127.2
Footwear do	113.0	116.8	116.5	116.6	116.7	116.8	116.8	117.1	117.1	117.1	117.1	117.1	118.1	118.5	120.1	122.4
Hides and skins do	104.4	115.1	105.5	121.1	121.4	114.0	114.0	114.6	117.7	117.2	123.1	128.6	136.0	148.9	173.8	188.6
Leather do	107.7	112.5	108.6	111.0	113.0	114.4	114.4	114.4	113.4	113.4	113.5	117.0	120.0	120.6	128.4	138.1
Lumber and wood products do	113.7	127.0	123.4	124.6	124.9	126.1	130.6	134.6	134.3	131.8	131.3	132.7	134.9	137.7	139.5	141.1
Lumber do	113.7	135.5	129.0	131.5	132.8	134.4	142.5	146.7	146.8	142.7	141.9	143.8	146.9	150.4	152.4	155.1
Machinery and equipment ♀ do	111.4	115.5	114.9	115.0	115.3	115.5	115.7	116.1	116.0	116.0	115.9	116.2	116.5	117.1	117.3	117.6
Agricultural machinery and equip do	113.0	117.2	116.5	116.7	116.6	116.9	117.4	117.5	117.5	117.5	117.5	118.6	119.9	121.5	122.0	122.1
Construction machinery and equip do	115.5	121.4	120.8	120.9	121.1	121.2	121.6	121.9	121.8	121.8	122.0	123.2	124.3	124.7	125.0	125.7
Electrical machinery and equip do	106.4	109.5	109.7	109.5	109.4	109.4	109.5	109.9	109.7	109.6	109.3	109.3	109.5	110.0	110.1	110.2
Metalworking machinery and equip do	114.0	117.3	116.0	116.6	117.4	117.9	117.7	118.1	118.0	118.1	118.2	118.4	118.5	118.9	119.4	119.7
Metals and metal products ♀ do	116.7	119.0	116.5	117.8	118.5	118.5	119.4	121.1	121.1	121.0	120.9	120.8	121.4	122.6	123.4	123.5
Heating equipment do	110.6	115.5	114.5	114.7	115.1	115.2	115.9	116.8	116.7	116.3	116.5	116.3	115.9	116.2	117.0	117.9
Iron and steel do	115.1	121.8	118.2	118.4	120.1	120.3	121.9	125.3	125.6	125.5	125.3	125.3	126.8	128.2	128.3	128.3
Nonferrous metals do	125.0	116.0	113.7	117.2	117.2	116.4	116.9	117.1	116.5	116.3	116.0	114.9	114.4	115.0	117.2	117.6
Nonmetallic mineral products ♀ do	113.3	122.4	120.9	121.6	121.8	122.2	123.3	124.2	124.2	124.1	124.0	124.2	124.3	124.6	124.8	125.6
Clay prod., structural, excl. refractories do	109.8	114.2	113.6	114.5	114.5	114.5	114.5	114.9	114.9	114.9	114.9	114.9	114.8	116.1	116.2	117.2
Concrete products do	112.2	120.6	118.5	119.4	119.6	120.1	121.5	122.8	122.6	122.6	122.6	122.9	123.4	123.8	124.5	125.1
Gypsum products do	100.0	106.8	98.9	101.0	101.2	104.0	112.7	114.3	114.5	113.6	112.1	114.1	113.4	112.8	115.3	114.9
Pulp, paper, and allied products do	108.2	110.1	109.3	109.6	109.9	110.2	110.5	110.6	110.6	110.6	110.6	110.7	110.8	111.6	112.3	112.8
Paper do	111.0	114.1	113.1	114.3	114.2	114.3	114.6	114.7	114.7	114.7	114.7	114.7	114.9	115.3	115.7	115.9
Rubber and plastics products do	108.6	109.2	109.1	109.0	108.7	108.7	109.7	109.8	109.7	109.5	109.5	109.4	109.5	109.2	108 9	108.7
Tires and tubes do	109.0	109.2	107.5	107.5	107.5	107.5	111.2	111.4	110.8	110.8	110.8	110.8	110.3	108.4	108.4	108.4
Textile products and apparel ♀ do	107.2	108.6	106.9	107.5	107.8	108.5	109.2	109.7	109.7	109.6	109.8	110.6	111.3	112.0	112.1	112.6
Apparel do	111.0	112.9	112.2	112.2	112.2	112.3	113.3	113.6	113.8	113.8	113.8	113.8	113.8	114.0	114.1	114.2
Cotton products do	105.6	110.6	107.8	108.9	109.6	110.9	111.9	112.5	112.2	ᶜ112.2	ᶜ112.5	113.6	116.7	118.0	119.6	120.5
Manmade fiber textile products do	102.1	100.8	97.6	98.6	99.7	101.4	101.9	103.1	103.1	102.5	103.2	104.3	105.4	105.9	106.1	107.2
Silk yarns do	114.3	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Wool products do	99.4	93.5	94.5	94.4	93.5	93.4	92.6	92.7	92.5	92.4	92.3	91.5	92.0	92.2	92.0	92.0
Transportation equipment ♀ Dec. 1968=100	104.5	110.3	109.5	109.7	109.8	110.0	110.3	110.5	109.6	110.7	110.8	112.9	113.4	113.6	113.8	113.8
Motor vehicles and equip 1967=100	108.5	114.7	113.8	114.1	114.2	114.4	114.7	114.9	113.8	115.2	115.3	117.5	117.9	118.1	118.1	118.1
Miscellaneous products ♀ do	109.9	112.8	112.8	112.7	112.5	112.6	112.8	113.0	113.0	113.0	113.1	113.2	113.7	114.0	114.2	114.1
Toys, sporting goods, etc do	109.4	112.6	113.1	112.5	112.4	112.6	112.6	112.6	112.6	112.6	112.8	113.1	113.5	114.0	114.5	114.0
Tobacco products do	114.0	116.7	116.9	116.5	116.5	116.5	116.6	116.8	116.8	116.8	116.8	116.7	117.4	117.4	117.4	117.4
PURCHASING POWER OF THE DOLLAR																
As measured by—																
Wholesale prices 1967=$1.00	$0.906	$0.878	$0.885	$0.883	$0.879	$0.875	$0.873	$0.870	$0.873	$0.874	$0.873	$0.867	$0.860	$0.853	$0.852	$0.851
Consumer prices do	.860	.824	.835	.832	.828	.823	.821	.819	.818	.817	.816	.812	.812	.808	.806	.806

CONSTRUCTION AND REAL ESTATE

CONSTRUCTION PUT IN PLACE ¶																
New construction (unadjusted), total ¶ mil. $	94,265	r108,968	7,535	8,461	9,281	9,837	r10,020	r10,346	r10,220	r10,277	r10,025	9,196	r8,408	r8,113	9,076	
Private, total ♀ do	66,147	r79,080	5,367	6,072	6,621	7,077	r7,237	r7,495	r7,464	r7,485	r7,374	7,067	r6,345	r6,038	6,730	
Residential (including farm)	31,748	r42,379	2,618	3,122	3,575	3,868	r4,005	r4,161	r4,162	r4,149	r4,054	3,891	r3,508	r3,331	3,723	
New housing units do	24,156	r34,177	2,082	2,408	2,737	3,054	3,243	3,398	3,434	3,409	3,341	3,212	r2,963	r2,845	3,127	
Nonresidential buildings, except farm and public utilities, total ♀ mil. $	21,417	22,479	1,667	1,833	1,842	1,951	2,022	2,071	2,011	2,034	2,012	1,913	1,748	r1,677	1,854	
Industrial do	6,538	5,423	462	496	477	459	465	423	421	460	430	433	362	r328	351	
Commercial do	9,754	11,619	808	894	913	1,004	1,087	1,160	1,087	1,093	1,098	1,023	956	r934	1,024	
Public utilities:																
Telephone and telegraph do	2,952	2,993	267	278	254	279	230	259	252	251	259	270	193	218		
Public, total ♀ do	28,118	29,888	2,168	2,389	2,660	2,760	2,783	2,851	2,756	2,792	2,651	2,129	r2,063	r2,075	2,346	
Buildings (excluding military) ♀ do	10,657	11,401	843	948	1,011	966	955	1,047	972	1,001	1,056	908	r888	908		
Housing and redevelopment do	1,107	1,137	98	106	97	104	81	82	83	95	118		89	66		
Industrial do	500	573	42	51	56	60	33	54	48	51	52	93	44	39	46	
Military facilities do	719	886	59	61	71	75	82	88	76	88	86	83	r74	66	84	
Highways and streets do	9,986	10,637	710	780	958	1,117	1,092	1,065	1,091	1,070	934	657	r585	r552		
New construction (seasonally adjusted at annual rates), total ¶ bil. $			103.0	105.9	107.6	109.2	r109.8	r111.8	r110.3	r114.7	r115.2	117.0	120.2	r121.2	123.8	
Private, total ♀ do			73.0	76.3	77.9	79.9	r80.3	r81.9	r81.7	r82.9	r84.8	86.0	88.2	r89.2	91.6	
Residential (including farm)			37.7	39.6	41.5	42.3	r42.5	r43.8	r45.0	r46.1	r46.8	47.7	49.7	r51.8	53.0	
Nonresidential buildings, except farm and public utilities, total ♀ bil. $			21.9	22.7	22.1	23.1	23.6	23.4	21.9	21.9	22.7	23.1	23.9	r23.4	24.4	
Industrial do			6.1	6.1	5.8	5.5	5.4	4.9	4.6	5.0	4.9	4.9	4.9	4.7	4.6	
Commercial do			10.7	11.3	11.0	11.8	12.7	13.1	11.7	11.5	12.2	12.4	13.4	13.1	13.6	
Public utilities:																
Telephone and telegraph do			3.2	3.4	3.1	3.2	2.7	3.0	2.9	2.7	2.9	3.0	3.1	3.1		
Public, total ♀ do			30.1	29.6	29.7	29.3	29.5	29.8	28.6	31.8	30.4	31.0	r31.9	r32.0	32.2	
Buildings (excluding military) ♀ do			10.4	11.1	11.6	10.5	11.1	12.3	10.8	12.5	12.3	12.4	r12.0	r11.9		
Housing and redevelopment do			.9	1.2	1.2	1.3	1.1	1.1	.9	1.3	1.2	1.2	1.2	.9		
Industrial do			.5	.6	.6	.6	.5	.6	.6	.6	.7	.5	.5	.5	.6	
Military facilities do			.9	.8	.8	.9	1.1	.9	.8	.9	.9	.9	1.0	1.0	1.2	
Highways and streets do			11.6	10.1	10.2	11.2	9.9	9.3	10.4	11.4	10.7	11.0	11.4	11.3		

r Revised. p Preliminary. c Corrected. 1 Series discontinued.
♂See corresponding note on p. S-8. ♀Includes data for items not shown separately.
¶Data have been revised to reflect the incorporation of new basic data, the change in estimating procedures, the modification of the type of construction classifications for private nonresidential buildings, the inclusion of farm housing in new private housing units, and the introduction of the results of a survey covering private nonresidential building construction in the 13 Western States. More detailed information may be obtained from the Bureau of Census Report C30-70S, available from the Superintendent of Documents (Washington, D.C. 20402).

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

CONSTRUCTION AND REAL ESTATE—Continued

CONSTRUCTION CONTRACTS																
Construction contracts in 50 States (F. W. Dodge Division, McGraw-Hill):																
Valuation, total mil. $	68,160	80,590	r 6,323	7,743	7,555	8,077	7,670	7,712	6,814	6,568	6,405	6,286	6,234	5,607	7,284	
Index (mo. data seas. adj.) 1967=100	[1] 123	[1] 144	142	161	141	147	151	153	154	137	155	160	165	155	159	
Public ownership mil. $	21,977	22,626	r 1,696	2,074	2,065	2,795	2,683	2,299	2,010	1,837	1,012	1,087	2,137	1,634	1,686	
Private ownership do	41,735	47,879	r 4,627	5,669	5,489	5,282	4,987	5,413	4,804	4,731	263	244	4,097	3,973	5,598	
By type of building:																
Nonresidential do	24,394	25,846	r 2,180	2,080	2,264	2,800	2,621	2,120	2,246	2,065	2,128	1,959	1,728	1,799	2,187	
Residential do	24,675	37,119	r 2,708	3,168	3,310	3,485	3,357	3,255	3,196	3,171	3,001	2,997	2,667	2,664	3,617	
Non-building construction do	18,992	19,925	r 1,436	2,495	1,981	1,792	1,691	2,337	1,372	1,332	1,275	1,331	1,840	1,144	1,480	
New construction planning (Engineering News-Record) ⊙ do	66,937		5,245	4,580	5,502	2,837	4,725	3,828	4,749	6,024	9,919		4,456	6,500	7,133	4,234
HOUSING STARTS AND PERMITS																
New housing units started:																
Unadjusted:																
Total (private and public) thous.	1,469.0	2,084.5	169.3	203.6	203.5	196.8	197.0	205.9	175.6	181.7	176.4	155.3	150.9	r 152.2	r 202.9	212.0
Inside SMSA's do	1,034.4	1,518.5	123.6	147.3	144.3	137.3	146.5	151.3	125.2	132.5	128.9	118.1	111.6	r 116.5	r 151.1	154.6
Privately owned do	1,433.6	2,052.2	167.9	201.1	198.5	193.8	194.3	204.5	173.8	179.7	173.7	152.1	149.1	r 152.2	r 203.2	212.0
One-family structures do	812.9	1,151.0	91.6	116.0	115.6	116.9	107.7	111.7	102.1	102.9	92.9	80.4	76.2	r 76.3	r 110.9	120.3
Seasonally adjusted at annual rates:																
Total privately owned do			1,938	1,951	2,046	2,008	2,091	2,219	2,029	2,038	2,228	2,457	2,487	r 2,682	r 2,357	2,115
One-family structures do			1,080	1,122	1,152	1,150	1,162	1,198	1,172	1,155	1,242	1,347	1,415	r 1,325	r 1,298	1,174
New private housing units authorized by building permits (13,000 permit-issuing places):																
Monthly data are seas. adj. at annual rates:																
Total thous.	1,352	1,907	1,627	1,638	1,927	1,849	2,052	2,006	1,900	2,173	1,952	2,292	2,105	2,078	r 1,928	1,987
One-family structures do	647	903	796	833	921	914	960	908	865	980	897	1,049	1,043	954	r 928	967
Manufacturers' shipments of mobile homes:																
Unadjusted do	401.2	r 496.6	r 36.0	r 43.3	r 41.3	r 47.8	r 45.6	r 50.0	r 54.0	r 50.8	r 39.9	34.4	33.3	39.7	48.8	
Seasonally adjusted at annual rates do			r 433	r 482	r 493	r 521	r 535	r 525	r 545	r 520	r 513	r 509	554	552	595	
CONSTRUCTION COST INDEXES																
Dept. of Commerce composite 1967=100	122	131	127	129	130	131	133	134	134	134	134	135	135	136	137	
American Appraisal Co., The:																
Average, 30 cities 1913=100	1,132	1,258	1,211	1,218	1,241	1,257	1,286	1,298	1,297	1,296	1,295	1,316	1,325	1,336		
Atlanta do	1,254	1,411	1,393	1,393	1,394	1,394	1,429	1,441	1,440	1,439	1,439	1,482	1,536	1,540		
New York do	1,202	1,359	1,305	1,305	1,310	1,312	1,412	1,416	1,415	1,415	1,415	1,417	1,416	1,425		
San Francisco do	1,088	1,174	1,163	1,168	1,168	1,168	1,184	1,195	1,193	1,189	1,187	1,190	1,195	1,266		
St. Louis do	1,116	1,219	1,168	1,168	1,236	1,236	1,249	1,253	1,252	1,252	1,252	1,259	1,260	1,264		
Associated General Contractors of America, Inc., The (building only) ♂ 1967=100	124		139	141	142	146	149	150								
Boeckh indexes:																
Average, 20 cities:																
Apartments, hotels, office buildings 1967=100	124.4	135.0	131.9	133.2	132.7	133.3	136.5	137.2	138.5	138.5	138.5	138.5	141.8		143.5	
Commercial and factory buildings do	123.1	133.9	130.3	130.9	131.7	132.0	135.2	136.1	138.1	138.1	138.1	138.1	140.6		143.1	
Residences do	122.4	132.8	128.5	129.7	129.7	130.3	135.6	136.3	137.5	137.5	137.5	137.5	141.4		143.3	
Engineering News-Record:																
Building 1967=100	124.4	140.5	134.4	136.2	138.8	140.6	141.8	143.4	147.4	147.2	147.4	147.9	149.0	150.5	151.2	[2] 152.1
Construction do	128.9	146.7	139.6	141.2	144.2	147.2	149.3	150.9	153.2	153.5	153.6	154.6	155.6	156.6	157.2	[2] 157.6
Federal Highway Adm.—Highway construction:																
Composite (avg. for year or qtr.) 1967=100	125.6	131.7	124.1			133.4			135.5			133.5			135.5	
CONSTRUCTION MATERIALS																
Output index:																
Composite, unadjusted ♀ 1947-49=100	162.1	174.1	181.3	187.1	181.8	198.3	188.9	182.2	179.0	176.8	161.8	162.0				
Seasonally adjusted do			187.7	183.6	168.7	184.9	197.0	165.2	174.0	157.3	169.9	188.9				
Iron and steel products, unadjusted do	166.4	163.8	183.4	194.7	192.3	201.9	198.2	140.6	144.8	145.5	130.7	141.0	131.3			
Lumber and wood products, unadj do	162.3	182.7	198.3	195.4	176.0	191.6	176.7	193.0	190.4	187.6	180.5	177.6	177.6	187.5		
Portland cement, unadjusted do	194.3	209.0	170.3	217.5	227.0	265.2	253.7	270.0	255.3	255.7	215.1	156.8				
REAL ESTATE																
Mortgage applications for new home construction:																
FHA net applications thous. units	299.1	360.4	36.0	34.4	31.9	34.7	30.9	31.5	29.7	27.0	22.1	31.7	23.3	r 26.5	27.9	20.6
Seasonally adjusted annual rates do			344	348	375	378	392	359	343	351	291	450	333	326	260	221
Requests for VA appraisals do	143.7	217.9	17.9	19.9	19.0	23.5	21.0	20.0	21.7	18.1	16.4	15.7	15.4	16.8	20.0	21.7
Seasonally adjusted annual rates do			186	206	221	250	234	218	253	231	207	228	232	224	207	248
Home mortgages insured or guaranteed by—																
Fed. Hous. Adm.: Face amount mil. $	8,113.73	10,374.60	849.48	759.52	793.73	951.62	983.62	1,117.40	862.75	821.04	869.50	859.78	935.45	813.63	798.12	653.69
Vet. Adm.: Face amount§ do	3,442.90	6,065.83	307.20	351.49	417.95	523.36	563.32	578.34	696.10	520.25	789.56	719.71	639.38	616.73	717.71	516.86
Federal Home Loan Banks, outstanding advances to member institutions, end of period mil. $	10,615	7,936	9,690	8,269	7,268	7,241	7,338	7,514	7,637	7,640	7,709	7,936	7,238	6,515	5,992	5,913
New mortgage loans of all savings and loan associations, estimated total mil. $	21,387	39,485	2,795	3,168	3,438	4,301	4,151	4,111	3,672	3,405	3,298	3,592	2,632	r 2,849	3,909	
By purpose of loan:																
Home construction do	4,150	6,835	521	597	620	718	686	641	628	609	589	573	481	r 518	714	
Home purchase do	10,239	18,810	1,143	1,306	1,451	2,109	2,087	2,225	1,951	1,717	1,661	1,590	1,253	1,400	1,860	
All other purposes do	6,998	13,840	1,131	1,265	1,367	1,474	1,378	1,245	1,093	1,079	1,048	1,429	898	r 931	1,335	
Foreclosures number	101,070	116,698	10,351	9,665	9,340	10,142	9,603	9,508	10,068	9,527	10,141	10,602				
Fire losses (on bldgs., contents, etc.) mil. $	2,263.92	2,245.84	221.54	194.02	195.50	189.44	175.36	186.60	177.70	162.57	156.50	183.70	175.40	168.80		

r Revised. p Preliminary. [1] Computed from cumulative valuation total. [2] Index as of May 1, 1972: Building, 152.7; construction, 158.5. ⊙ Data for Apr., July, Sept. 1971, and Mar. 1972 are for 5 weeks; other months, 4 weeks. ♀ Includes data for items not shown separately. §Data include guaranteed direct loans sold. ♂ New base; comparable data for earlier periods will be shown later.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

DOMESTIC TRADE

ADVERTISING

Marketing/Communications advertising index, seasonally adjusted:†																
Combined index† 1957–59=100	199		190	198	202	210	208	212	202	205						
Television (network) do	249		221	237	241	266	242	246	226	239						
Spot TV do	318		290	290	309	322	325	322	335	295						
Magazines do	165		170	168	179	175	182	184	175	175						
Newspapers do	127		131	145	134	136	142	154	140	157						
Magazine advertising (general and natl. farm magazines):																
Cost, total mil. $	1,185.7	1,251.4	109.7	115.8	128.2	104.2	77.5	76.8	109.9	132.5	132.3	100.7	72.4	94.0	107.4	121.0
Apparel and accessories do	50.9	47.0	4.7	5.8	4.2	2.2	1.5	3.9	6.8	4.7	4.8	3.4	1.6	3.0	4.3	6.0
Automotive, incl. accessories do	95.3	111.3	11.6	11.7	12.9	9.7	6.7	5.0	7.7	15.9	9.9	4.4	5.7	9.1	11.3	11.6
Building materials do	20.8	19.2	1.7	2.4	2.8	1.6	.9	1.1	2.1	2.2	2.1	.7	1.1	1.1	2.5	3.3
Drugs and toiletries do	156.6	158.6	14.0	14.2	15.3	14.6	11.1	11.3	13.9	15.5	13.8	12.6	9.1	13.3	12.2	13.4
Foods, soft drinks, confectionery do	99.4	108.1	9.1	8.6	9.7	9.2	8.2	6.3	8.5	12.0	13.1	10.1	5.1	9.8	10.4	10.4
Beer, wine, liquors do	98.0	88.2	5.7	7.2	8.8	8.9	5.5	4.5	6.4	9.4	12.2	13.4	2.9	4.2	5.6	7.4
Household equip., supplies, furnishings do	71.1	64.0	5.8	7.3	8.2	4.8	3.6	2.7	5.7	8.0	7.3	5.1	2.3	3.9	5.9	8.5
Industrial materials do	43.8	33.1	2.6	2.9	3.5	3.1	2.0	2.4	3.2	3.1	3.5	2.0	2.1	1.9	2.6	2.4
Soaps, cleansers, etc do	16.4	17.8	1.9	1.6	2.0	1.4	1.5	1.3	1.7	1.4	1.7	1.1	1.1	2.2	1.7	2.3
Smoking materials do	64.7	118.2	10.0	10.3	11.5	10.8	9.5	9.6	9.5	10.1	9.4	9.6	8.2	8.8	8.5	8.7
All other do	468.9	486.0	42.5	43.9	49.3	37.8	26.9	28.8	44.3	50.1	54.6	38.4	33.2	36.8	42.3	46.9
Newspaper advertising expenditures (64 cities): ⊕																
Total* mil. $	3,119.5	3,289.9	268.5	286.2	298.4	273.6	239.7	265.6	[1] 275.6	[1] 321.4	[1] 319.8	[1] 293.2	279.4	273.7		
Automotive do	92.8	101.9	8.0	11.8	9.7	10.3	8.8	8.9	9.8	8.5	8.0	4.8	6.8	8.6		
Classified do	724.3	764.3	63.4	65.3	71.5	65.2	64.7	70.6	64.8	73.1	63.9	54.3	71.1	69.5		
Financial do	117.0	106.6	9.3	10.0	8.0	9.8	8.5	6.1	9.0	10.3	9.4	9.6	13.5	8.6		
General do	426.5	461.8	39.0	43.9	46.0	39.2	27.9	29.8	38.8	49.1	48.2	35.0	39.9	40.0		
Retail do	1,759.0	1,855.3	148.8	155.3	163.3	149.1	129.8	150.2	153.3	180.5	190.3	189.5	148.1	146.9		

WHOLESALE TRADE

Merchant wholesalers sales (unadj.), total mil. $	246,643	267,357	22,507	22,002	22,053	23,684	22,367	23,148	23,418	22,787	23,356	23,654	21,756	r 22,012	24,663	
Durable goods establishments do	111,778	122,420	10,085	10,201	10,261	11,233	10,384	10,788	10,855	10,696	10,666	10,478	9,725	r 9,951	11,376	
Nondurable goods establishments do	134,865	144,937	12,422	11,801	11,792	12,451	11,983	12,361	12,563	12,091	12,690	13,176	12,031	r 12,061	13,287	
Merchant wholesalers inventories, book value, end of year or month (unadj.), total mil. $	26,622	28,828	26,873	27,099	27,114	27,308	27,606	27,584	27,707	28,200	28,493	28,828	29,064	r 29,079	29,218	
Durable goods establishments do	15,318	16,987	15,814	16,215	16,265	16,420	16,686	16,645	16,616	16,754	16,759	16,987	17,041	r 17,171	17,334	
Nondurable goods establishments do	11,304	11,841	11,060	10,884	10,848	10,888	10,921	10,939	11,091	11,446	11,733	11,841	12,023	r 11,908	11,884	

RETAIL TRADE ‡

All retail stores:‡																
Estimated sales (unadj.), total ‡ mil. $	375,527	408,850	32,105	33,965	34,199	35,033	34,560	33,840	34,102	35,659	36,018	42,572	30,604	r 30,987	r 36,162	[2] 34,972
Durable goods stores ♀ do	114,288	131,814	10,705	11,175	11,174	12,056	11,299	10,923	11,418	12,089	11,796	11,931	9,661	r 10,181	r 12,208	[2] 11,836
Automotive group do	64,966	78,916	6,743	6,944	6,841	7,401	6,799	6,353	6,758	7,329	7,100	6,149	5,756	r 6,192	r 7,524	[2] 7,189
Passenger car, other auto. dealers do	59,388	72,538	6,256	6,394	6,287	6,785	6,217	5,806	6,237	6,781	6,516	5,570	5,317	r 5,760	6,948	
Tire, battery, accessory dealers do	5,578	6,378	487	550	554	616	582	547	521	548	584	579	439	r 432	576	
Furniture and appliance group ♀ do	17,778	18,560	1,467	1,420	1,442	1,555	1,521	1,527	1,524	1,610	1,677	2,173	1,560	r 1,550	r 1,669	[2] 1,555
Furniture, homefurnishings stores do	10,483	11,004	889	853	869	923	930	941	898	976	1,009	1,159	905	r 919	1,021	
Household appliance, TV, radio do	6,073	6,221	469	471	484	537	496	488	507	519	546	811	540	r 505	517	
Lumber, building, hardware group do	15,346	17,378	1,216	1,415	1,481	1,638	1,625	1,653	1,610	1,628	1,568	1,540	1,223	r 1,240	1,481	
Lumber, bldg. materials dealers ♂ do	11,995	13,733	980	1,119	1,152	1,286	1,283	1,344	1,304	1,302	1,244	1,127	984	r 998	1,183	
Hardware stores do	3,351	3,645	236	296	329	352	342	309	306	326	324	413	239	r 242	298	
Nondurable goods stores ♀ do	261,239	277,036	21,400	22,790	23,025	22,977	23,261	22,917	22,684	23,570	24,222	30,641	20,943	r 20,806	r 23,954	[2] 23,136
Apparel group do	19,810	20,804	1,502	1,767	1,679	1,673	1,570	1,637	1,674	1,741	1,897	3,001	1,437	r 1,309	r 1,722	[2] 1,582
Men's and boys' wear stores do	4,630	4,727	312	382	388	405	346	349	354	379	439	750	353	r 302	364	
Women's apparel, accessory stores do	7,582	8,193	601	688	667	654	625	635	663	701	752	1,183	547	r 521	664	
Shoe stores do	3,501	3,532	275	341	291	280	266	295	315	292	303	403	235	r 210	303	
Drug and proprietary stores do	13,352	13,736	1,111	1,105	1,128	1,106	1,106	1,132	1,087	1,115	1,099	1,565	1,105	r 1,101	r 1,163	[2] 1,103
Eating and drinking places do	29,689	31,131	2,416	2,482	2,705	2,752	2,829	2,889	2,650	2,722	2,530	2,688	2,454	r 2,402	r 2,676	[2] 2,709
Food group do	86,114	89,239	7,149	7,469	7,548	7,445	7,970	7,284	7,350	7,566	7,185	8,300	7,101	r 7,105	r 7,891	[2] 7,434
Grocery stores do	79,756	82,793	6,632	6,925	6,996	6,881	7,408	6,748	6,818	7,022	6,673	7,707	6,620	r 6,619	r 7,354	[2] 6,962
Gasoline service stations do	27,994	29,163	2,301	2,338	2,435	2,512	2,633	2,626	2,475	2,509	2,493	2,528	2,388	r 2,264	r 2,443	[2] 2,441
General merchandise group with non-stores ♀ mil. $	61,320	68,134	4,850	5,367	5,319	5,452	5,271	5,569	5,620	5,862	6,824	9,904	4,426	r 4,512	r 5,716	[2] 5,527
General merchandise group without non-stores ♀ § mil. $	55,812	62,242	4,386	4,915	4,853	4,993	4,778	5,085	5,082	5,291	6,245	9,361	4,004	r 4,064	r 5,190	[2] 5,011
Department stores do	37,295	42,027	2,916	3,317	3,270	3,398	3,205	3,371	3,444	3,568	4,195	6,518	2,680	r 2,646	r 3,407	[2] 3,337
Mail order houses (dept. store mdse) do	3,853	4,301	351	324	294	317	292	369	359	404	575	548	269	r 327	420	
Variety stores do	6,959	6,972	499	572	570	551	537	549	537	552	621	1,133	419	r 464	596	
Liquor stores do	7,980	8,773	650	668	712	731	779	712	708	738	758	1,073	669	r 652	740	
Estimated sales (seas. adj.), total ‡ do			33,274	33,578	33,502	33,827	33,688	34,655	35,219	34,964	35,574	34,896	34,886	r 35,345	r 36,402	[2] 35,853
Durable goods stores ♀ do			10,613	10,747	10,576	10,782	10,747	11,298	11,833	11,695	11,885	11,534	11,475	r 11,457	r 12,044	[2] 11,712
Automotive group do			6,337	6,463	6,319	6,409	6,431	6,830	7,365	7,109	7,248	6,639	6,578	r 6,689	7,022	
Passenger car, other auto. dealers do			5,803	5,937	5,794	5,869	5,910	6,284	6,809	6,564	6,690	6,162	6,028	r 6,121	6,398	
Tire, battery, accessory dealers do			534	526	525	540	521	546	556	545	558	477	550	r 568	624	
Furniture and appliance group ♀ do			1,569	1,533	1,505	1,541	1,518	1,542	1,497	1,583	1,575	1,651	1,741	r 1,728	1,776	
Furniture, homefurnishings stores do			930	886	867	894	926	936	903	964	946	954	1,020	r 1,027	1,058	
Household appliance, TV, radio do			529	532	530	542	480	509	477	510	520	558	607	r 573	569	
Lumber, building, hardware group do			1,351	1,371	1,391	1,446	1,438	1,493	1,488	1,515	1,575	1,548	1,685	r 1,576	1,640	
Lumber, bldg. materials dealers ♂ do			1,062	1,085	1,090	1,122	1,135	1,186	1,179	1,193	1,255	1,249	1,359	r 1,249	1,278	
Hardware stores do			289	286	301	324	303	307	309	322	320	299	326	r 327	362	

r Revised. [1] Data for Sept.–Dec. 1970 are as follows (mil. $): 256.2, 279.5, 309.5, 264.4; 7.0, 9.0, 7.1, 5.6; 58.6, 60.1, 58.0, 46.1; 8.9, 10.2, 7.8, 8.8; 37.9, 42.6, 48.5, 30.6; 143.9, 157.6, 188.1, 173.2. [2] Advance estimate. ⊕Source: Media Records, Inc. 64-City Newspaper Advertising Trend Chart. *New series. Beginning Jan. 1971 the series was revised to reflect trends in newspaper advertising expenditures in 64 cities instead of linage in 52 cities as formerly published. ‡Revised to reflect new sample design, improved techniques, and new information from the 1967 Census of Business; revisions for periods prior to Oct. 1970 appear on p. 55 ff. of the Dec. 1971 SURVEY (complete details appear in the Census Bureau Monthly Retail Trade Report, Aug. 1971 issue. ♀ Includes data for items not shown separately. †Revised series; 1970 monthly revisions are in the June 1971 SURVEY (no comparable earlier data are available). ♂ Comprises lumber yards, building materials dealers, and paint, plumbing, and electrical stores. § Except department stores mail order.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

DOMESTIC TRADE—Continued

RETAIL TRADE†—Continued

All retail stores†—Continued																
Estimated sales (seas. adj.)—Continued																
Nondurable goods stores ♀ mil. $			22,661	22,831	22,926	23,045	22,941	23,357	23,386	23,269	23,689	23,562	23,411	r23,888	r24,358	r24,141
Apparel group do			1,709	1,712	1,750	1,755	1,729	1,749	1,683	1,700	1,775	1,773	1,732	r1,741	1,756	
Men's and boys' wear stores do			391	395	405	413	389	409	385	384	397	388	390	r409	416	
Women's apparel, accessory stores do			666	665	690	696	694	686	666	665	699	715	677	r673	670	
Shoe stores do			292	297	297	283	285	294	284	291	304	295	286	r287	277	
Drug and proprietary stores do			1,151	1,143	1,135	1,133	1,124	1,167	1,138	1,133	1,141	1,165	1,137	r1,155	1,184	
Eating and drinking places do			2,565	2,538	2,584	2,574	2,567	2,614	2,573	2,632	2,677	2,746	2,745	r2,714	2,796	
Food group do			7,372	7,431	7,492	7,418	7,411	7,478	7,516	7,391	7,474	7,523	7,387	r7,665	7,741	
Grocery stores do			6,837	6,891	6,947	6,867	6,878	6,950	6,993	6,851	6,944	6,994	6,860	r7,133	7,210	
Gasoline service stations do			2,353	2,343	2,362	2,390	2,433	2,511	2,523	2,494	2,521	2,523	2,506	r2,493	2,488	
General merchandise group with nonstores ♀ mil. $			5,501	5,526	5,546	5,654	5,653	5,757	5,872	5,817	5,954	5,756	5,874	r5,965	6,135	
General merchandise group without nonstores ♀ § mil. $			4,987	5,076	5,092	5,194	5,150	5,251	5,315	5,247	5,387	5,261	5,376	r5,486	5,589	
Department stores do			3,336	3,427	3,413	3,503	3,472	3,511	3,618	3,554	3,641	3,607	3,578	r3,650	3,707	
Mail order houses (dept. store mdse.) do			340	342	345	358	354	384	370	382	395	345	396	r399	407	
Variety stores do			594	577	596	584	571	577	571	568	577	572	599	r617	628	
Liquor stores do			718	714	718	754	734	741	754	748	742	728	727	r753	797	
Estimated inventories, end of year or month: ‡																
Book value (unadjusted), total ‡ mil. $	45,465	49,134	49,111	49,906	49,956	49,675	49,352	48,657	50,169	51,356	52,052	49,134	48,962	49,929	51,467	
Durable goods stores ♀ do	20,014	22,438	22,672	23,166	23,490	23,427	23,000	21,759	22,435	22,575	22,759	22,438	22,714	23,153	23,808	
Automotive group do	8,832	11,197	11,224	11,608	11,926	12,048	11,698	10,453	11,080	11,094	11,105	11,197	11,339	11,633	12,011	
Furniture and appliance group do	3,396	3,470	3,442	3,512	3,495	3,469	3,433	3,462	3,504	3,557	3,632	3,470	3,413	3,479	3,563	
Lumber, building, hardware group do	2,733	2,794	2,950	2,947	2,982	2,941	2,897	2,815	2,814	2,847	2,823	2,794	2,878	2,969	3,053	
Nondurable goods stores ♀ do	25,451	26,696	26,439	26,740	26,466	26,248	26,352	26,898	27,734	28,781	29,293	26,696	26,248	26,776	27,659	
Apparel group do	4,297	4,427	4,504	4,527	4,446	4,388	4,423	4,648	4,818	4,949	5,052	4,427	4,275	4,447	4,640	
Food group do	5,235	5,723	5,309	5,361	5,383	5,427	5,446	5,410	5,477	5,659	5,845	5,723	5,560	5,566	5,700	
General merchandise group with nonstores mil. $	9,553	10,218	10,269	10,497	10,480	10,331	10,383	10,625	11,209	11,793	11,947	10,218	10,091	10,436	10,992	
Department stores do	5,429	5,903	5,893	6,001	5,993	5,861	5,897	6,031	6,442	6,846	7,010	5,903	5,845	5,984	6,366	
Book value (seas. adj.), total ‡ do	46,555	50,474	48,246	48,809	49,259	49,534	49,592	50,299	50,844	50,800	50,377	50,474	50,542	50,646	50,890	
Durable goods stores ♀ do	20,490	23,124	21,704	22,056	22,509	22,679	22,707	23,313	23,769	23,652	23,306	23,124	22,930	22,958	23,025	
Automotive group do	9,021	11,603	10,354	10,699	11,053	11,318	11,335	11,987	12,380	12,259	11,890	11,603	11,305	11,327	11,331	
Furniture and appliance group do	3,451	3,523	3,463	3,470	3,492	3,472	3,461	3,476	3,494	3,467	3,466	3,523	3,533	3,557	3,585	
Lumber, building, hardware group do	2,809	2,872	2,886	2,858	2,912	2,900	2,894	2,846	2,848	2,884	2,843	2,872	2,931	2,987	2,984	
Nondurable goods stores ♀ do	26,065	27,350	26,542	26,753	26,750	26,855	26,885	26,986	27,075	27,148	27,071	27,350	27,612	27,688	27,865	
Apparel group do	4,467	4,602	4,477	4,522	4,518	4,547	4,550	4,566	4,554	4,625	4,626	4,602	4,652	4,627	4,654	
Food group do	5,188	5,672	5,309	5,361	5,388	5,454	5,495	5,498	5,521	5,564	5,647	5,672	5,639	5,622	5,700	
General merchandise group with nonstores mil. $	10,163	10,866	10,431	10,572	10,606	10,645	10,596	10,632	10,732	10,648	10,609	10,866	10,922	11,042	11,215	
Department stores do	5,776	6,280	5,947	6,049	6,078	6,093	6,042	6,043	6,153	6,134	6,133	6,280	6,381	6,380	6,470	
Firms with 11 or more stores: †																
Estimated sales (unadj.), total ♀ do	117,245	125,607	9,521	10,388	10,304	10,328	10,372	10,143	10,275	10,639	11,352	15,282	8,991	r9,104	10,928	
Apparel group ♀ do	5,475	5,741	413	515	477	464	417	455	472	483	529	854	351	r323	490	
Men's and boys' wear stores do	819	750	47	63	70	66	51	52	55	62	75	129	52	r43	64	
Women's apparel, accessory stores do	1,875	2,123	150	184	175	169	155	165	174	184	199	335	124	r121	180	
Shoe stores do	1,473	1,498	116	151	126	119	108	127	137	121	129	180	90	r85	132	
Drug and proprietary stores do	4,344	4,693	359	364	382	362	376	405	367	384	380	630	360	r365	399	
Eating and drinking places do	2,859	2,716	215	217	254	246	256	263	221	218	215	227	195	r197	232	
Furniture and appliance group do	1,508	1,600	118	127	122	136	131	119	131	147	142	209	138	r133	143	
General merchandise group with nonstores ♀ mil. $	46,102	52,092	3,687	4,141	4,076	4,207	4,021	4,229	4,286	4,442	5,248	7,718	3,300	r3,395	4,345	
General merchandise group without nonstores § mil. $	43,487	49,008	3,427	3,911	3,827	3,966	3,746	3,974	3,996	4,143	4,939	7,434	3,104	r3,169	4,067	
Dept. stores, excl. mail order sales do	31,893	36,544	2,507	2,920	2,871	2,997	2,807	2,958	2,996	3,092	3,625	5,583	2,323	r2,313	2,970	
Variety stores do	5,417	5,398	389	449	438	423	409	419	416	426	490	889	324	r362	467	
Grocery stores do	43,183	45,235	3,672	3,843	3,831	3,713	4,052	3,577	3,665	3,810	3,657	4,278	3,652	r3,688	4,140	
Tire, battery, accessory dealers do	1,827	1,955	152	175	171	193	173	165	156	164	177	180	123	r121	183	
Estimated sales (seas. adj.), total ♀ do			10,210	10,342	10,496	10,552	10,341	10,571	10,639	10,442	10,845	10,544	10,690	r10,866	11,124	
Apparel group ♀ do			466	479	502	475	486	480	462	462	494	490	465	r462	476	
Men's and boys' wear stores do			60	63	76	66	66	64	60	57	65	64	62	r60	71	
Women's apparel, accessory stores do			171	176	183	179	177	176	170	171	184	188	170	r173	180	
Shoe stores do			125	129	129	113	125	126	123	124	127	122	119	r122	114	
Drug and proprietary stores do			385	379	384	375	376	425	387	397	394	410	394	r411	416	
Eating and drinking places do			217	206	248	235	237	253	213	210	228	239	212	r219	234	
General merchandise group with nonstores ♀ mil. $			4,155	4,224	4,245	4,361	4,255	4,314	4,525	4,433	4,605	4,431	4,459	r4,538	4,694	
General merchandise group without nonstores § mil. $			3,877	3,993	3,990	4,119	3,974	4,052	4,243	4,151	4,309	4,205	4,212	r4,279	4,407	
Dept. stores, excl. mail order sales do			2,852	2,970	2,969	3,068	2,952	3,012	3,180	3,123	3,225	3,161	3,114	r3,160	3,249	
Variety stores do			461	451	453	447	443	442	450	437	447	446	475	r487	500	
Grocery stores do			3,736	3,779	3,874	3,852	3,766	3,842	3,774	3,671	3,821	3,701	3,773	r3,907	3,939	
Tire, battery, accessory dealers do			170	163	158	167	152	169	172	163	170	147	160	r160	197	
All retail stores, accts. receivable, end of yr. or mo.: ♂																
Total (unadjusted) mil. $	22,860	23,514	20,987	21,337	21,531	21,632	21,332	21,426	21,760	21,826	22,329	23,514	22,312	21,931		
Durable goods stores do	7,387	7,753	7,015	7,186	7,303	7,576	7,481	7,597	7,780	7,791	7,685	7,753	7,331	7,297		
Nondurable goods stores do	15,473	15,761	13,972	14,151	14,228	14,056	13,851	13,829	13,980	14,035	14,644	15,761	14,981	14,634		
Charge accounts do	9,001	9,385	8,274	8,658	8,917	8,997	8,794	8,826	8,975	9,032	9,185	9,385	8,744	8,703		
Installment accounts do	13,859	14,129	12,713	12,679	12,614	12,635	12,538	12,600	12,785	12,794	13,144	14,129	13,568	13,228		
Total (seasonally adjusted) do	21,394	22,046	21,351	21,531	21,616	21,638	21,706	21,847	21,964	21,933	22,257	22,046	21,858	22,158		
Durable goods stores do	7,214	7,580	7,263	7,338	7,378	7,423	7,392	7,507	7,605	7,581	7,680	7,580	7,508	7,529		
Nondurable goods stores do	14,180	14,466	14,088	14,193	14,238	14,215	14,314	14,340	14,359	14,352	14,577	14,466	14,350	14,629		
Charge accounts do	8,603	8,986	8,558	8,704	8,794	8,805	8,829	8,908	8,982	8,907	9,081	8,986	8,862	9,075		
Installment accounts do	12,791	13,060	12,793	12,827	12,822	12,833	12,877	12,939	12,982	13,038	13,176	13,060	12,996	13,083		

r Revised. 1 Advance estimate. †See note marked "†" on p. S–11. ‡Series revised to reflect benchmarking to the levels of the 1968–70 Annual Retail Trade Reports (Census Bureau), and also recalculation of seasonal factors for all lines of trade; description of revisions and revised data appear on p. 55 ff. of the Dec. 1971 SURVEY (1968–70). ♀Includes data not shown separately. §Except department stores mail order. ♂See note marked "‡" on p. S–11; data prior to Feb. 1971 will be shown later.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr. p

LABOR FORCE, EMPLOYMENT, AND EARNINGS

POPULATION OF THE UNITED STATES

Total, incl. armed forces overseas †—mil.	[1] 204.88	[1] 207.05	206.39	206.56	206.72	206.89	207.05	207.22	207.40	207.59	207.78	207.94	208.08	208.20	208.31	208.44

LABOR FORCE §

Labor force, persons 16 years of age and over—thous.	85,903	86,929	85,598	85,780	85,954	87,784	88,808	88,453	86,884	87,352	87,715	87,541	87,147	87,318	87,914	87,787
Civilian labor force—do.	82,715	84,113	82,668	82,898	83,104	84,968	86,011	85,678	84,135	85,019	84,883	[2] 84,553	84,778	85,410	85,324	
Employed, total—do.	78,627	79,120	77,493	78,204	78,709	79,478	80,681	80,618	79,295	80,065	80,204	80,188	[2] 79,106	79,366	80,195	80,627
Agriculture—do.	3,462	3,387	3,042	3,505	3,598	3,920	3,971	3,764	3,444	3,470	3,262	2,948	2,869	2,909	3,094	3,287
Nonagricultural industries—do.	75,165	75,732	74,452	74,699	75,111	75,559	76,710	76,853	75,851	76,595	76,942	77,240	[2] 76,237	76,458	77,101	77,339
Unemployed—do.	4,088	4,993	5,175	4,694	4,394	5,490	5,330	5,061	4,840	4,570	4,815	4,695	[2] 5,447	5,412	5,215	4,697
Seasonally Adjusted ‡																
Civilian labor force‡—do.			83,455	83,788	83,986	83,401	83,930	84,313	84,491	84,750	85,116	85,225	85,707	85,535	86,313	86,284
Employed, total—do.			78,446	78,732	78,830	78,600	79,014	79,199	79,451	79,832	80,020	80,098	80,636	80,623	81,241	81,205
Agriculture—do.			3,387	3,540	3,412	3,301	3,374	3,407	3,363	3,416	3,419	3,400	3,393	3,357	3,482	3,324
Nonagricultural industries—do.			75,059	75,192	75,418	75,299	75,640	75,792	76,088	76,416	76,601	76,698	77,243	77,266	77,759	77,881
Unemployed—do.			5,009	5,056	5,156	4,801	4,916	5,114	5,040	4,918	5,096	5,127	5,071	4,912	5,072	5,079
Long-term, 15 weeks and over—do.	662	1,181	1,100	1,088	1,183	1,175	1,255	1,291	1,250	1,253	1,311	1,273	1,198	1,294	1,224	1,137
Rates (unemployed in each group as percent of total in the group):‡																
All civilian workers	4.9	5.9	6.0	6.0	6.1	5.8	5.9	6.1	6.0	5.8	6.0	6.0	5.9	5.7	5.9	5.9
Men, 20 years and over	3.5	4.4	4.3	4.4	4.5	4.3	4.3	4.5	4.5	4.3	4.4	4.3	4.2	4.0	4.1	4.3
Women, 20 years and over	4.8	5.7	5.8	5.9	5.9	5.6	5.7	5.8	5.7	5.5	5.8	5.8	5.5	5.0	5.4	5.4
Both sexes, 16–19 years	15.3	16.9	17.5	17.0	17.4	16.2	16.5	17.1	16.9	16.7	16.7	17.3	17.8	18.8	17.9	17.3
White	4.5	5.4	5.5	5.6	5.6	5.3	5.4	5.6	5.4	5.3	5.6	5.4	5.3	5.1	5.3	5.4
Negro and other races	8.2	9.9	9.5	9.8	10.5	9.4	10.0	9.9	10.4	10.4	9.4	10.4	10.6	10.5	10.5	9.6
Married men	2.6	3.2	3.2	3.2	3.2	3.1	3.1	3.2	3.3	3.0	3.3	3.2	3.0	2.8	2.8	2.9
Occupation: White-collar workers	2.8	3.5	3.7	3.7	3.6	3.2	3.5	3.5	3.4	3.4	3.4	3.6	3.6	3.3	3.5	3.4
Blue-collar workers	6.2	7.4	7.4	7.5	7.5	7.1	7.2	7.5	7.7	7.1	7.5	7.5	7.1	7.0	6.9	6.8
Industry of last job (nonagricultural):																
Private wage and salary workers	5.2	6.2	6.4	6.3	6.4	6.1	6.1	6.2	6.2	5.9	6.2	6.3	6.1	5.9	6.1	5.9
Construction	9.7	10.4	10.7	10.0	11.0	10.3	9.8	9.9	9.7	10.2	9.7	11.2	9.8	10.3	9.8	10.6
Manufacturing	5.6	6.8	7.0	7.0	6.9	6.7	6.7	6.8	6.9	6.2	6.6	6.9	6.4	6.0	6.2	5.8
Durable goods	5.7	7.0	7.3	7.5	7.3	7.0	6.8	6.9	7.0	6.4	6.7	6.7	6.7	6.1	6.3	5.8

EMPLOYMENT

Employees on payrolls of nonagricultural estab.:																
Total, not adjusted for seasonal variation—thous.	70,616	70,699	69,782	70,309	70,738	71,355	70,452	70,542	71,184	71,379	71,638	72,034	70,643	r 70,776	r 71,339	71,834
Private sector (excl. gov't)—do.	58,081	57,841	56,811	57,331	57,745	58,422	58,114	58,281	58,500	58,337	58,479	58,805	57,462	r 57,442	r 57,959	58,457
Seasonally Adjusted																
Total—thous.	70,616	70,699	70,480	70,599	70,769	70,657	70,531	70,529	70,853	70,848	71,042	71,185	71,584	r 71,729	r 71,990	72,172
Private sector (excl. gov't)—do.	58,081	57,841	57,688	57,768	57,911	57,819	57,719	57,686	57,998	57,913	58,055	58,147	58,486	r 58,568	r 58,797	58,948
Mining—do.	622	601	622	623	622	619	597	609	616	521	525	607	616	r 612	r 611	603
Contract construction—do.	3,345	3,259	3,264	3,282	3,275	3,255	3,228	3,219	3,250	3,290	3,320	3,245	3,320	r 3,236	r 3,262	3,235
Manufacturing—do.	19,369	18,610	18,609	18,639	18,702	18,608	18,533	18,457	18,616	18,560	18,603	18,566	18,609	r 18,690	r 18,777	18,855
Durable goods—do.	11,198	10,590	10,571	10,598	10,651	10,598	10,552	10,485	10,597	10,561	10,572	10,548	10,574	r 10,637	r 10,695	10,743
Ordnance and accessories—do.	242	193	195	194	196	193	191	191	190	189	186	184	183	r 182	183	185
Lumber and wood products—do.	572	580	566	567	570	574	579	583	591	597	601	600	604	r 603	r 604	593
Furniture and fixtures—do.	460	459	450	452	457	458	461	456	465	467	470	474	478	r 481	r 484	483
Stone, clay, and glass products—do.	638	628	622	628	633	629	625	627	633	631	634	632	640	r 641	r 645	650
Primary metal industries—do.	1,315	1,225	1,264	1,270	1,272	1,259	1,226	1,156	1,182	1,187	1,178	1,176	1,186	r 1,187	r 1,211	1,218
Fabricated metal products—do.	1,380	1,332	1,298	1,333	1,339	1,333	1,335	1,331	1,346	1,341	1,339	1,331	1,336	r 1,345	r 1,357	1,364
Machinery, except electrical—do.	1,977	1,791	1,796	1,784	1,783	1,769	1,770	1,775	1,794	1,791	1,797	1,793	1,784	r 1,798	r 1,792	1,803
Electrical equip. and supplies—do.	1,923	1,788	1,787	1,789	1,793	1,783	1,773	1,772	1,791	1,793	1,791	1,793	1,792	1,803	r 1,813	1,830
Transportation equipment—do.	1,807	1,751	1,753	1,745	1,768	1,759	1,751	1,754	1,758	1,720	1,732	1,719	1,716	r 1,736	r 1,744	1,753
Instruments and related products—do.	459	432	429	426	429	430	431	430	435	437	436	434	436	r 438	r 438	440
Miscellaneous manufacturing ind.—do.	426	411	411	410	411	411	410	410	412	408	408	412	419	r 423	424	424
Nondurable goods—do.	8,171	8,020	8,038	8,041	8,051	8,010	7,981	7,972	8,019	7,999	8,031	8,018	8,035	r 8,053	r 8,082	8,112
Food and kindred products—do.	1,782	1,754	1,760	1,753	1,758	1,751	1,762	1,748	1,755	1,728	1,750	1,748	1,757	r 1,749	r 1,760	1,761
Tobacco manufactures—do.	82	74	77	79	78	77	69	70	72	69	71	69	71	71	r 73	74
Textile mill products—do.	978	962	958	958	963	956	959	959	960	963	970	974	979	r 981	r 988	990
Apparel and other textile products—do.	1,372	1,362	1,368	1,374	1,373	1,357	1,349	1,351	1,361	1,365	1,370	1,357	1,353	r 1,365	r 1,366	1,375
Paper and allied products—do.	706	688	689	690	681	682	676	681	694	693	691	690	688	r 689	r 692	696
Printing and publishing—do.	1,107	1,088	1,092	1,088	1,091	1,088	1,083	1,080	1,082	1,085	1,084	1,084	1,090	r 1,090	r 1,091	1,095
Chemicals and allied products —do.	1,051	1,015	1,021	1,021	1,024	1,016	1,008	1,004	1,008	1,008	1,008	1,005	1,003	r 1,003	r 1,000	1,001
Petroleum and coal products—do.	190	190	191	190	190	189	188	188	190	189	189	191	188	192	191	189
Rubber and plastics products, nec.—do.	580	582	574	577	582	583	584	582	591	594	592	594	600	604	r 612	619
Leather and leather products—do.	322	308	308	311	311	311	303	309	306	305	306	306	306	r 309	r 309	312
Transportation, communication, electric, gas, and sanitary services—thous.	4,504	4,481	4,520	4,505	4,518	4,500	4,476	4,428	4,460	4,442	4,434	4,465	4,502	r 4,479	r 4,540	4,536
Wholesale and retail trade—do.	14,922	15,174	15,074	15,107	15,148	15,135	15,158	15,223	15,273	15,270	15,278	15,315	15,447	r 15,495	r 15,513	15,606
Wholesale trade—do.	3,824	3,855	3,852	3,854	3,866	3,837	3,835	3,844	3,865	3,873	3,874	3,884	3,902	r 3,913	r 3,936	3,945
Retail trade—do.	11,098	11,319	11,222	11,253	11,282	11,298	11,323	11,379	11,408	11,397	11,404	11,431	11,545	r 11,582	r 11,577	11,661
Finance, insurance, and real estate—do.	3,690	3,800	3,758	3,769	3,788	3,807	3,806	3,804	3,821	3,834	3,851	3,860	3,872	r 3,879	r 3,889	3,902
Services—do.	11,630	11,917	11,841	11,843	11,858	11,895	11,921	11,946	11,962	11,996	12,044	12,089	12,120	12,177	r 12,205	12,211
Government—do.	12,535	12,858	12,792	12,831	12,858	12,838	12,812	12,843	12,855	12,935	12,987	13,038	13,098	13,161	r 13,193	13,224
Federal—do.	2,705	2,664	2,662	2,667	2,667	2,640	2,643	2,650	2,674	2,675	2,669	2,669	2,675	2,672	r 2,669	2,669
State and local—do.	9,830	10,194	10,130	10,164	10,191	10,198	10,169	10,193	10,181	10,260	10,318	10,369	10,423	10,489	r 10,524	10,555
Production (or nonsupervisory) workers on private nonagricultural payrolls, not seas. adj thous.	47,950	47,766	46,775	47,296	47,708	48,322	47,995	48,180	48,397	48,243	48,384	48,712	47,381	r 47,343	r 47,830	48,290
Total on manufacturing payrolls—do.	14,033	13,487	13,345	13,357	13,441	13,611	13,315	13,524	13,738	13,616	13,605	13,514	13,373	r 13,465	r 13,577	13,615
Seasonally Adjusted																
Total on manufacturing payrolls—do.	14,033	13,487	13,448	13,502	13,569	13,496	13,440	13,371	13,515	13,462	13,505	13,474	13,527	r 13,597	r 13,683	13,758
Durable goods—do.	8,043	7,612	7,569	7,612	7,667	7,627	7,594	7,534	7,630	7,600	7,614	7,594	7,629	r 7,685	r 7,744	7,791
Ordnance and accessories—do.	131	96	99	97	98	95	93	94	94	93	92	90	90	89	89	90
Lumber and wood products—do.	493	500	487	488	491	495	500	503	509	515	519	516	520	r 519	r 519	509
Furniture and fixtures—do.	379	378	370	372	375	378	380	375	383	384	388	391	395	397	r 399	399
Stone, clay, and glass products—do.	507	499	492	498	502	499	496	497	502	502	504	502	510	r 511	r 514	519
Primary metal industries—do.	1,043	965	1,002	1,008	1,012	996	965	901	926	932	922	920	934	r 937	r 961	965
Fabricated metal products—do.	1,051	1,012	980	1,014	1,020	1,013	1,016	1,016	1,026	1,020	1,018	1,011	1,016	r 1,024	r 1,036	1,041
Machinery, except electrical—do.	1,319	1,170	1,172	1,163	1,159	1,152	1,156	1,159	1,175	1,171	1,177	1,174	1,168	r 1,178	r 1,174	1,184

r Revised. p Preliminary. [1] As of July 1. [2] See note § below.

§Effective Jan. 1972, data reflect adjustment to the 1970 Census of Population. Civilian labor force, nonagricultural employment, and unemployment figures for Jan. 1972 are raised by about 0.4% over the 1960-based figures. For comparison of Jan. 1972 (and subsequent months) with pre-1972 data, the following approximate amounts (in thous.) should be added to the earlier figure: Civilian labor force, 330; nonagricultural employment, 290; unemployment, 30. Unemployment *rates* are unaffected.

‡Effective Feb. 1972 SURVEY, labor force data reflect new seasonal factors; comparable figures for prior periods appear in EMPLOYMENT AND EARNINGS, Feb. 1972 (USDL, Bureau of Labor Statistics). †See note "†," p. S-14.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr. p

LABOR FORCE, EMPLOYMENT, AND EARNINGS—Continued

EMPLOYMENT—Continued																
Seasonally Adjusted																
Production workers on mfg. payrolls—Continued																
Durable goods—Continued																
Electrical equipment and supplies.....thous.	1,268	1,180	1,173	1,177	1,184	1,179	1,169	1,167	1,185	1,190	1,189	1,191	1,192	1,205	r 1,214	1,227
Transportation equipment.....do....	1,246	1,238	1,225	1,225	1,253	1,246	1,244	1,248	1,251	1,216	1,230	1,221	1,219	r 1,234	r 1,245	1,261
Instruments and related products.....do....	277	257	253	253	255	256	257	256	260	261	261	259	260	r 261	r 262	265
Miscellaneous manufacturing ind.....do....	329	318	316	317	318	318	318	318	319	316	314	319	325	r 330	331	331
Nondurable goods.....do....	5,990	5,875	5,879	5,890	5,902	5,869	5,846	5,837	5,885	5,862	5,891	5,880	5,898	r 5,912	r 5,939	5,967
Food and kindred products.....do....	1,199	1,180	1,184	1,181	1,184	1,178	1,188	1,179	1,185	1,156	1,177	1,175	1,183	1,177	r 1,187	1,190
Tobacco manufactures.....do....	68	61	64	66	65	64	56	56	58	56	58	57	58	58	61	62
Textile mill products.....do....	858	844	839	840	845	838	841	841	842	845	851	855	862	862	r 868	871
Apparel and other textile products.....do....	1,203	1,191	1,197	1,202	1,204	1,188	1,179	1,180	1,189	1,193	1,198	1,185	1,180	r 1,190	r 1,191	1,199
Paper and allied products.....do....	544	526	526	527	519	520	515	520	533	532	530	529	528	529	r 533	535
Printing and publishing.....do....	681	665	668	666	667	667	661	658	661	663	661	661	666	r 666	r 666	669
Chemicals and allied products.....do....	603	583	583	584	588	585	582	577	582	581	581	580	581	578	r 575	576
Petroleum and coal products.....do....	116	116	116	116	116	115	115	115	116	116	116	118	114	119	r 117	115
Rubber and plastics products, nec.....do....	443	448	440	443	448	449	450	447	458	460	458	459	464	r 468	r 476	482
Leather and leather products.....do....	275	262	262	265	266	265	259	264	261	260	261	261	262	r 265	r 265	268
HOURS AND MAN-HOURS																
Seasonally Adjusted																
Average weekly gross hours per production worker on payrolls of private nonagric. estab.....hours..			37.0	37.0	36.9	37.1	36.9	36.9	36.7	37.0	37.1	37.2	37.0	37.2	37.1	37.3
Not seasonally adjusted.....do....	37.1	37.0	36.8	36.7	36.8	37.3	37.3	37.4	37.0	37.0	37.0	37.3	36.7	36.8	36.9	37.0
Mining.....do....	42.7	42.4	42.8	42.2	42.4	42.3	42.2	42.0	41.9	42.5	42.3	42.6	43.0	r 42.5	43.0	42.3
Contract construction.....do....	37.4	37.3	37.8	37.1	36.8	37.2	37.1	37.1	35.7	37.6	39.0	36.8	37.4	37.3	37.5	36.9
Manufacturing: Not seasonally adjusted.....do....	39.8	39.9	39.7	39.5	40.0	40.2	39.8	39.8	39.8	40.0	40.2	40.7	39.8	40.1	40.3	40.5
Seasonally adjusted.....do....			39.8	39.8	40.0	40.0	40.0	39.8	39.5	39.8	40.1	40.3	40.0	40.5	40.4	40.8
Overtime hours.....do....	3.0	2.9	2.9	2.9	3.0	2.9	3.0	2.9	2.8	3.0	3.0	3.1	2.9	3.2	3.3	3.4
Durable goods.....do....	40.3	40.4	40.4	40.3	40.5	40.6	40.4	40.0	39.7	40.3	40.6	40.9	40.6	41.1	41.0	41.5
Overtime hours.....do....	2.9	2.9	2.8	2.8	2.9	2.9	2.8	2.8	2.7	2.8	2.9	3.0	2.9	3.2	3.3	3.6
Ordnance and accessories.....do....	40.6	41.7	41.9	41.5	41.5	41.6	41.9	41.9	41.7	41.8	41.9	42.0	41.2	r 42.4	r 42.2	42.3
Lumber and wood products.....do....	39.7	40.3	39.9	40.1	39.8	40.4	40.5	40.2	40.1	40.7	40.8	40.8	40.9	r 40.9	40.9	41.4
Furniture and fixtures.....do....	39.2	39.8	39.7	39.5	39.9	39.9	40.1	39.9	39.4	39.7	40.0	39.9	40.3	r 40.7	40.5	40.7
Stone, clay, and glass products.....do....	41.2	41.6	41.7	41.1	41.4	42.0	41.8	41.8	41.4	41.8	41.9	41.6	41.8	r 42.0	42.2	41.7
Primary metal industries.....do....	40.5	40.4	40.8	41.0	41.0	41.0	40.6	38.8	39.5	40.1	40.1	41.0	40.6	r 41.1	r 41.2	41.0
Fabricated metal products.....do....	40.7	40.3	40.3	40.1	40.7	40.6	40.7	40.2	39.3	40.1	40.4	40.9	40.4	41.0	r 40.9	41.4
Machinery, except electrical.....do....	41.1	40.6	40.2	40.0	40.5	40.7	40.7	40.8	40.5	40.8	41.1	41.3	41.0	r 41.4	41.4	42.0
Electrical equipment and supplies.....do....	39.9	39.9	39.7	39.8	39.9	39.9	40.1	40.0	39.6	39.9	40.1	40.3	40.1	r 40.7	r 40.3	40.9
Transportation equipment.....do....	40.3	40.7	41.7	40.6	41.1	41.4	39.5	39.9	38.5	40.5	40.5	41.7	40.7	41.9	42.0	42.7
Instruments and related products.....do....	40.1	39.8	39.7	39.7	40.0	39.7	39.8	39.8	39.7	39.9	40.2	40.4	40.3	r 40.8	40.3	40.1
Miscellaneous manufacturing ind.....do....	38.7	38.9	38.8	38.6	38.9	38.7	39.2	39.2	38.7	38.9	39.1	39.2	39.0	r 39.6	39.3	39.6
Nondurable goods.....do....	39.1	39.3	39.1	39.2	39.4	39.3	39.3	39.3	39.1	39.3	39.5	39.5	39.4	r 39.6	r 39.6	39.9
Overtime hours.....do....	3.0	3.0	2.9	2.9	3.0	3.1	3.0	3.1	3.1	3.0	3.0	3.0	3.1	3.2	r 3.3	3.3
Food and kindred products.....do....	40.5	40.3	40.5	40.5	40.5	40.4	40.5	40.5	40.5	40.0	40.0	40.3	40.1	40.0	r 40.0	40.2
Tobacco manufactures.....do....	37.8	37.0	38.0	37.5	38.3	36.2	39.6	37.1	36.6	34.7	35.6	35.6	34.8	r 33.6	r 34.5	34.1
Textile mill products.....do....	39.9	40.6	40.3	40.4	40.8	40.8	40.3	40.7	40.4	40.8	41.1	41.0	41.3	41.2	r 41.4	41.8
Apparel and other textile products.....do....	35.3	35.5	35.2	35.1	35.5	35.4	35.8	35.7	35.4	36.0	36.2	35.9	35.7	r 36.2	r 35.8	36.1
Paper and allied products.....do....	41.9	42.1	41.9	42.3	42.1	42.3	42.4	42.4	41.9	42.0	42.3	42.3	42.1	r 42.6	r 42.7	43.1
Printing and publishing.....do....	37.7	37.6	37.5	37.5	37.7	37.7	37.6	37.5	37.4	37.5	37.6	37.5	37.5	37.5	37.7	38.0
Chemicals and allied products.....do....	41.6	41.6	41.4	41.7	41.5	41.7	41.4	41.5	42.1	41.5	41.4	41.7	41.8	r 41.8	41.7	41.7
Petroleum and coal products.....do....	42.7	42.4	41.9	41.7	41.7	42.3	42.6	43.4	42.9	42.4	41.8	42.7	42.2	42.0	41.7	42.2
Rubber and plastics products, nec.....do....	40.3	40.3	40.3	40.3	40.4	40.7	40.3	40.1	40.0	40.3	40.6	40.9	40.8	41.0	r 41.2	41.4
Leather and leather products.....do....	37.2	37.7	37.4	38.3	37.8	37.5	37.7	37.6	37.3	37.9	38.3	37.9	38.0	38.5	r 38.2	38.9
Trans., comm., elec., gas, etc.....do....	40.5	40.2	40.6	40.6	40.0	40.7	38.0	40.5	40.6	40.3	40.4	40.5	40.0	r 40.4	r 40.7	40.6
Wholesale and retail trade.....do....	35.3	35.1	35.0	35.2	35.1	35.2	35.3	35.1	35.1	35.2	35.2	35.3	35.1	r 35.1	r 35.1	35.2
Wholesale trade.....do....	40.0	39.8	39.7	39.6	39.8	39.9	39.6	39.7	39.7	39.8	39.9	40.0	39.7	40.0	39.9	40.1
Retail trade.....do....	33.8	33.7	33.5	33.7	33.7	33.7	33.8	33.6	33.6	33.8	33.7	33.9	33.7	r 33.5	r 33.6	33.6
Finance, insurance, and real estate.....do....	36.8	37.0	36.9	36.9	37.0	37.0	37.1	37.3	37.0	36.9	36.9	37.0	37.3	37.1	37.1	37.1
Services.....do....	34.4	34.2	34.0	34.1	34.1	34.1	34.4	34.3	34.2	34.2	34.1	34.2	34.1	34.2	33.9	34.1
Seasonally Adjusted																
Man-hours, all wage and salary workers, nonagric. establishments, for 1 week in the month, seas. adjusted at annual rate.....bil. man-hours..	138.11	137.87	137.38	137.56	138.07	137.99	137.91	137.67	137.64	138.07	138.92	139.17	139.57	r 140.36	r 140.67	141.65
Man-hour indexes (aggregate weekly), industrial and construction ind., total.....1967=100..	97.3	93.6	93.7	93.7	94.4	94.1	93.2	92.5	92.4	93.3	94.5	94.1	94.7	r 95.3	r 95.9	96.5
Mining.....do....	100.9	95.5	100.9	99.7	100.1	99.0	94.4	96.7	97.7	79.5	79.6	97.4	100.0	98.7	r 99.6	95.9
Contract construction.....do....	102.4	98.8	100.3	99.3	98.3	98.5	97.4	97.1	94.4	100.7	105.5	96.7	101.3	r 97.5	r 99.0	96.4
Manufacturing.....do....	96.3	92.7	92.4	92.5	93.5	93.1	92.4	91.6	91.9	92.5	93.1	93.5	93.4	r 94.7	r 95.2	96.5
Durable goods.....do....	94.2	89.2	88.9	88.9	90.2	90.0	89.0	87.7	87.8	89.0	89.5	90.2	89.9	r 91.9	r 92.4	93.8
Ordnance and accessories.....do....	73.3	55.2	57.1	55.4	56.0	54.4	53.6	54.2	53.9	53.5	53.1	52.0	51.0	r 51.9	r 51.7	52.4
Lumber and wood products.....do....	93.7	96.4	93.1	93.8	93.6	95.8	97.0	96.9	97.8	100.4	101.5	100.9	101.9	r 101.7	r 101.7	101.0
Furniture and fixtures.....do....	98.1	99.3	97.0	97.1	98.9	99.6	100.7	98.9	99.7	100.7	102.5	103.1	105.2	r 106.7	r 106.8	107.3
Stone, clay, and glass products.....do....	100.6	99.8	98.7	98.4	99.9	100.8	99.7	99.9	99.9	100.9	101.5	100.4	102.5	103.2	r 104.3	104.1
Primary metal industries.....do....	96.8	89.6	93.9	94.9	95.3	93.8	90.0	80.3	84.0	85.8	84.9	86.6	87.1	r 88.4	r 90.9	90.9
Fabricated metal products.....do....	97.9	93.4	90.4	93.0	95.0	94.1	94.6	93.4	92.2	93.6	94.1	94.6	93.9	r 96.0	r 96.9	98.6
Machinery, except electrical.....do....	93.1	81.5	80.9	79.8	80.6	80.5	80.8	81.2	81.7	82.0	83.0	83.2	82.2	r 83.7	r 83.4	85.4
Electrical equipment and supplies.....do....	95.1	88.6	87.6	88.2	88.9	88.5	88.2	87.9	88.3	89.4	89.7	90.3	90.0	r 92.3	r 92.1	94.4
Transportation equipment.....do....	88.7	88.8	90.1	87.7	90.8	90.9	86.6	87.8	84.9	86.8	87.8	89.8	87.5	r 91.2	r 92.2	94.9
Instruments and related products.....do....	95.8	88.2	86.5	86.5	87.8	87.5	88.0	87.7	88.8	89.6	90.3	90.1	90.2	r 91.7	r 90.9	91.5
Miscellaneous manufacturing ind.....do....	95.6	92.5	91.9	91.7	92.7	92.2	93.4	93.4	92.5	92.1	92.0	93.7	95.0	r 98.0	97.5	98.3
Nondurable goods.....do....	99.3	97.7	97.4	97.8	98.3	97.7	97.4	97.3	97.7	97.5	98.4	98.3	98.4	r 99.0	r 99.4	100.5
Food and kindred products.....do....	100.1	98.0	98.8	98.5	98.8	98.0	99.1	98.3	98.8	95.2	97.0	97.5	97.7	97.0	r 97.8	98.5
Tobacco manufactures.....do....	90.5	78.7	85.4	86.9	87.4	81.4	77.9	73.0	74.5	68.2	72.5	71.2	70.9	r 68.4	r 73.9	74.2
Textile mill products.....do....	98.5	98.5	97.3	97.6	99.2	98.4	97.5	98.5	97.9	99.2	100.6	100.9	102.4	102.2	r 103.4	104.8
Apparel and other textile products.....do....	95.2	95.0	94.6	94.7	95.9	94.4	94.7	94.6	94.5	96.4	97.3	95.5	94.6	r 96.7	r 95.7	97.2

r Revised. p Preliminary.
†Revisions (back to 1960), to adjust to the 1970 Census, appear in "Estimates of the Population of the United States and Components of Change: 1940 to 1972" (P-25, No. 481), Bureau of the Census.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS

	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.p

LABOR FORCE, EMPLOYMENT, AND EARNINGS—Continued

HOURS AND MAN-HOURS—Continued

Man-hour indexes, seas. adjusted—Continued

Manufacturing indus., nondurable goods—Con.																
Paper and allied products	1967=100	101.2	98.3	97.9	99.0	97.0	97.7	97.0	97.9	99.2	99.2	99.6	99.4	98.7	r 100.1	r 101.1	102.4
Printing and publishing	do	101.3	98.3	98.7	98.4	99.1	99.1	97.9	97.2	97.4	97.9	97.9	97.7	98.4	r 98.4	r 98.9	100.1
Chemicals and allied products	do	101.8	98.5	98.1	98.9	99.1	99.1	97.9	97.3	99.5	98.0	97.7	98.3	98.7	r 98.2	r 97.4	97.6
Petroleum and coal products	do	101.6	100.7	99.4	98.9	98.9	99.5	100.2	102.0	101.7	100.6	99.1	103.0	98.4	102.2	r 99.8	99.2
Rubber and plastics products, nec	do	108.7	110.0	108.0	108.7	110.2	111.3	110.4	109.1	111.5	112.9	113.2	114.3	115.3	r 116.8	r 119.4	121.5
Leather and leather products	do	88.4	85.3	84.5	87.6	86.8	85.7	84.2	85.6	84.0	85.0	86.2	85.3	85.9	r 88.0	r 87.3	89.9

WEEKLY AND HOURLY EARNINGS

Not Seasonally Adjusted

Avg. weekly gross earnings per prod. worker on payrolls of private nonagric. estab.	dollars	119.46	126.91	123.65	124.05	125.49	127.57	127.94	129.03	129.13	129.13	128.76	130.92	129.92	130.64	131.73	132.83
Mining	do	163.97	171.72	168.82	170.89	171.30	172.10	172.53	173.43	174.72	167.78	165.82	182.76	183.60	r 181.02	r 182.31	184.02
Contract construction	do	196.35	213.36	205.53	205.35	209.05	213.94	216.41	220.23	216.23	225.38	223.61	216.45	214.44	215.28	219.70	220.43
Manufacturing establishments	do	133.73	142.44	139.74	139.83	142.00	143.51	142.09	141.69	143.28	144.00	144.72	150.18	147.66	149.17	r 151.13	152.69
Durable goods	do	143.47	153.52	151.50	150.40	153.09	155.04	151.98	151.60	153.20	154.71	155.88	162.70	159.58	161.17	163.59	165.21
Ordnance and accessories	do	146.57	160.55	157.59	156.94	158.12	160.93	160.66	161.80	163.41	163.44	162.96	168.75	165.97	r 170.49	r 168.82	169.66
Lumber and wood products	do	117.51	126.54	121.70	123.11	125.42	129.65	128.88	129.20	129.68	131.61	129.92	130.15	128.40	r 129.68	r 132.11	133.72
Furniture and fixtures	do	108.58	115.42	112.29	111.25	113.76	116.29	115.53	118.78	118.00	118.37	118.37	121.88	118.31	r 119.00	r 121.00	121.10
Stone, clay, and glass products	do	140.08	152.26	147.44	147.55	151.01	155.24	155.40	157.78	157.13	157.03	155.45	155.58	153.78	r 155.74	r 159.68	160.55
Primary metal industries	do	159.17	170.89	168.10	171.39	170.57	173.87	170.53	166.45	171.83	172.70	173.96	184.50	184.78	r 186.55	r 188.70	189.47
Fabricated metal products	do	143.67	150.72	146.77	147.26	152.22	153.38	150.72	151.13	150.42	151.93	153.47	159.83	155.59	157.16	r 159.54	162.35
Machinery, except electrical	do	154.95	161.99	159.57	158.00	160.79	162.39	161.20	162.01	164.02	164.83	166.04	174.30	170.56	r 173.47	r 175.56	177.66
Electrical equip. and supplies	do	130.87	139.65	137.36	136.72	138.90	139.95	139.00	140.00	140.80	140.75	142.21	147.24	144.00	r 145.52	r 146.29	147.83
Transportation equipment	do	163.62	180.71	182.55	175.12	182.52	183.85	172.97	171.74	172.82	182.04	182.48	196.35	186.76	191.58	r 194.69	196.88
Instruments and related products	do	134.34	140.49	138.55	137.86	140.10	140.10	140.23	140.58	142.80	142.36	144.18	147.70	147.17	r 149.08	r 149.11	148.03
Miscellaneous manufacturing ind.	do	109.13	115.14	113.68	113.19	114.07	114.46	113.48	115.64	115.14	116.33	117.32	120.48	118.81	r 119.95	r 120.26	121.27
Nondurable goods	do	120.43	128.12	124.87	125.65	127.01	128.44	129.63	129.17	130.75	129.63	130.28	133.73	132.16	r 133.28	r 134.35	135.09
Food and kindred products	do	127.98	136.21	133.27	134.13	136.21	136.89	137.63	135.94	138.24	135.54	136.34	142.51	140.10	139.79	r 142.09	142.84
Tobacco manufactures	do	110.38	116.55	114.45	118.91	125.07	121.44	130.87	119.31	114.53	108.72	109.96	118.44	113.21	r 111.55	r 113.56	114.23
Textile mill products	do	97.76	104.34	102.51	102.00	103.94	104.96	102.66	104.86	104.75	106.19	107.23	108.73	109.75	111.11	r 111.92	112.61
Apparel and other textile products	do	84.37	88.40	87.44	86.45	87.69	87.69	88.43	90.00	89.82	90.47	91.48	91.55	90.37	r 92.62	r 92.52	92.88
Paper and allied products	do	144.14	154.93	149.76	151.26	152.04	155.24	157.30	158.53	159.09	157.78	158.15	162.64	159.64	r 161.63	r 163.24	164.82
Printing and publishing	do	147.78	157.92	153.38	154.42	157.17	158.34	158.30	159.47	161.36	160.55	160.55	165.68	161.39	162.19	165.88	167.83
Chemicals and allied products	do	153.50	163.90	158.98	162.57	161.85	164.30	164.79	164.79	169.66	166.00	166.40	170.11	170.56	171.39	r 171.39	173.05
Petroleum and coal products	do	182.76	194.19	188.10	193.73	194.65	195.11	197.80	195.53	199.45	198.09	195.77	196.70	201.83	202.03	r 203.01	209.72
Rubber and plastics products, nec	do	128.96	137.42	132.47	134.06	136.21	137.57	137.94	139.04	140.94	140.48	141.17	145.44	143.72	144.08	r 144.43	143.91
Leather and leather products	do	92.63	97.64	96.09	95.98	97.52	98.30	98.56	97.38	96.68	99.15	100.22	102.56	101.99	103.95	r 102.33	101.68
Trans., comm., elec., gas, etc.	do	155.93	169.24	163.61	164.82	164.37	169.32	162.43	172.98	176.66	174.56	175.80	179.05	177.51	r 180.10	r 181.75	182.11
Wholesale and retail trade	do	95.66	100.74	98.55	99.18	99.88	101.60	103.61	103.68	102.08	101.85	101.56	103.31	103.06	r 103.11	r 104.05	104.05
Wholesale trade	do	137.60	146.07	142.16	142.63	145.33	146.40	146.43	147.63	147.68	148.06	148.85	152.74	151.27	r 151.65	r 152.04	152.82
Retail trade	do	82.47	86.61	84.41	85.25	85.58	87.72	89.78	89.18	87.62	87.10	86.84	89.00	88.31	r 87.78	r 88.64	88.98
Finance, insurance, and real estate	do	113.34	121.36	119.56	120.29	121.77	121.36	122.06	123.09	121.77	122.47	122.10	123.58	126.82	126.14	r 126.14	126.51
Services	do	96.66	102.26	100.30	100.64	101.02	101.57	103.70	103.75	103.66	103.32	103.36	104.65	104.75	r 105.74	105.43	106.08
Spendable earnings per worker (with 3 dependents), total private sector†	current dollars	104.61	112.12	109.55	109.86	111.00	112.64	112.93	113.79	113.86	113.86	113.57	115.28	116.18	116.74	117.60	118.47
	1967 dollars	89.95	92.43	91.44	91.40	91.89	92.71	92.72	93.19	93.18	93.02	92.63	93.65	94.30	94.30	94.84	95.31
Manufacturing	current dollars	115.90	124.24	122.14	122.21	123.90	125.07	123.97	123.65	124.89	125.45	126.01	130.25	130.09	131.26	r 132.79	134.00
	1967 dollars	99.66	102.42	101.95	101.67	102.57	102.94	101.78	101.27	102.20	102.49	102.78	105.81	105.59	106.03	r 107.09	107.80
Avg. hourly gross earnings per prod. worker on payrolls of private nonagric. estab.	dollars	3.22	3.43	3.36	3.38	3.41	3.42	3.43	3.45	3.49	3.49	3.48	3.51	3.54	3.55	3.57	3.59
Mining	do	3.84	4.05	4.01	4.04	4.04	4.04	4.05	4.10	4.15	3.92	3.92	4.27	4.32	4.31	r 4.31	4.34
Contract construction	do	5.25	5.72	5.54	5.55	5.65	5.63	5.68	5.75	5.86	5.90	5.90	5.93	5.99	5.98	5.97	5.99
Manufacturing	do	3.36	3.57	3.52	3.54	3.55	3.57	3.57	3.56	3.60	3.60	3.60	3.69	3.71	3.72	r 3.75	3.77
Excluding overtime	do	3.24	3.44	3.40	3.42	3.43	3.44	3.45	3.43	3.46	3.46	3.47	3.55	3.58	3.59	r 3.61	3.62
Durable goods	do	3.56	3.80	3.75	3.76	3.78	3.80	3.79	3.79	3.83	3.82	3.83	3.93	3.95	3.96	3.99	4.01
Excluding overtime	do	3.43	3.67	3.63	3.64	3.66	3.67	3.66	3.66	3.69	3.69	3.69	3.79	3.81	3.82	3.84	3.86
Ordnance and accessories	do	3.61	3.85	3.77	3.80	3.81	3.85	3.89	3.88	3.90	3.91	3.88	3.98	3.98	4.04	4.01	4.03
Lumber and wood products	do	2.96	3.14	3.05	3.07	3.12	3.17	3.19	3.19	3.21	3.21	3.20	3.19	3.21	r 3.21	r 3.23	3.23
Furniture and fixtures	do	2.77	2.90	2.85	2.86	2.88	2.90	2.91	2.94	2.95	2.93	2.93	2.98	2.98	r 2.99	r 3.01	3.02
Stone, clay, and glass products	do	3.40	3.66	3.57	3.59	3.63	3.67	3.70	3.73	3.75	3.73	3.71	3.74	3.76	3.78	r 3.82	3.85
Primary metal industries	do	3.93	4.23	4.12	4.17	4.15	4.21	4.19	4.29	4.35	4.35	4.36	4.50	4.54	4.55	r 4.58	4.61
Fabricated metal products	do	3.53	3.74	3.66	3.70	3.74	3.75	3.74	3.75	3.77	3.77	3.78	3.87	3.88	3.89	3.92	3.95
Machinery, except electrical	do	3.77	3.99	3.94	3.95	3.97	3.99	4.00	4.02	4.04	4.04	4.04	4.16	4.16	r 4.19	r 4.21	4.23
Electrical equip. and supplies	do	3.28	3.50	3.46	3.47	3.49	3.49	3.51	3.50	3.52	3.51	3.52	3.60	3.60	3.62	r 3.63	3.65
Transportation equipment	do	4.06	4.44	4.42	4.40	4.43	4.43	4.39	4.37	4.42	4.44	4.44	4.62	4.60	4.65	r 4.68	4.71
Instruments and related products	do	3.35	3.53	3.49	3.49	3.52	3.52	3.55	3.55	3.57	3.55	3.56	3.62	3.67	r 3.69	r 3.70	3.71
Miscellaneous manufacturing ind.	do	2.82	2.96	2.93	2.94	2.94	2.95	2.94	2.95	2.96	2.96	2.97	3.05	3.07	r 3.06	r 3.06	3.07
Nondurable goods	do	3.08	3.26	3.21	3.23	3.24	3.26	3.29	3.27	3.31	3.29	3.29	3.36	3.38	r 3.40	r 3.41	3.42
Excluding overtime	do	2.97	3.14	3.10	3.12	3.13	3.13	3.16	3.15	3.18	3.17	3.17	3.24	3.26	3.27	3.28	3.29
Food and kindred products	do	3.16	3.38	3.34	3.37	3.38	3.38	3.39	3.34	3.38	3.38	3.40	3.51	3.52	3.53	r 3.57	3.58
Tobacco manufactures	do	2.92	3.15	3.11	3.24	3.30	3.30	3.33	3.19	3.03	3.02	3.08	3.29	3.32	r 3.37	r 3.40	3.42
Textile mill products	do	2.45	2.57	2.55	2.55	2.56	2.56	2.56	2.57	2.58	2.59	2.59	2.62	2.69	2.71	2.71	2.72
Apparel and other textile products	do	2.39	2.49	2.47	2.47	2.47	2.47	2.47	2.50	2.53	2.52	2.52	2.55	2.56	r 2.58	2.57	2.58
Paper and allied products	do	3.44	3.68	3.60	3.61	3.62	3.67	3.71	3.73	3.77	3.73	3.73	3.80	3.81	3.83	r 3.85	3.86
Printing and publishing	do	3.92	4.20	4.09	4.14	4.18	4.20	4.21	4.23	4.28	4.27	4.27	4.36	4.35	4.36	4.40	4.44
Chemicals and allied products	do	3.69	3.94	3.84	3.88	3.90	3.94	3.99	3.99	4.03	4.00	4.00	4.06	4.10	r 4.12	r 4.11	4.13
Petroleum and coal products	do	4.28	4.58	4.50	4.58	4.58	4.58	4.60	4.59	4.66	4.65	4.65	4.65	4.84	4.88	r 4.88	4.90
Rubber and plastics products, nec	do	3.20	3.41	3.32	3.36	3.38	3.38	3.44	3.45	3.48	3.46	3.46	3.53	3.54	3.54	r 3.54	3.51
Leather and leather products	do	2.49	2.59	2.59	2.58	2.58	2.58	2.58	2.59	2.62	2.63	2.61	2.65	2.67	2.70	r 2.70	2.69
Trans., comm., elec., gas, etc.	do	3.85	4.21	4.07	4.10	4.13	4.15	4.23	4.25	4.33	4.31	4.33	4.41	4.46	r 4.48	r 4.51	4.53
Wholesale and retail trade	do	2.71	2.87	2.84	2.85	2.87	2.87	2.87	2.88	2.90	2.91	2.91	2.91	2.97	r 2.98	2.99	2.99
Wholesale trade	do	3.44	3.67	3.59	3.62	3.67	3.66	3.67	3.70	3.72	3.72	3.74	3.79	3.82	r 3.82	r 3.82	3.83
Retail trade	do	2.44	2.57	2.55	2.56	2.57	2.58	2.58	2.57	2.60	2.60	2.60	2.61	2.66	2.66	r 2.67	2.68
Finance, insurance, and real estate	do	3.08	3.28	3.24	3.26	3.30	3.28	3.29	3.30	3.30	3.31	3.30	3.34	3.40	3.40	r 3.40	3.41
Services	do	2.81	2.99	2.95	2.96	2.98	2.97	2.98	2.99	3.04	3.03	3.04	3.06	3.09	r 3.11	3.11	3.12
Miscellaneous hourly wages:																	
Construction wages, 20 cities (E NR): ♂																	
Common labor	$ per hr.	5.224	5.956	5.64	5.717	5.86	6.014	6.05	6.156	6.185	6.182	6.182	6.228	6.276	6.319	6.333	6.345
Skilled labor	do	7.314	8.254	7.878	7.992	8.21	8.365	8.38	8.471	8.515	8.511	8.511	8.551	8.636	8.742	8.763	8.818
Farm, without board or rm., 1st of mo.	do	1.64	1.73		1.76			1.74			1.70			1.82			1.84
Railroad wages (average, class I)	do	‡3.939					4.363										

r Revised. p Preliminary. ‡ Includes adjustments not distributed by months.

† Data for 1971 have been revised to reflect changes in accordance with Tax Reform Act of 1971 in personal exemptions and low income allowances effective retroactively to Jan. 1, 1971; data beginning Aug. 1971 also incorporate revised Consumer Price Index to reflect repeal of the 7% auto excise tax.

♂ Wages as of May 1, 1972: Common, $6.387; skilled, $8.867.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

LABOR FORCE, EMPLOYMENT, AND EARNINGS—Continued

HELP-WANTED ADVERTISING																
Seasonally adjusted index‡ 1967=100	92	80	78	78	79	83	85	85	80	80	81	85	85	87	90	
LABOR TURNOVER																
Manufacturing establishments:																
Unadjusted for seasonal variation:																
Accession rate, total mo. rate per 100 employees	4.0	3.9	3.5	3.7	3.9	4.9	4.0	5.3	4.8	3.8	3.3	2.5	4.1	3.7	p 4.1	
New hires do	2.8	2.5	2.2	2.3	2.6	3.5	2.7	3.4	3.3	2.7	2.2	1.6	2.5	r 2.4	p 2.8	
Separation rate, total do	4.8	4.2	3.7	4.0	3.7	3.8	4.8	5.5	5.3	4.3	3.7	3.8	4.0	3.5	p 3.9	
Quit do	2.1	1.8	1.5	1.6	1.7	1.8	1.8	2.8	2.9	1.9	1.5	1.2	1.7	1.6	p 1.9	
Layoff do	1.8	1.6	1.4	1.4	1.2	1.2	2.1	1.8	1.5	1.5	1.5	1.8	1.4	1.1	p 1.1	
Seasonally adjusted:																
Accession rate, total do			3.9	4.0	3.8	3.7	3.7	4.2	3.9	3.6	4.1	3.9	4.4	4.5	p 4.6	
New hires do			2.5	2.5	2.5	2.4	2.5	2.8	2.5	2.4	2.7	2.7	2.9	r 3.0	p 3.2	
Separation rate, total do			4.1	4.3	4.0	4.1	4.4	4.5	3.9	4.0	4.1	4.4	4.2	4.1	p 4.3	
Quit do			1.7	1.7	1.8	1.9	1.8	1.9	1.7	1.7	1.9	1.9	2.0	2.1	p 2.2	
Layoff do			1.5	1.6	1.5	1.5	1.5	1.9	1.7	1.4	1.4	1.4	1.3	1.2	p 1.2	
INDUSTRIAL DISPUTES																
Work stoppages:																
Number of stoppages:																
Beginning in month or year number	5,716	4,900	440	540	590	610	450	420	330	290	280	180	300	290	360	
In effect during month do			590	750	790	850	670	660	540	540	490	360	460	455	540	
Workers involved in stoppages:																
Beginning in month or year thous	3,305	3,200	116	174	702	272	820	166	88	210	249	27	79	58	122	
In effect during month do			200	254	774	384	967	472	286	300	455	243	154	137	161	
Man-days idle during month or year do	66,414	45,000	2,292	2,184	3,437	3,923	7,906	4,505	2,841	4,507	4,229	4,444	2,284	1,597	1,517	
PLACEMENTS, UNEMPLOYMENT INSURANCE																
Nonfarm placements thous	3,845	3,700	295	309	308	365	315	367	353	313	317	266				
Unemployment insurance programs:																
Insured unemployment, all programs § do	2,070		3,091	2,756	2,443	2,332	2,431	2,349	2,174	2,129	2,311	2,666	3,097	p 3,122	p 2,922	
State programs:																
Initial claims do	15,387	p 15,337	1,265	1,111	964	1,152	1,468	1,277	1,043	1,048	1,336	1,623	p 1,643			
Insured unemployment, avg weekly do	1,805	p 2,150	2,577	2,283	2,001	1,893	1,993	1,912	1,739	1,716	1,879	2,221	2,524	r p 2,492	p 2,279	
Percent of covered employment: ♂																
Unadjusted	3.4	p 4.0	4.8	4.3	3.8	3.6	3.8	3.6	3.3	3.2	3.5	4.2	4.8	p 4.7	p 4.3	
Seasonally adjusted			3.9	4.0	4.2	4.4	4.4	4.2	4.5	4.5	4.2	3.8	3.4	p 3.5	p 3.5	
Beneficiaries, average weekly thous	1,518	p 1,813	2,339	2,105	1,769	1,714	1,459	1,472	1,328	1,280	p 1,352	p 1,591	p 2,136			
Benefits paid mil. $	3,848.5	p 4,957.0	631.0	541.9	434.5	446.7	425.4	433.6	377.8	p 367.2	p 406.9	r p 489.6	p 550.9			
Federal employees, insured unemployment, average weekly thous	31	p 34	35	31	29	31	36	35	33	35	35	35	37	r p 36	p 34	
Veterans' program (UCX):																
Initial claims do	556	p 622	57	51	45	54	53	54	48	43	51	59	p 68			
Insured unemployment, avg weekly do	79	p 131	128	121	113	114	120	120	106	97	105	118	133	p 140	r 136	
Beneficiaries, average weekly do	75	p 115	128	122	110	115	112	116	107	95	p 95	r p 108	p 126			
Benefits paid mil. $	203.2		33.3	30.8	27.0	30.1	30.0	31.6	28.9	25.0	26.1	29.2	p 30.0			
Railroad program:																
Applications thous	128	609	30	85	36	45	89	98	100	48	19	7	8	4	4	
Insured unemployment, avg weekly do	18	26	19	20	18	13	15	32	33	27	48	33	35	27	26	
Benefits paid mil. $	38.7	75.7	4.6	4.4	3.5	4.2	3.8	8.7	11.1	7.6	9.9	8.9	8.0	6.2	6.0	

FINANCE

BANKING																
Open market paper outstanding, end of period:																
Bankers' acceptances mil. $	7,058	7,889	7,174	7,301	7,494	7,645	7,454	8,377	8,148	7,811	7,479	7,889	7,601	7,935	7,985	
Commercial and finance co. paper, total do	31,765	30,824	31,223	31,367	31,115	29,472	29,746	30,057	29,946	31,205	31,164	130,824	31,857	32,247	32,390	
Placed through dealers do	12,671	11,418	13,570	13,489	13,000	11,736	11,470	11,948	12,304	12,351	12,231	11,418	12,427	12,787	12,778	
Placed directly (finance paper) do	19,094	19,406	17,653	17,878	18,115	17,736	18,276	18,109	17,642	18,854	18,933	19,406	19,430	19,460	19,612	
Agricultural loans and discounts outstanding of agencies supervised by the Farm Credit Adm.:																
Total, end of period mil. $	14,774	16,347	15,492	15,718	15,899	16,146	16,137	16,107	16,044	16,211	16,194	16,347	16,456	16,684	17,083	
Farm mortgage loans:																
Federal land banks do	7,187	7,917	7,347	7,426	7,502	7,579	7,650	7,709	7,766	7,826	7,870	7,917	7,971	8,039	8,139	
Loans to cooperatives do	2,030	2,076	2,153	2,113	2,056	2,041	1,997	1,942	1,942	2,030	2,076	2,076	2,098	2,149	2,267	
Other loans and discounts do	5,557	6,354	5,993	6,179	6,341	6,527	6,490	6,456	6,336	6,355	6,248	6,354	6,387	6,766	6,677	
Bank debits to demand deposit accounts, except interbank and U.S. Government accounts, annual rates, seasonally adjusted: ⊕																
Total (233 SMSA's) ⊙ bil. $			11,590.7	11,572.3	11,316.5	11,730.8	11,703.8	12,093.8	12,202.2	12,221.4	12,915.7	12,383.2	12,531.2	13,028.3	12,788.5	
New York SMSA do			5,348.7	5,315.4	5,033.8	5,244.0	5,210.2	5,408.9	5,570.3	5,755.8	5,918.9	5,523.3	5,687.0	6,013.9	5,631.4	
Total 232 SMSA's (except N.Y.) do			6,241.9	6,256.9	6,282.7	6,486.8	6,493.6	6,684.8	6,631.9	6,465.6	6,996.9	6,859.9	6,844.2	7,014.4	7,157.1	
6 other leading SMSA's ¶ do			2,588.2	2,592.2	2,606.3	2,691.0	2,681.0	2,783.7	2,757.5	2,683.2	2,945.2	2,859.8	2,803.1	2,913.1	2,932.9	
226 other SMSA's do			3,653.8	3,664.7	3,676.4	3,795.9	3,812.6	3,901.2	3,874.4	3,782.5	4,051.6	4,000.2	4,041.1	4,101.3	4,224.2	
Federal Reserve banks, condition, end of period:																
Assets, total ♀ mil. $	90,157	99,523	90,681	90,357	91,210	92,945	91,899	92,154	93,755	95,256	93,698	99,523	96,551	94,126	r 96,849	p 98,198
Reserve bank credit outstanding, total ♀ do	66,795	75,821	67,387	66,665	69,757	68,565	69,285	70,094	71,013	71,150	71,004	75,821	72,176	71,219	74,365	74,405
Discounts and advances do	335	39	391	81	1,051	446	778	858	198	211	146	39	15	6	255	58
U.S. Government securities do	62,142	70,218	64,160	63,721	65,764	65,518	65,841	66,868	67,566	67,205	67,817	70,218	69,552	67,698	69,928	70,307
Gold certificate account do	10,457	9,875	10,464	10,475	10,075	10,075	10,075	9,875	9,875	9,875	9,875	9,875	9,875	9,475	9,475	9,475
Liabilities, total ♀ do	90,157	99,523	90,681	90,357	91,210	92,945	91,899	92,154	93,755	95,256	93,698	99,523	96,551	94,126	r 96,849	p 98,198
Deposits, total do	26,687	31,475	27,748	26,949	27,604	26,701	27,345	27,187	28,467	28,441	26,588	31,475	29,471	27,252	r 30,527	30,153
Member-bank reserve balances do	24,150	27,780	25,895	24,735	25,494	24,540	25,311	25,409	25,422	25,697	23,718	27,780	25,650	25,525	r 27,869	27,416
Federal Reserve notes in circulation do	51,386	54,954	50,593	50,889	51,485	52,228	52,619	52,829	52,830	53,121	54,186	54,954	53,801	53,914	54,340	54,478

r Revised. p Preliminary. 1 Beginning Dec. 1971, data on new basis reflect inclusion of paper issued directly by real estate investment trusts and several additional finance companies. ‡Monthly data prior to 1969 will be available later. Revision for Nov. 1970 (1967=100), 78. § Average weekly data include claims filed under extended duration provisions of regular State laws.

♂Insured unemployment as % of average covered employment in a 12-month period.

⊕ Series revised to reflect recalculation of seasonal factors and trading-day adjustment; revisions for periods prior to Feb. 1971 will be shown later.

⊙Total SMSA's include some cities and counties not designated as SMSA's.

¶Includes Boston, Philadelphia, Chicago, Detroit, San Francisco-Oakland and Los Angeles-Long Beach. ♀Includes data not shown separately.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	End of year		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
FINANCE—Continued																
BANKING—Continued																
All member banks of Federal Reserve System, averages of daily figures:																
Reserves held, total—mil. $	[1] 29,265	[1] 31,329	29,686	29,885	30,419	30,023	30,547	30,455	30,802	30,860	30,953	31,329	32,865	r 31,922	r 31,921	p 32,623
Required—do	[1] 28,993	[1] 31,164	29,487	29,745	30,107	29,892	30,385	30,257	30,596	30,653	30,690	31,164	32,692	r 31,798	r 31,688	32,416
Excess—do	[1] 272	[1] 165	199	140	312	131	162	198	206	207	263	165	173	r 124	r 233	207
Borrowings from Federal Reserve banks—do	[1] 321	[1] 107	319	148	330	453	820	804	501	360	407	107	20	r 33	99	109
Free reserves—do	[1] −49	[1] 58	−120	−8	−18	−322	−658	−606	−295	−153	−144	58	153	r 91	r 134	98
Large commercial banks reporting to Federal Reserve System, Wed. nearest end of yr. or mo.:																
Deposits:‡																
Demand, adjusted♂—mil. $	87,739	91,683	82,579	82,275	84,929	83,897	83,813	84,699	82,082	82,842	87,258	91,683	87,329	86,494	91,037	88,996
Demand, total♀—do	147,355	152,699	146,456	141,474	143,627	152,972	139,736	145,012	141,160	144,435	149,106	152,699	146,564	151,788	143,920	148,502
Individuals, partnerships, and corp.—do	103,149	106,885	99,253	97,099	100,713	102,131	97,285	99,588	96,333	100,492	103,293	106,885	99,963	102,735	100,628	101,536
State and local governments—do	6,774	6,563	6,957	6,353	7,228	7,632	6,158	6,601	6,368	6,112	7,196	6,563	7,714	7,311	6,575	7,165
U.S. Government—do	4,380	7,571	2,889	5,833	2,718	5,332	3,901	4,838	5,647	3,551	2,237	7,571	r 4,531	3,518	5,579	8,614
Domestic commercial banks—do	21,704	20,880	24,703	20,750	22,042	24,967	20,844	21,934	21,200	22,730	24,305	20,880	22,211	26,500	20,190	20,694
Time, total♀—do	119,443	140,932	129,128	129,293	131,110	131,856	132,932	134,161	136,161	137,160	138,217	140,932	142,532	144,286	144,863	147,119
Individuals, partnerships, and corp.:																
Savings—do	48,035	54,542	52,973	53,044	53,535	53,644	53,140	52,969	53,313	53,605	54,124	54,542	55,869	56,578	57,616	57,295
Other time—do	51,650	61,274	55,514	54,779	55,720	56,451	57,172	58,417	59,737	60,294	60,890	61,274	61,371	62,085	r 61,931	62,610
Loans (adjusted), total♂†—do	180,429	192,238	177,200	177,164	179,986	182,817	180,734	185,358	186,256	186,003	188,924	192,238	190,040	r 192,317	194,538	199,554
Commercial and industrial—do	81,693	83,770	81,162	81,072	81,703	82,156	81,488	82,671	83,435	83,003	82,875	83,770	82,047	r 82,597	83,795	85,488
For purchasing or carrying securities—do	8,560	8,835	7,256	6,719	7,014	7,599	6,719	7,707	7,743	7,787	8,675	8,835	8,844	r 9,765	9,526	10,629
To nonbank financial institutions—do	13,642	14,504	13,270	13,306	13,974	14,879	13,808	14,038	13,617	13,204	13,895	14,504	r 13,844	r 14,397	14,773	14,673
Real estate loans—do	34,035	38,400	34,560	34,737	35,096	35,675	36,177	36,734	37,206	37,557	38,049	38,400	38,887	39,178	r 39,709	40,423
Other loans—do	50,906	57,183	48,290	48,993	50,924	50,141	50,802	53,400	54,083	51,927	55,161	57,183	r 56,867	r 57,031	58,866	59,229
Investments, total‡—do	72,194	81,033	75,509	75,672	74,872	76,335	75,138	74,228	75,160	77,209	79,944	81,033	80,548	81,001	81,492	81,179
U.S. Government securities, total—do	28,061	28,944	28,060	26,569	25,453	26,637	25,396	24,921	25,080	26,187	28,298	28,944	27,881	27,927	27,749	27,076
Notes and bonds—do	21,983	24,605	22,384	22,160	21,652	22,409	21,852	22,113	22,400	23,340	24,566	24,605	23,972	23,782	23,281	23,486
Other securities—do	44,133	52,089	47,449	49,103	r 49,419	49,698	49,742	49,307	50,080	51,022	51,646	52,089	52,667	53,074	53,743	54,103
Commercial bank credit (last Wed. of mo., except for June 30 and Dec. 31 call dates), seas. adj.:																
Total loans and investments⊙—bil. $	435.9	482.9	449.5	452.5	456.1	461.1	463.7	468.4	472.4	r 477.2	r 479.8	r 485.7	r 491.4	r 496.6	r 504.3	505.9
Loans⊙—do	292.0	318.6	296.5	298.2	300.7	301.7	304.1	309.7	313.0	r 317.0	r 318.7	r 320.6	r 325.7	r 328.5	r 333.3	334.8
U.S. Government securities—do	58.0	60.3	61.1	60.7	60.4	62.8	61.6	60.9	59.9	r 59.1	r 58.8	r 60.7	r 59.7	r 61.0	r 62.2	62.4
Other securities—do	85.9	103.9	91.9	93.5	95.1	96.6	98.0	97.8	99.5	r 101.1	r 102.2	r 104.5	r 106.0	r 107.1	r 108.7	108.6
Money and interest rates: §																
Bank rates on short-term business loans:																
In 35 centers—percent per annum	[2] 8.48	[2] 6.32	------	------	6.00	------	------	6.51	------	------	6.18	------	------	5.52	------	------
New York City—do	[2] 8.22	[2] 6.01	------	------	5.66	------	------	6.25	------	------	5.86	------	------	5.35	------	------
7 other northeast centers—do	[2] 8.86	[2] 6.56	------	------	6.25	------	------	6.77	------	------	6.40	------	------	5.72	------	------
8 north central centers—do	[2] 8.46	[2] 6.30	------	------	5.95	------	------	6.46	------	------	6.13	------	------	5.37	------	------
7 southeast centers—do	[2] 8.44	[2] 6.62	------	------	6.37	------	------	6.77	------	------	6.47	------	------	5.87	------	------
8 southwest centers—do	[2] 8.52	[2] 6.46	------	------	6.17	------	------	6.64	------	------	6.43	------	------	5.79	------	------
4 west coast centers—do	[2] 8.49	[2] 6.38	------	------	6.12	------	------	6.54	------	------	6.21	------	------	5.39	------	------
Discount rate (N.Y.F.R. Bank), end of year or month—percent	5.50	[2] 4.75	4.75	4.75	4.75	4.75	5.00	5.00	5.00	5.00	4.75	4.75	4.50	4.50	4.50	4.50
Federal intermediate credit bank loans—do	[2] 8.50	[2] 6.37	6.80	6.35	6.11	6.05	6.01	6.00	5.99	6.00	6.12	6.12	6.29	6.20	6.20	------
Home mortgage rates (conventional 1st mortgages):																
New home purchase (U.S. avg.)—percent	[2] 8.27	[2] 7.59	7.52	7.37	7.36	7.38	7.51	7.60	7.67	7.68	7.65	7.62	7.62	7.45	r 7.38	7.37
Existing home purchase (U.S. avg.)—do	[2] 8.20	[2] 7.54	7.47	7.34	7.33	7.38	7.50	7.58	7.63	7.62	7.56	7.51	6.45	7.35	r 7.31	7.29
Open market rates, New York City:																
Bankers' acceptances (prime, 90 days)—do	[3] 7.31	[3] 4.85	3.80	4.36	4.91	5.33	5.60	5.57	5.49	5.05	4.78	4.45	3.92	3.52	3.95	4.43
Commercial paper (prime, 4–6 months)—do	[3] 7.72	[3] 5.11	4.19	4.57	5.10	5.45	5.75	5.73	5.75	5.54	4.92	4.74	4.08	3.93	4.17	4.58
Finance Co. paper placed directly, 3–6 mo.—do	[3] 7.23	[3] 4.91	4.05	4.27	4.69	5.24	5.54	5.57	5.44	5.30	4.81	4.60	3.95	3.78	4.03	4.38
Stock Exchange call loans, going rate—do	[3] 7.95	[3] 5.73	5.49	5.32	5.50	5.50	5.93	6.00	6.00	5.92	5.53	5.36	4.89	4.63	4.55	4.88
Yield on U.S. Government securities (taxable):																
3-month bills (rate on new issue)—percent	[3] 6.458	[3] 4.338	3.323	3.780	4.139	4.699	5.405	5.078	4.668	4.489	4.191	4.023	3.403	3.180	3.723	3.723
3–5 year issues—do	[3] 7.37	[3] 5.77	4.74	5.42	6.02	6.36	6.77	6.39	5.96	5.68	5.50	5.42	5.33	5.51	5.74	6.01
CONSUMER CREDIT (Short- and Intermediate-term)																
Total outstanding, end of year or month—mil. $	126,802	137,237	123,604	125,047	126,025	127,388	128,354	129,704	130,644	131,606	133,263	137,237	135,830	135,253	136,135	------
Installment credit, total—do	101,161	109,545	99,168	100,028	100,692	101,862	102,848	104,060	104,973	105,763	107,097	109,545	108,826	108,634	109,481	------
Automobile paper—do	35,490	38,310	35,028	35,496	35,819	36,349	36,763	37,154	37,383	37,759	38,164	38,310	38,111	38,239	38,762	------
Other consumer goods paper—do	29,949	32,447	28,591	28,682	28,706	28,976	29,165	29,477	29,840	30,072	30,586	32,447	32,096	31,615	31,682	------
Repair and modernization loans—do	4,110	4,356	4,045	4,077	4,126	4,186	4,240	4,295	4,330	4,357	4,370	4,356	4,319	4,332	4,354	------
Personal loans—do	31,612	34,432	31,504	31,773	32,041	32,351	32,680	33,134	33,420	33,575	33,977	34,432	34,300	34,448	34,683	------
By type of holder:																
Financial institutions, total—do	87,064	94,086	86,015	86,805	87,491	88,544	89,458	90,536	91,279	91,943	92,901	94,086	93,668	93,955	94,853	------
Commercial banks—do	41,895	45,976	41,563	42,094	42,482	43,011	43,509	44,112	44,603	44,947	45,396	45,976	45,878	45,963	46,415	------
Finance companies—do	31,123	32,140	30,326	30,369	30,441	30,609	30,906	31,098	31,133	31,331	31,643	32,140	31,948	31,979	32,221	------
Credit unions—do	12,500	14,191	12,509	12,686	12,874	13,206	13,296	13,570	13,780	13,875	14,052	14,191	14,062	14,126	14,328	------
Miscellaneous lenders—do	1,546	1,776	1,617	1,656	1,694	1,718	1,747	1,756	1,763	1,790	1,810	1,776	1,780	1,887	1,889	------
Retail outlets, total—do	14,097	15,459	13,153	13,223	13,201	13,318	13,390	13,524	13,694	13,820	14,196	15,459	15,158	14,679	14,628	------
Automobile dealers—do	327	360	325	330	344	339	344	347	349	354	359	360	359	360	366	------

r Revised. p Preliminary.
[1] Average for Dec. [2] Average for year. [3] Daily average.
♂For demand deposits, the term "adjusted" denotes demand deposits other than domestic commercial bank and U.S. Government, less cash items in process of collection; for loans, exclusive of loans to and Federal funds transactions with domestic commercial banks and after deduction of valuation reserves (individual loan items are shown gross; i.e., before deduction of valuation reserves).
‡Revisions for months prior to Feb. 1971 will be shown later.
♀Includes data not shown separately. ⊙Adjusted to exclude interbank loans.
§For bond yields, see p. S–20.

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Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

FINANCE—Continued

CONSUMER CREDIT—Continued

Outstanding credit—Continued																
Noninstallment credit, total mil $	25,641	27,692	24,436	25,019	25,333	25,526	25.506	25,644	25,671	25,843	26,166	27,692	27,004	26,619	26,654	
Single-payment loans, total do	9,484	10,300	9,557	9,676	9,765	9,862	9,854	9,997	10,061	10,097	10,182	10,300	10,324	10,433	10,511	
Commercial banks do	8,205	8,916	8,249	8,350	8,425	8,512	8,498	8,633	8,694	8,722	8,795	8,916	8,937	9,008	9,083	
Other financial institutions do	1,279	1,384	1,308	1,326	1,340	1,350	1,356	1,364	1,367	1,375	1,387	1,384	1,387	1,425	1,428	
Charge accounts, total do	8,850	9,818	7,207	7,689	8,004	8,214	8,271	8,305	8,305	8,435	8,634	9,818	8,929	8,141	8,011	
Retail outlets do	6,932	7,597	5,316	5,774	6,046	6,199	6,173	6,120	6,101	6,269	6,482	7,597	6,719	6,008	5,969	
Credit cards do	1,918	2,221	1,891	1,915	1,958	2,015	2,098	2,185	2,204	2,166	2,152	2,221	2,210	2,133	2,042	
Service credit do	7,307	7,874	7,672	7,654	7,564	7,450	7,381	7,342	7,305	7,311	7,350	7,574	7,751	8,045	8,132	
Installment credit extended and repaid:																
Unadjusted:																
Extended, total do	104,130	117,638	9,575	10,079	9,562	10,667	10,098	10,300	9,849	9,797	10,711	11,966	8,766	8,902	10,951	
Automobile paper do	29,831	34,638	3,074	3,100	2,883	3,301	3,032	3,066	2,927	3,037	3,105	2,780	2,470	2,762	3,358	
Other consumer goods paper do	36,781	40,979	3,076	3,363	3,148	3,538	3,415	3,465	3,454	3,423	3,737	5,061	3,297	2,926	3,727	
All other do	37,518	42,021	3,425	3,616	3,531	3,828	3,651	3,769	3,468	3,337	3,869	4,125	2,999	3,214	3,866	
Repaid, total do	101,138	109,254	9,651	9,219	8,898	9,497	9,112	9,088	8,936	9,007	9,377	9,518	9,485	9,094	10,104	
Automobile paper do	30,943	31,818	2,915	2,632	2,560	2,771	2,618	2,675	2,698	2,661	2,700	2,634	2,669	2,634	2,835	
Other consumer goods paper do	34,441	38,481	3,413	3,272	3,124	3,268	3,226	3,153	3,091	3,191	3,223	3,200	3,648	3,407	3,660	
All other do	35,754	38,955	3,323	3,315	3,214	3,458	3,268	3,260	3,147	3,155	3,454	3,684	3,168	3,053	3,609	
Seasonally adjusted:																
Extended, total do			9,533	9,751	9,690	9,715	9,675	10,049	10,156	10,031	10,572	10,130	10,184	10,339	10,996	
Automobile paper do			2,897	2,872	2,756	2,838	2,773	3,004	3,147	2,992	3,162	2,973	2,978	3,046	3,143	
Other consumer goods paper do			3,210	3,415	3,295	3,433	3,399	3,465	3,462	3,467	3,595	3,604	3,706	3,698	3,921	
All other do			3,426	3,464	3,639	3,444	3,503	3,580	3,547	3,572	3,815	3,553	3,500	3,595	3,932	
Repaid, total do			9,038	9,088	9,197	9,190	8,914	9,222	9,157	9,107	9,306	9,230	9,547	9,373	9,632	
Automobile paper do			2,696	2,566	2,640	2,678	2,565	2,697	2,732	2,634	2,662	2,696	2,761	2,693	2,693	
Other consumer goods paper do			3,164	3,249	3,211	3,233	3,203	3,262	3,172	3,219	3,254	3,188	3,501	3,408	3,422	
All other do			3,178	3,273	3,346	3,279	3,146	3,263	3,253	3,254	3,390	3,346	3,285	3,272	3,517	

FEDERAL GOVERNMENT FINANCE

Budget receipts, expenditures, and net lending:																
Expenditure account:																
Receipts (net) mil. $	[1] 193,743	[1]188,392	13,205	21,024	13,190	22,508	13,198	15,652	19,710	12,462	14,945	17,213	17,596	15,239	15,237	
Expenditure (excl. net lending) do	[1] 194,460	[1]210,318	18,328	17,769	16,882	19,669	18,507	19,276	18,265	18,677	18,798	17,085	19,226	18,589	20,000	
Expend. acct. surplus or deficit (–) do	[1] –716	[1]–21,927	–5,123	3,255	–3,692	2,840	–5,309	–3,624	1,444	–6,215	–3,852	128	–1,630	r–3,350	–4,763	
Loan account:																
Net lending do	[1] –2,128	[1]–1,107	–318	–49	–270	–297	–49	–306	69	–115	–149	–399	–243	–175	–327	
Budget surplus or deficit (–) do	[1] –2,845	[1]–23,033	–5,441	3,206	–3,961	2,543	–5,358	–3,930	1,513	–6,330	–4,002	–271	–1,873	–3,525	–5,090	
Budget financing, total do	[1] 2,845	[1] 23,033	5,441	–3,206	3,961	–2,543	5,358	3,930	–1,513	6,330	4,002	271	1,873	3,525	5,090	
Borrowing from the public do	[1] 5,397	[1] 19,448	675	–271	2,197	–311	4,226	6,854	–2,003	1,407	2,590	8,482	134	r 1	3,795	
Reduction in cash balances do	[1]–2,552	[1] 3,794	4,766	–2,935	1,764	–2,232	1,132	–2,924	490	4,923	1,412	–8,211	1,739	r 3,524	1,295	
Gross amount of debt outstanding do	[1] 382,603	[1] 409,468	403,863	403,742	408,736	409,468	415,677	424,990	422,163	421,878	424,555	434,350	432,607	434,344	437,553	
Held by the public do	[1] 284,880	[1] 304,328	302,713	302,442	304,638	304,328	308,554	315,408	313,406	314,812	317,402	325,884	326,018	326,019	329,814	
Budget receipts by source and outlays by agency:																
Receipts (net), total mil. $	[1] 193,743	[1] 188,392	13,205	21,024	13,190	22,508	13,198	15,652	19,710	12,462	14,945	17,213	17,596	15,239	15,237	
Individual income taxes (net) do	[1] 90,412	[1] 86,230	3,366	9,630	3,846	9,867	6,519	6,920	9,192	6,282	7,455	7,096	10,944	6,846	3,905	
Corporation income taxes (net) do	[1] 32,829	[1] 26,785	3,523	4,015	623	6,447	879	453	4,306	736	512	4,927	1,070	666	4,722	
Social insurance taxes and contributions (net) mil. $	[1] 45,298	[1] 48,578	3,990	4,971	6,366	3,764	3,464	5,996	3,784	2,983	4,120	2,642	3,615	5,740	4,350	
Other do	[1] 25,203	[1] 26,798	2,326	2,409	2,355	2,430	2,336	2,282	2,428	2,460	2,858	2,549	1,967	1,986	1,928	
Expenditures and net lending, total ♀ do	[1] 196,588	[1] 211,425	18,646	17,818	17,152	19,965	18,556	19,582	18,196	18,791	18,947	17,484	19,469	18,764	20,327	
Agriculture Department do	[1] 8,307	[1] 8,560	320	271	437	266	2,054	1,432	680	1,406	1,094	1,120	1,040	636	354	
Defense Department, military do	[1] 77,150	[1]74,546	6,309	6,041	5,809	7,590	5,047	5,482	5,764	5,886	5,996	6,386	5,967	6,107	6,872	
Health, Education, and Welfare Department mil. $	[1] 52,338	[1] 61,866	5,374	5,226	5,143	7,183	5,418	5,488	5,452	5,654	5,761	5,571	5,897	6,013	6,179	
Treasury Department do	[1] 19,510	[1] 20,991	1,869	1,816	1,819	1,744	1,739	1,837	1,893	1,564	1,931	1,774	1,892	1,856	1,900	
National Aeronautics and Space Adm do	[1] 3,749	[1] 3,381	333	252	274	245	377	291	273	266	286	285	259	276	310	
Veterans Administration do	[1] 8,653	[1] 9,756	962	881	874	870	796	893	755	830	818	893	1,020	861	1,042	
Receipts and expenditures (national income and product accounts basis), qtrly. totals seas. adj. at annual rates:																
Federal Government receipts, total bil. $	191.5	198.8	196.5			197.7			197.8			203.0			p 222.1	
Personal tax and nontax receipts do	92.2	89.0	86.6			87.6			88.8			93.0			r 105.4	
Corporate profit tax accruals do	30.6	33.6	34.1			34.8			33.2			32.1			p 34.6	
Indirect business tax and nontax accruals do	19.3	20.3	20.7			19.9			19.7			20.7			r 20.3	
Contributions for social insurance do	49.3	56.0	55.1			55.5			56.1			57.2			p 61.8	
Federal Government expenditures, total do	205.1	221.9	212.7			221.4			224.6			228.7			r 235.5	
Purchases of goods and services do	97.2	97.6	96.4			96.0			97.6			100.3			r 104.9	
National defense do	75.4	71.4	72.6			71.4			70.2			71.4			r 75.8	
Transfer payments do	63.4	75.9	69.6			77.8			78.0			78.1			r 79.4	
Grants-in-aid to State and local govts do	24.4	29.6	27.0			29.5			30.2			31.6			r 32.2	
Net interest paid do	14.6	13.7	14.0			13.3			13.9			13.8			r 13.1	
Subsidies less current surplus of government enterprises bil. $	5.5	5.1	5.8			4.8			4.8			4.9			r 5.8	
Less: Wage accruals less disbursements do			.0			.0			.0			.0			.0	
Surplus or deficit (–) do	–13.6	–23.1	–16.2			–23.7			–26.7			–25.7			p–13.3	

LIFE INSURANCE

Institute of Life Insurance:																
Assets, total, all U.S. life insurance cos. bil. $	207.25	221.57	211.50	212.70	213.41	214.28	215.28	216.44	217.49	218.26	219.35	221.57	223.31	224.74		
Government securities do	11.07	11.13	11.02	10.95	10.95	10.79	11.03	11.08	11.00	11.02	11.15	11.13	11.32	11.34		
Corporate securities do	88.52	99.43	92.63	93.76	94.20	95.03	95.68	96.43	97.20	97.78	98.44	99.43	101.35	102.82		
Mortgage loans, total do	74.38	75.60	74.52	74.54	74.55	74.54	74.58	74.71	74.80	74.86	74.90	75.60	75.52	75.46		
Nonfarm do	68.73	70.00	68.97	68.99	69.00	68.97	69.02	69.12	69.21	69.27	71.31	70.00	69.98	69.94		
Real estate do	6.32	7.10	6.48	6.54	6.59	6.64	6.73	6.75	6.81	6.88	6.95	7.10	7.10	7.00		
Policy loans and premium notes do	16.06	17.03	16.29	16.37	16.44	16.52	16.59	16.68	16.78	16.85	16.95	17.03	17.07	17.13		
Cash do	1.76	1.78	1.56	1.37	1.40	1.46	1.38	1.44	1.46	1.45	1.53	1.78	1.51	1.47		
Other assets do	9.15	9.52	8.99	9.18	9.29	9.31	9.29	9.35	9.44	9.42	9.43	9.52	9.44	9.51		

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[1] Data shown in 1970 and 1971 annual columns are for fiscal years ending June 30 of the respective years; they include revisions not distributed to months.
♀ Includes data for items not shown separately.

FINANCE—Continued

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
LIFE INSURANCE—Continued																
Institute of Life Insurance—Continued																
Payments to policyholders and beneficiaries in U.S., total—mil. $	16,449.4	17,177.2	1,571.7	1,414.4	1,353.7	1,430.0	1,326.7	1,348.6	1,466.5	1,392.7	1,354.8	1,918.9				
Death benefits—do	7,017.3	7,423.3	702.0	611.1	592.8	635.7	567.8	609.5	638.1	605.3	608.9	709.5				
Matured endowments—do	978.3	990.2	95.6	87.7	81.9	85.4	76.3	73.7	80.9	77.6	80.8	83.5				
Disability payments—do	232.9	256.8	23.8	19.9	20.1	25.2	19.7	20.1	23.6	23.0	21.3	21.2				
Annuity payments—do	1,757.1	1,944.4	166.7	161.3	157.4	164.9	161.0	164.2	168.6	181.1	156.1	163.5				
Surrender values—do	2,886.4	2,881.6	275.6	249.7	234.3	243.5	233.0	241.6	232.9	224.9	230.3	264.1				
Policy dividends—do	3,577.4	3,680.9	308.0	284.7	267.2	275.3	268.9	239.5	321.8	278.8	257.4	677.1				
Life Insurance Agency Management Association:																
Insurance written (new paid-for insurance):‡																
Value, estimated total—mil. $	[1] 193,574	186,634	16,781	16,360	14,800	16,380	14,175	17,495	15,718	14,777	15,096	20,237	13,858	14,996	19,046	
Ordinary (incl. mass-marketed ord.)—do	123,272	131,319	12,018	11,059	10,572	11,372	10,347	10,814	10,624	10,894	11,741	13,409	9,894	11,334	13,421	
Group—do	[1] 63,690	47,948	4,116	4,551	3,523	4,383	3,265	6,079	4,495	3,243	2,780	6,301	3,366	3,020	4,953	
Industrial—do	6,512	7,365	647	750	705	625	563	602	599	640	575	527	598	642	672	
Premiums collected:																
Total life insurance premiums—do	19,940															
Ordinary (incl. mass-marketed ord.)—do	14,912															
Group—do	3,753															
Industrial—do	1,275															
MONETARY STATISTICS																
Gold and silver:																
Gold:																
Monetary stock, U.S. (end of period)—mil. $	10,732	10,132	10,732	10,732	10,332	10,332	10,332	10,332	10,132	10,132	10,132	10,132	10,132	9,588	9,588	9,588
Net release from earmark§—do	−615	−889	−76	−38	−352	−62	−50	−262	2	0	−1	5	0	−544	38	
Exports—thous. $	37,789	51,249	9,774	2,614	10,430	3,564	1,955	2,861	434	97	84	1,586	522	1,117	23,831	
Imports—do	237,464	283,948	20,296	20,795	35,386	18,469	7,259	48,001	22,732	23,083	23,192	16,163	15,119	19,390	27,714	
Production:																
South Africa—mil. $	1,128.0	1,098.4	94.3	91.9	91.5	92.0	93.4	92.3	91.3	93.4	91.7	85.7	87.8	81.2		
Canada—do	81.8	77.2	6.7	6.5	6.7	6.7	5.8	6.3	6.1	6.3	6.6	5.9	6.0	5.9		
United States—do																
Silver:																
Exports—thous. $	27,613	19,499	3,273	2,661	1,527	1,269	913	651	1,580	237	212	1,382	864	1,499	10,574	
Imports—do	64,957	49,507	5,204	5,907	2,900	3,785	3,645	4,655	4,134	3,219	4,167	3,878	5,304	4,696	4,689	
Price at New York—dol. per fine oz	1.771	1.546	1.669	1.726	1.667	1.608	1.581	1.587	1.421	1.336	1.320	1.394	1.473	1.504	1.536	
Production:																
Canada—thous. fine oz[1]																
Mexico—do																
United States—do	47,483	41,030	4,699	3,535	3,985	3,867	1,016	1,718	2,741	4,067	3,499	3,287	3,257	3,976		
Currency in circulation (end of period)—bil. $	57.1	61.1	56.3	56.6	57.4	58.4	58.6	58.9	58.8	59.2	60.6	61.1	59.4	59.8	60.4	
Money supply and related data (avg. of daily fig.):⊕																
Unadjusted for seasonal variation:																
Total money supply—bil. $	210.0	224.1	217.5	222.3	219.9	223.7	226.0	224.9	226.2	227.5	229.6	235.1	235.3	229.0	231.3	p 236.2
Currency outside banks—do	47.7	51.1	49.5	50.1	50.5	51.0	51.9	51.9	51.9	52.2	52.8	53.5	52.6	52.6	53.2	53.5
Demand deposits—do	162.3	173.0	168.0	172.3	169.4	172.7	174.1	173.0	174.3	175.3	176.9	181.5	182.7	176.4	178.1	182.7
Time deposits adjusted¶—do	208.2	253.8	246.2	248.5	251.4	253.8	255.5	258.1	260.3	264.1	265.5	269.0	273.7	277.3	r 280.8	283.1
U.S. Government demand deposits¶—do	6.4	6.4	5.5	5.5	7.8	5.3	6.8	6.8	7.5	5.3	3.9	6.7	7.2	7.2	7.7	7.6
Adjusted for seasonal variation:																
Total money supply—do			219.7	221.2	223.8	225.5	227.4	228.0	227.6	227.7	227.7	228.2	228.8	231.2	r 233.5	p 235.1
Currency outside banks—do			50.0	50.5	50.8	51.1	51.6	51.7	51.9	52.2	52.2	52.5	52.8	53.2	53.7	54.0
Demand deposits—do			169.7	170.7	173.0	174.5	175.8	176.3	175.7	175.5	175.5	175.7	176.0	178.0	179.9	181.1
Time deposits adjusted¶—do			245.4	248.1	251.3	254.4	256.4	257.3	259.6	263.3	265.3	269.9	274.4	278.1	279.9	282.8
Turnover of demand deposits except interbank and U.S. Govt., annual rates, seas. adjusted:‡																
Total (233 SMSA's)⊙—ratio of debits to deposits			80.3	79.8	77.8	80.4	80.0	81.6	82.2	82.6	86.4	83.7	83.9	84.5	83.0	
New York SMSA—do			182.5	182.4	174.3	184.0	184.4	189.0	190.6	199.5	203.7	196.1	205.3	205.1	195.2	
Total 232 SMSA's (except N.Y.)—do			54.2	54.0	53.9	55.2	55.0	55.9	55.6	54.3	58.1	57.3	56.3	56.2	57.2	
6 other leading SMSA's♂—do			78.6	78.4	79.2	81.3	80.4	82.8	82.3	80.0	87.2	85.2	82.0	82.6	83.3	
226 other SMSA's—do			44.5	44.2	44.0	45.0	45.0	45.4	45.2	44.2	46.7	46.4	46.2	45.8	47.0	
PROFITS AND DIVIDENDS (QTRLY.)																
Manufacturing corps. (Fed. Trade and SEC):																
Net profit after taxes, all industries—mil. $	28,572	31,029	6,995			8,525			7,538			7,971				
Food and kindred products—do	2,549	2,754	612			700			739			703				
Textile mill products—do	413	558	93			151			139			175				
Lumber and wood products (except furniture)—mil. $	304	603	88			160			190			165				
Paper and allied products—do	719	501	128			156			141			76				
Chemicals and allied products—do	3,434	3,778	907			1,015			954			902				
Petroleum refining—do	5,893	5,829	1,524			1,390			1,508			1,407				
Stone, clay, and glass products—do	627	853	69			289			283			212				
Primary nonferrous metal—do	1,297	621	210			256			64			91				
Primary iron and steel—do	692	748	204			351			22			171				
Fabricated metal products (except ordnance, machinery, and transport. equip.)—mil. $	1,066	1,070	226			330			312			202				
Machinery (except electrical)—do	2,689	2,489	520			648			616			705				
Elec. machinery, equip., and supplies—do	2,349	2,555	542			663			633			717				
Transportation equipment (except motor vehicles, etc.)—mil. $	593	585	101			182			185			117				
Motor vehicles and equipment—do	1,424	3,097	867			937			406			887				
All other manufacturing industries—do	4,522	4,990	903			1,298			1,347			1,442				
Dividends paid (cash), all industries—do	15,070	15,251	3,805			3,882			3,481			4,083				
Electric utilities, profits after taxes (Federal Reserve)—mil. $																
SECURITIES ISSUED																
Securities and Exchange Commission:																
Estimated gross proceeds, total—mil. $	88,666	105,233	11,070	7,244	6,969	10,994	9,316	9,346	9,445	9,410	10,569	6,911	7,115	7,248	6,556	
By type of security:																
Bonds and notes, total—do	80,037	92,272	9,777	5,825	6,337	9,661	7,120	8,659	8,250	8,687	9,300	5,710	6,283	6,210	5,580	
Corporate—do	30,315	32,129	2,782	2,623	2,638	3,042	1,951	1,844	2,573	2,665	2,436	2,473	2,319	2,277	2,253	
Common stock—do	7,240	9,291	982	882	579	1,228	669	418	1,030	637	1,999	1,032	529	844	694	
Preferred stock—do	1,390	3,670	311	537	54	104	1,527	270	165	86	270	169	303	194	282	

r Revised. p Preliminary. [1] Includes $17.2 bil. SGLI.
§Or increase in earmarked gold (—). ⊕Beginning Jan. 1972 SURVEY, data reflect corrections to the latest benchmark levels available to nonmember banks and changes in seasonal factors. Revised monthly data back to 1964 will be shown later. ¶At all commercial banks.
‡Series revised to reflect recalculation of seasonal factors; revisions for periods prior to Feb. 1971 will be shown later ⊙Total SMSA's include some cities and counties not designated as SMSA's. ♂Includes Boston, Philadelphia, Chicago, Detroit, San Francisco-Oakland, anp Los Angeles-Long Beach.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

FINANCE—Continued

SECURITIES ISSUED—Continued

Securities and Exchange Commission—Continued																
Estimated gross proceeds—Continued																
By type of issuer:																
Corporate, total ♀ mil. $	38,945	45,090	6,075	4,042	3,271	4,375	4,147	2,532	3,768	3,387	3,704	3,673	3,151	3,315	3,229	.....
Manufacturing do	10,513	11,578	2,417	1,135	789	1,206	582	474	1,146	662	811	980	378	521	604	.....
Extractive (mining) do	2,093	1,283	111	109	100	174	111	97	90	87	129	73	105	61	189	.....
Public utility do	11,017	11,800	1,452	1,267	588	1,055	732	849	1,070	934	1,217	891	529	988	740	.....
Transportation § do	2,260	2,418	161	335	339	297	219	88	149	190	152	232	269	124	105	.....
Communication do	5,136	5,819	532	273	405	218	1,622	359	282	432	269	352	749	498	227	.....
Financial and real estate do	5,517	8,814	1,038	591	876	813	643	511	704	848	963	845	919	1,025	1,112	.....
Noncorporate, total ♀ do	49,721	60,143	4,995	3,202	3,698	6,619	5,169	6,815	5,677	6,022	6,864	3,237	3,964	3,933	3,327	.....
U.S. Government do	14,831	17,325	517	467	466	2,779	1,153	3,228	1,698	2,455	3,254	443	529	539	586	.....
State and municipal do	17,762	24,370	2,104	1,859	2,114	1,988	1,951	1,850	2,044	1,679	2,286	2,058	1,737	1,942	2,185	.....
State and municipal issues (Bond Buyer):																
Long-term do	17,762	24,370	2,104	1,859	2,114	1,988	1,951	1,850	2,044	1,679	2,286	2,058	1,737	1,942	r 2,185	2,020
Short-term do	17,880	26,281	2,453	2,482	1,840	2,932	1,353	1,882	2,781	1,843	2,785	2,492	1,594	1,752	r 3,407	1,402

SECURITY MARKETS

Stock Market Customer Financing*

Margin credit at brokers and banks, end of month, total mil. $	.....	1 6,835	5,392	5,598	5,701	5,783	5,860	5,917	5,990	6,016	5,995	6,835	6,850	6,427	.....	.....
At brokers do	.....	1 6,000	4,531	4,776	4,874	4,976	5,050	5,121	5,208	5,238	5,198	6,000	5,989	6,477	.....	.....
At banks do	.....	1 835	861	822	827	807	810	796	782	778	797	835	861	950	.....	.....
Other security credit at banks do	.....	1 1,298	1,183	1,206	1,235	1,263	1,183	1,206	1,237	1,204	1,209	1,298	1,313	1,327	.....	.....
Free credit balances at brokers:																
Margin accounts do	.....	1 387	465	445	431	415	410	405	364	393	412	387	448	434	.....	.....
Cash accounts do	.....	1 1,837	2,333	2,216	2,084	2,023	1,841	1,838	1,734	1,765	1,758	1,837	2,040	2,108	.....	.....

Bonds

Prices:																
Standard & Poor's Corporation:																
High grade corporate:																
Composite♂ dol. per $100 bond	61.5	65.0	65.8	65.0	63.7	63.5	63.2	63.4	64.2	65.2	66.4	66.5	67.1	66.7	r 66.2	65.1
Domestic municipal (15 bonds) do	72.3	80.0	82.8	80.4	75.6	74.8	74.0	77.4	81.7	84.7	84.1	83.5	84.6	83.8	84.1	82.5
U.S. Treasury bonds, taxable¶ do	60.52	67.70	67.94	67.57	65.72	65.84	66.16	67.33	69.35	70.38	70.47	68.80	68.79	68.32	68.43	67.66
Sales:																
Total, excl. U.S. Government bonds (SEC):																
All registered exchanges:																
Market value mil. $	4,763.24	8,803.91	766.76	766.33	761.07	667.64	603.44	678.46	758.11	773.19	743.05	872.36	963.66	862.43	.....	.....
Face value do	6,299.55	10,157.90	879.80	877.60	891.08	798.59	702.54	789.84	861.07	851.32	815.80	979.30	1,011.89	903.78	.....	.....
New York Stock Exchange:																
Market value do	4,328.33	8,009.57	682.48	688.22	690.89	613.16	564.20	627.76	694.85	704.31	683.91	803.14	866.66	770.82	.....	.....
Face value do	5,554.92	9,080.68	767.53	782.02	793.11	727.51	646.00	718.02	769.97	766.77	745.08	890.20	896.11	804.49	.....	.....
New York Stock Exchange, exclusive of some stopped sales, face value, total mil. $	4,494.86	6,563.82	600.80	615.41	574.79	509.87	444.24	489.80	478.40	530.42	497.11	639.34	596.42	521.85	569.24	515.14
Yields:																
Domestic corporate (Moody's) percent	8.51	7.94	7.84	7.86	8.03	8.14	8.14	8.12	7.97	7.88	7.77	7.75	7.66	7.68	7.66	7.71
By rating:																
Aaa do	8.04	7.39	7.21	7.25	7.53	7.64	7.64	7.59	7.44	7.39	7.26	7.25	7.19	7.27	7.24	7.30
Aa do	8.31	7.78	7.73	7.74	7.84	7.96	7.96	7.93	7.81	7.69	7.56	7.57	7.52	7.52	7.53	7.57
A do	8.56	8.03	7.96	7.99	8.14	8.20	8.21	8.20	8.04	7.97	7.88	7.81	7.70	7.70	7.66	7.74
Baa do	9.10	8.56	8.46	8.45	8.62	8.75	8.76	8.76	8.59	8.48	8.38	8.38	8.23	8.23	8.24	8.24
By group:																
Industrials do	8.26	7.57	7.36	7.43	7.68	7.80	7.85	7.80	7.64	7.58	7.46	7.42	7.34	7.39	7.35	7.42
Public utilities do	8.67	8.13	8.08	8.05	8.23	8.39	8.34	8.30	8.12	8.04	7.96	7.92	7.85	7.84	7.81	7.87
Railroads do	9.04	8.38	8.39	8.37	8.40	8.43	8.46	8.48	8.39	8.25	8.13	8.12	7.98	8.00	8.03	8.04
Domestic municipal:																
Bond Buyer (20 bonds) do	6.34	5.46	5.15	5.69	5.70	6.19	6.05	5.39	5.24	5.11	5.44	5.02	5.35	5.29	5.40	5.20
Standard & Poor's Corp. (15 bonds) do	6.50	5.70	5.44	5.65	6.14	6.22	6.31	5.95	5.52	5.24	5.30	5.36	5.25	5.33	5.30	5.45
U.S. Treasury bonds, taxable⊙ do	6.59	5.82	r 5.71	5.75	5.96	5.94	5.91	5.78	5.56	5.46	5.44	5.62	5.62	5.67	5.66	5.74

Stocks

Dividend rates, prices, yields, and earnings, common stocks (Moody's):																
Dividends per share, annual rate, composite dollars	8.99	8.81	8.84	8.85	8.85	8.85	8.82	8.77	8.76	8.75	8.73	8.73	8.75	8.78	8.79	8.80
Industrials do	9.76	9.50	9.55	9.57	9.55	9.57	9.53	9.43	9.43	9.41	9.39	9.39	9.42	9.45	9.45	9.49
Public utilities do	4.69	4.77	4.75	4.78	4.78	4.78	4.78	4.78	4.78	4.78	4.79	4.81	4.83	4.83	4.86	4.86
Railroads do	3.92	3.78	3.82	3.82	3.85	3.84	3.84	3.84	3.84	3.84	3.49	3.51	3.51	3.58	3.58	3.58
N.Y. banks do	6.77	7.28	7.28	7.28	7.28	7.28	7.28	7.28	7.28	7.28	7.28	7.31	7.31	7.31	7.31	7.31
Property and casualty insurance cos do	10.44	10.62	10.57	10.57	10.57	10.57	10.57	10.66	10.70	10.70	10.70	10.77	10.79	10.91	10.91	10.99
Price per share, end of mo., composite do	226.70	261.43	268.58	277.35	263.90	261.94	251.35	262.95	261.31	251.49	251.26	271.78	276.91	281.04	285.67	286.59
Industrials do	270.83	318.75	326.01	339.59	324.75	320.58	305.79	322.28	320.26	306.25	306.87	333.51	341.04	348.64	354.30	356.26
Public utilities do	79.06	84.16	89.49	85.82	81.51	84.95	83.31	79.70	78.81	82.41	79.80	85.56	84.18	81.48	80.77	77.94
Railroads do	65.61	85.12	80.28	87.10	83.44	84.56	81.86	93.50	93.32	86.56	82.15	92.07	95.27	94.21	95.75	94.88
Yields, composite percent	3.97	3.37	3.29	3.19	3.35	3.38	3.51	3.34	3.35	3.48	3.47	3.21	3.16	3.12	3.08	3.07
Industrials do	3.60	2.98	2.93	2.82	2.94	2.99	3.12	2.93	2.94	3.07	3.06	2.82	2.76	2.71	2.67	2.66
Public utilities do	5.94	5.67	5.31	5.56	5.86	5.63	5.74	6.00	6.07	5.80	6.00	5.62	5.74	5.93	6.02	6.24
Railroads do	5.97	4.44	4.76	4.39	4.61	4.54	4.69	4.11	4.11	4.44	4.25	3.81	3.68	3.80	3.74	3.77
N.Y. banks do	4.03	4.14	3.74	3.95	4.26	4.39	4.46	4.34	4.31	4.19	3.97	3.84	3.88	3.91	3.58	3.43
Property and casualty insurance cos do	4.02	3.25	3.23	3.27	3.35	3.15	3.15	3.08	3.11	3.31	3.33	3.27	3.28	3.24	3.14	2.90
Earnings per share (indust., qtrly. at ann. rate; pub. util. and RR., for 12 mo. ending each qtr.):																
Industrials dollars	15.30	r 17.53	17.08	.....	.....	18.31	.....	.....	15.05	.....	.....	r 19.86	.....	.....	18.60	.....
Public utilities do	6.89	r p 7.01	6.91	.....	.....	c 6.88	.....	.....	7.10	.....	.....	r p 7.14	.....	.....	.....	.....
Railroads do	3.53	r 3.93	3.09	.....	.....	4.04	.....	.....	4.32	.....	.....	r 3.93	.....	.....	.....	.....

r Revised. p Preliminary. 1 End of year. *New series; more detailed information appears in the February 1972 Federal Reserve Bulletin.
♀ Includes data not shown separately. § Beginning April 1971 SURVEY, data restated to include "other transportation" in addition to railroad data formerly shown.
♂ Number of bonds represented fluctuates; the change in the number does not affect the continuity of the series.
¶ Prices are derived from average yields on basis of an assumed 3 percent 20-year bond.
⊙ For bonds due or callable in 10 years or more.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

FINANCE—Continued

SECURITY MARKETS—Continued																
Stocks—Continued																
Dividend yields, preferred stocks, 10 high-grade (Standard & Poor's Corp.)—percent	7.22	6.75	6.48	6.59	6.82	6.99	7.03	7.04	6.90	6.75	6.78	6.81	6.57	6.67	6.76	6.91
Prices:																
Dow-Jones averages (65 stocks)	243.92	298.12	296.67	309.11	307.39	300.23	298.28	297.74	308.42	302.19	285.91	301.72	315.61	317.15	323.84	329.83
Industrial (30 stocks)	753.19	884.76	901.29	932.54	925.49	900.43	887.81	875.40	901.22	872.15	822.11	869.90	904.65	914.37	939.23	958.16
Public utility (15 stocks)	108.75	117.22	123.22	122.92	117.75	114.36	118.12	113.28	111.20	113.76	111.03	112.43	118.84	113.41	114.34	110.56
Transportation (20 stocks)	152.36	217.20	200.55	217.16	221.10	217.96	214.94	222.89	241.35	236.52	221.48	237.81	249.85	255.10	259.48	270.08
Standard & Poor's Corporation:♂																
Industrial, public utility, and railroad:																
Combined index (500 stocks)—1941–43=10	83.22	98.29	99.60	103.04	101.64	99.72	99.00	97.24	99.40	97.29	92.78	99.17	103.30	105.24	107.69	108.81
Industrial, total (425 stocks) ♀—do	91.28	108.35	109.59	113.68	112.41	110.26	109.09	107.26	109.85	107.28	102.21	109.67	114.12	116.86	119.73	121.34
Capital goods (116 stocks)—do	87.87	102.80	104.69	109.38	108.61	105.46	102.46	100.90	104.55	100.66	95.51	103.78	109.69	113.90	116.89	120.19
Consumers' goods (184 stocks)—do	80.22	99.78	98.54	102.41	101.96	100.96	100.55	99.82	103.34	101.31	97.47	103.92	106.45	109.42	113.20	115.05
Public utility (55 stocks)—do	54.48	59.33	62.42	62.06	59.20	57.90	60.08	57.51	56.48	57.41	55.86	57.07	60.19	57.41	57.73	55.70
Railroad (20 stocks)—do	32.13	41.94	39.70	42.29	42.05	42.12	42.05	43.55	47.18	44.58	41.19	43.17	45.16	45.66	46.48	47.38
Banks:																
New York City (9 stocks)—do	43.83	46.30	48.02	49.05	46.24	44.68	44.54	42.97	45.10	45.91	46.42	49.79	49.70	49.28	52.16	55.76
Outside New York City (16 stocks)—do	77.06	87.06	89.58	93.01	88.82	85.97	85.83	85.08	85.09	84.98	83.55	88.74	90.16	90.19	94.79	103.47
Property-liability insurance (16 stocks)—do	78.34	115.04	103.88	112.76	114.06	119.24	126.23	123.73	127.11	120.71	115.65	119.58	119.26	122.20	128.19	133.66
New York Stock Exchange common stock indexes:																
Composite—12/31/65=50	45.72	54.22	54.89	56.81	56.00	55.06	54.83	53.73	54.95	53.76	51.17	54.76	57.19	58.45	59.96	60.65
Industrial—do	48.03	57.92	58.43	60.65	60.21	59.25	58.70	57.62	59.13	57.52	54.50	58.85	61.33	63.36	65.18	66.10
Transportation—do	32.14	44.35	41.71	45.35	45.48	44.90	44.02	44.83	48.09	47.02	44.29	48.34	50.56	52.80	53.71	55.50
Utility—do	37.24	39.44	41.60	41.73	39.70	38.71	39.72	38.17	37.53	37.93	36.87	37.52	40.02	38.56	38.56	37.48
Finance—do	60.00	70.38	70.66	73.91	70.89	70.01	70.42	69.41	72.14	71.24	68.98	72.28	74.24	73.74	77.15	80.36
Sales:																
Total on all registered exchanges (SEC):																
Market value—mil. $	131,126	185,027	18,721	18,678	16,670	15,186	15,563	15,327	12,833	12,994	12,304	17,648	16,872	18,549	-------	-------
Shares sold—millions	4,539	5,916	581	581	535	462	409	460	393	403	405	574	547	609	-------	-------
On New York Stock Exchange:																
Market value—mil. $	103,063	147,098	14,661	14,850	13,368	12,249	11,903	12,271	10,165	10,214	9,757	13,997	12,971	14,278	-------	-------
Shares sold (cleared or settled)—millions	3,213	4,265	397	415	395	337	296	337	286	289	295	416	376	423	-------	-------
New York Stock Exchange:																
Exclusive of odd-lot and stopped stock sales (sales effected)—millions	2,937	3,891	390	402	303	304	265	321	253	280	276	378	380	376	404	368
Shares listed, N.Y. Stock Exchange, end of period:																
Market value, all listed shares—bil. $	612.49	741.83	709.33	734.34	706.82	709.59	684.56	711.93	709.00	681.17	679.42	741.83	761.35	782.94	790.22	791.04
Number of shares listed—millions	15,522	17,500	16,306	16,375	16,471	16,663	16,797	16,915	17,032	17,170	17,320	17,500	17,589	17,692	17,777	17,916

FOREIGN TRADE OF THE UNITED STATES

FOREIGN TRADE																
Value of Exports																
Exports (mdse.), incl. reexports, total—mil. $	43,224.0	44,136.6	4,156.0	3,849.5	3,970.4	3,740.1	3,395.9	3,424.1	4,264.9	2,893.2	3,263.9	4,088.9	3,872.6	3,818.4	4,349.2	-------
Excl. Dept. of Defense shipments—do	42,659.3	43,555.3	4,107.9	3,805.5	3,913.5	3,685.6	3,338.3	3,366.5	4,225.1	2,827.8	3,220.7	4,056.5	3,814.8	3,780.0	4,309.7	-------
Seasonally adjusted—do	-------	-------	3,814.6	3,521.3	3,782.6	3,660.7	3,492.7	3,678.0	4,510.6	2,709.9	3,159.7	3,858.6	4,220.8	3,805.6	3,890.7	-------
By geographic regions:																
Africa—do	1,579.1	1,694.1	149.2	137.2	131.6	142.6	160.1	141.7	173.2	53.3	106.7	183.0	148.7	131.3	136.6	-------
Asia—do	10,022.8	9,849.5	903.1	889.6	930.8	823.8	708.1	704.1	981.5	616.7	737.1	912.4	871.5	809.8	1,068.8	-------
Australia and Oceania—do	1,188.2	1,168.8	90.7	105.8	73.8	85.8	93.3	130.6	104.9	100.1	73.7	117.7	81.6	91.0	95.0	-------
Europe—do	14,816.8	14,574.1	1,512.0	1,303.0	1,324.4	1,149.5	1,120.0	1,114.9	1,421.1	820.7	988.8	1,404.2	1,304.2	1,289.6	1,436.5	-------
Northern North America—do	9,080.3	10,367.7	943.5	883.8	936.0	999.1	740.7	777.4	908.0	917.6	931.9	876.6	859.5	925.2	1,024.3	-------
Southern North America—do	3,241.3	3,154.2	274.7	271.9	267.1	265.4	272.8	259.6	310.0	223.6	230.8	287.4	262.0	274.5	296.1	-------
South America—do	3,290.0	3,328.2	282.8	281.7	306.8	273.8	302.8	295.5	366.1	161.2	194.9	307.5	309.1	297.0	291.9	-------
By leading countries:																
Africa:																
Egypt—do	77.2	62.9	3.0	4.2	3.8	2.7	10.3	2.5	5.7	2.0	4.0	8.2	5.2	5.9	9.1	-------
Republic of South Africa—do	562.7	622.4	50.9	44.0	46.7	49.2	50.2	47.3	65.2	17.8	52.1	88.8	67.4	38.3	48.4	-------
Asia; Australia and Oceania:																
Australia, including New Guinea—do	1,003.5	1,018.8	77.5	91.7	64.6	72.7	81.8	119.7	91.7	90.4	62.3	100.0	69.2	74.2	80.2	-------
India—do	572.5	648.2	61.7	87.1	78.3	49.5	52.1	45.9	63.7	38.7	44.0	51.8	41.8	29.2	45.9	-------
Pakistan—do	325.4	211.6	30.2	16.9	18.8	11.6	16.7	15.6	29.4	14.4	4.0	5.8	14.9	15.7	19.9	-------
Malaysia—do	66.6	73.8	5.0	5.0	5.1	9.5	4.4	6.0	8.9	4.7	5.5	8.4	7.6	5.5	9.5	-------
Indonesia—do	266.0	263.0	18.3	17.3	27.2	25.6	21.4	18.9	34.4	10.8	17.8	24.2	27.7	25.4	18.1	-------
Philippines—do	373.2	340.2	30.8	30.4	29.8	36.6	25.5	25.0	34.6	16.4	21.5	35.6	29.7	25.1	34.8	-------
Japan—do	4,651.9	4,054.7	364.2	331.2	370.5	303.4	261.0	299.7	371.2	291.6	329.0	403.9	370.9	321.7	512.6	-------
Europe:																
France—do	1,483.0	1,380.2	144.6	124.7	131.4	113.6	108.3	109.9	132.7	80.3	82.8	125.3	121.9	144.1	172.4	-------
East Germany—do	32.5	25.4	2.2	1.5	.7	1.2	.3	.2	1.8	.7	2.6	7.1	1.5	1.7	5.7	-------
West Germany—do	2,740.7	2,832.0	254.3	298.1	274.4	219.0	240.9	217.1	259.9	164.0	203.2	261.4	229.3	233.2	251.7	-------
Italy—do	1,353.0	1,314.0	123.6	119.5	143.6	92.2	87.1	96.3	120.8	65.7	90.5	142.6	110.8	114.4	144.8	-------
Union of Soviet Socialist Republics—do	118.7	160.6	18.4	12.2	8.0	11.0	12.8	10.8	14.9	9.3	13.7	26.6	21.6	29.6	35.1	-------
United Kingdom—do	2,536.3	2,374.0	283.7	189.4	194.4	179.0	164.4	156.3	240.4	133.2	153.9	255.7	253.8	182.8	277.0	-------
North and South America:																
Canada—do	9,079.3	10,365.7	943.5	883.8	934.6	999.1	740.7	777.4	908.0	917.6	931.9	876.6	859.5	925.2	1,024.2	-------

r Revised.
♂Number of stocks represents number currently used; the change in number does not affect continuity of the series.
♀Includes data not shown separately.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

FOREIGN TRADE OF THE UNITED STATES—Continued

FOREIGN TRADE—Continued																
Value of Exports—Continued																
Exports (mdse.), incl. reexports—Continued																
By leading countries—Continued																
North and South America—Continued																
Latin American Republics, total ♀ mil. $	5,695.2	5,667.0	487.3	484.3	501.5	477.8	502.5	487.2	584.2	329.6	372.8	520.9	504.3	502.6	515.1	
Argentina do	441.0	391.0	29.0	34.6	38.9	29.1	32.9	32.9	47.1	13.5	17.0	43.9	41.8	34.1	25.4	
Brazil do	840.5	966.3	77.5	80.0	88.0	72.9	88.9	80.2	107.5	48.8	60.8	87.5	88.0	96.9	95.7	
Chile do	300.3	223.7	19.0	18.5	18.4	19.3	20.2	20.4	24.5	10.0	14.0	20.5	17.8	18.2	16.6	
Colombia do	394.8	378.0	39.0	31.5	32.9	29.5	35.1	31.1	37.5	18.4	30.2	29.5	29.6	28.9	25.0	
Mexico do	1,703.7	1,622.1	144.2	137.3	135.1	135.7	135.5	126.5	134.8	131.3	136.1	150.8	133.2	140.5	158.8	
Venezuela do	759.3	787.1	66.9	71.8	79.9	70.0	70.7	76.0	82.3	39.8	43.1	69.3	74.4	69.9	73.4	
Exports of U.S. merchandise, total do	42,590.1	43,497.2	4,106.6	3,785.6	3,911.2	3,679.2	3,350.6	3,377.0	4,209.5	2,841.0	3,219.5	4,032.1	3,823.8	3,761.1	4,289.5	
Excluding military grant-aid do	42,025.4	42,915.9	4,058.5	3,741.6	3,854.3	3,624.7	3,292.9	3,319.4	4,169.7	2,775.6	3,176.4	3,999.6	3,765.9	3,722.7	4,250.0	
Agricultural products, total do	7,246.8	7,694.9	715.9	633.5	623.6	605.6	579.0	546.0	749.8	466.3	629.2	842.4	770.1	715.2	668.6	
Nonagricultural products, total do	35,343.3	35,802.3	3,390.7	3,174.2	3,287.6	3,073.6	2,773.3	2,830.7	3,459.6	2,374.7	2,590.3	3,189.7	3,053.7	3,045.9	3,620.9	
By commodity groups and principal commodities:																
Food and live animals ♀ mil. $	4,356.3	4,365.0	388.2	343.0	358.6	334.9	323.6	308.5	444.9	284.1	381.9	460.3	379.4	373.0	376.4	
Meats and preparations (incl. poultry) do	174.7	192.0	16.8	14.3	15.9	15.0	13.3	18.1	17.4	14.6	17.3	23.2	14.9	14.5	17.7	
Grains and cereal preparations do	2,596.0	2,447.4	226.0	195.8	213.2	172.3	184.2	170.8	277.6	137.5	189.6	224.4	215.8	229.2	198.8	
Beverages and tobacco do	701.7	709.6	67.0	57.9	64.3	60.0	61.4	74.4	122.7	10.1	12.0	76.2	126.2	112.0	49.5	
Crude materials, inedible, exc. fuels ♀ do	4,604.8	4,326.2	409.4	381.9	353.2	361.5	298.4	302.5	369.2	226.5	371.7	463.3	397.7	378.2	436.2	
Cotton, raw, excl. linters and waste do	372.1	583.5	74.6	62.4	44.6	44.5	31.2	24.4	47.8	29.7	42.0	65.4	53.9	65.2	72.1	
Soybeans, exc. canned or prepared do	1,215.9	1,324.8	110.2	102.9	92.8	110.0	109.2	102.7	93.7	90.9	146.4	158.4	134.9	110.4	102.9	
Metal ores, concentrates, and scrap do	939.5	485.9	45.7	48.2	45.2	40.3	39.8	35.4	53.2	24.3	21.9	37.5	25.4	30.7	41.9	
Mineral fuels, lubricants, etc. ♀ do	1,594.7	1,497.4	130.1	141.8	147.7	133.5	107.1	167.3	158.2	87.1	62.1	122.1	116.6	109.1	136.5	
Coal and related products do	1,044.1	950.7	82.5	86.4	99.8	89.1	65.0	117.3	106.7	53.3	19.8	76.4	71.6	70.5	87.4	
Petroleum and products do	487.9	478.9	43.0	50.0	42.7	41.0	36.6	45.6	45.4	29.4	35.8	36.4	36.5	31.4	42.8	
Animal and vegetable oils, fats, waxes do	493.0	615.0	56.5	54.2	49.2	49.3	62.7	45.4	58.1	40.6	37.0	58.9	52.4	39.7	38.2	
Chemicals do	3,825.6	3,837.4	335.6	323.9	338.8	347.9	368.0	385.4	424.7	205.3	223.1	309.1	337.8	351.8	342.3	
Manufactured goods ♀ do	5,065.2	4,413.0	404.5	388.6	380.8	390.4	353.3	352.2	436.3	253.0	315.2	409.3	357.4	391.9	434.8	
Textiles do	603.1	632.1	56.3	53.9	53.7	50.0	50.1	56.0	67.9	33.0	44.8	66.8	58.8	59.8	63.8	
Iron and steel do	1,268.8	791.1	67.9	65.8	65.3	72.7	72.1	57.4	70.7	39.3	65.5	83.5	62.9	65.4	74.7	
Nonferrous base metals do	892.5	595.6	61.4	60.2	57.5	54.1	35.3	36.7	51.7	24.3	36.1	56.0	42.9	53.2	55.6	
Machinery and transport equipment, total mil. $	17,881.9	19,464.8	1,948.3	1,728.1	1,840.1	1,633.0	1,421.8	1,383.0	1,815.5	1,384.2	1,498.2	1,760.3	1,664.9	1,637.4	2,057.6	
Machinery, total ♀ do	11,379.3	11,596.0	1,073.6	1,012.3	994.7	959.2	908.3	861.9	1,100.6	822.6	893.4	1,083.6	1,047.6	1,026.7	1,190.3	
Agricultural do	626.4	596.7	61.4	60.7	53.2	53.2	49.6	38.2	59.1	43.3	40.7	44.3	48.7	63.1	71.0	
Metalworking do	395.7	404.5	35.4	32.6	32.3	31.1	29.8	27.7	36.7	21.5	39.0	47.1	38.4	27.7	35.2	
Construction, excav. and mining do	1,422.3	1,404.2	135.1	143.2	126.6	111.9	110.3	98.0	140.0	94.5	101.3	121.8	122.0	121.5	145.4	
Electrical do	2,999.2	3,068.0	264.5	255.1	264.9	246.9	244.3	238.4	291.7	234.6	240.3	300.5	296.3	276.4	323.2	
Transport equipment, total do	6,502.6	7,895.7	874.7	715.8	845.4	673.8	513.5	521.1	714.8	561.6	604.7	676.7	617.3	610.8	867.3	
Motor vehicles and parts do	3,550.0	4,151.1	412.6	358.7	393.7	415.7	271.8	280.0	416.3	288.3	351.6	337.1	341.5	368.5	418.5	
Miscellaneous manufactured articles do	2,570.7	2,733.6	248.1	231.2	232.1	233.4	221.1	232.8	258.0	185.4	211.3	258.7	240.6	250.6	284.0	
Commodities not classified do	1,496.3	1,535.2	119.0	157.1	146.5	135.3	134.9	125.3	122.0	124.7	107.1	113.8	150.8	117.4	133.9	
Value of Imports																
General imports, total do	39,951.6	45,602.1	3,906.8	3,893.2	3,840.6	4,278.2	3,690.4	3,844.2	4,253.7	3,471.6	3,530.5	4,282.7	4,279.9	4,177.3	4,844.2	
Seasonally adjusted do			3,564.9	3,753.6	3,983.2	4,018.6	3,789.7	3,934.3	4,245.2	3,531.3	3,386.9	4,132.3	4,539.6	4,403.2	4,475.0	
By geographic regions:																
Africa do	1,112.9	1,236.8	94.7	113.1	106.1	104.3	96.3	113.3	134.7	78.6	81.0	139.9	104.1	119.4	126.4	
Asia do	9,621.2	11,782.5	890.2	979.5	935.1	1,119.2	851.5	934.8	1,104.0	946.7	1,060.9	1,327.0	1,126.7	999.3	1,332.1	
Australia and Oceania do	870.6	895.0	63.2	68.6	76.7	83.4	86.3	88.1	120.4	62.3	45.3	98.7	66.0	68.4	73.3	
Europe do	11,394.6	12,845.6	1,152.8	1,108.1	1,114.8	1,216.4	1,185.1	1,197.7	1,216.8	920.9	786.7	1,032.3	1,244.2	1,240.6	1,427.6	
Northern North America do	11,094.8	12,765.6	1,140.1	1,081.5	1,105.8	1,217.0	968.3	961.1	1,116.4	1,094.9	1,139.4	1,130.4	1,106.6	1,144.0	1,288.6	
Southern North America do	2,850.1	3,001.4	300.9	278.8	269.6	260.0	230.9	242.2	222.9	187.4	245.3	281.4	296.1	290.1	327.5	
South America do	2,983.1	3,033.9	266.2	263.4	233.2	280.3	276.7	306.0	335.5	178.3	169.1	269.4	330.8	312.0	275.8	
By leading countries:																
Africa:																
Egypt do	22.9	19.1	2.5	2.4	.9	.7	.7	2.1	4.3	1.2	.9	1.5	1.5	1.3	.6	
Republic of South Africa do	290.2	286.5	25.4	19.5	33.5	28.8	19.2	17.7	30.4	23.2	17.3	30.4	17.4	23.1	34.4	
Asia; Australia and Oceania:																
Australia, including New Guinea do	622.6	636.2	41.2	45.8	55.3	57.4	63.4	52.2	89.0	48.8	34.5	72.9	49.6	46.8	48.7	
India do	298.1	329.2	25.4	26.9	28.0	31.7	26.2	30.2	41.9	15.3	17.4	36.2	42.1	34.5	38.2	
Pakistan do	80.2	77.1	10.8	7.0	3.2	4.2	4.7	6.8	8.8	3.1	3.7	9.3	5.6	5.8	1.5	
Malaysia do	270.2	269.1	21.9	22.6	19.9	32.2	13.9	30.1	24.3	17.5	22.3	26.8	27.8	29.0	26.0	
Indonesia do	182.4	207.2	17.3	17.6	18.8	17.5	17.4	21.4	20.7	12.9	14.2	18.4	23.7	19.6	17.1	
Philippines do	471.7	495.8	33.5	47.0	38.4	48.8	39.8	41.8	47.2	38.3	39.8	64.4	22.8	30.0	49.1	
Japan do	5,875.4	7,260.9	555.1	614.5	574.5	685.1	490.6	530.4	649.4	604.5	706.5	811.0	664.5	580.7	847.1	
Europe:																
France do	942.3	1,087.8	98.2	94.2	102.3	108.8	101.4	102.5	98.7	65.7	71.9	75.8	102.1	103.5	138.0	
East Germany do	9.4	10.1	1.1	.8	.9	.8	.9	.9	1.0	.6	.4	1.1	1.6	1.1	1.0	
West Germany do	3,127.0	3,650.8	313.9	313.6	299.5	336.6	336.0	347.6	356.8	264.2	222.3	299.7	325.2	336.3	385.7	
Italy do	1,316.0	1,406.0	125.5	121.0	109.9	128.1	128.1	149.4	120.9	93.5	89.2	120.5	155.2	142.9	164.3	
Union of Soviet Socialist Republics do	72.2	56.8	7.6	5.0	6.4	6.1	5.1	3.7	5.3	4.8	2.3	3.0	3.8	4.6	5.8	
United Kingdom do	2,193.6	2,459.1	216.6	205.2	230.2	246.6	222.9	235.5	235.4	193.5	150.9	182.8	226.9	232.1	263.7	
North and South America:																
Canada do	11,092.0	12,761.7	1,140.0	1,081.3	1,105.7	1,216.7	967.7	961.0	1,115.1	1,094.9	1,139.1	1,129.9	1,105.8	1,143.4	1,288.1	
Latin American Republics, total ♀ do	4,778.9	4,882.3	452.6	450.1	405.4	441.8	406.3	449.0	461.8	283.8	315.2	453.8	518.6	512.9	486.9	
Argentina do	171.8	175.9	15.5	13.5	10.6	15.9	17.4	20.6	22.5	12.5	8.9	19.1	16.8	16.7	15.3	
Brazil do	669.5	761.8	38.2	59.8	46.8	81.7	76.7	100.1	103.1	32.3	26.7	62.7	100.1	98.1	50.5	
Chile do	157.0	90.9	14.5	9.7	5.7	7.1	9.4	6.8	14.7	.7	.6	2.7	4.5	6.4	10.7	
Colombia do	268.8	239.4	20.0	23.2	20.3	22.0	27.4	22.6	26.7	9.0	10.7	23.1	30.4	31.6	17.9	
Mexico do	1,218.5	1,262.5	126.3	124.2	114.4	105.0	83.4	88.9	88.2	84.9	116.3	120.2	122.4	145.6	155.0	
Venezuela do	1,082.0	1,215.8	135.3	107.9	104.8	107.4	100.2	104.0	102.5	85.8	95.5	109.2	119.6	97.2	127.8	
By commodity groups and principal commodities:																
Agricultural products, total do	5,767.4	5,768.1	500.8	555.3	479.7	529.8	487.3	555.9	625.0	286.0	291.0	550.9	585.8	590.5	507.9	
Nonagricultural products, total do	34,184.2	39,834.0	3,410.7	3,342.3	3,365.2	3,753.4	3,211.8	3,291.3	3,628.7	3,185.6	3,239.6	3,731.8	3,694.1	3,586.8	4,336.2	

r Revised. ♀ Includes data not shown separately.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

FOREIGN TRADE OF THE UNITED STATES—Continued

FOREIGN TRADE—Continued

Value of Imports—Continued

General imports—Continued																
By commodity groups and principal commodities:																
Food and live animals ♀	mil. $	5,374.7	5,531.2	458.7	522.1	446.1	500.7	482.1	529.4	610.7	290.2	302.8	542.9	547.1	540.8	472.9	
Cocoa or cacao beans	do	200.7	181.3	14.8	17.3	9.9	15.6	16.0	12.5	12.9	6.5	5.8	25.4	18.3	18.7	13.4	
Coffee	do	1,159.5	1,167.8	81.3	110.4	95.2	102.3	113.8	141.3	142.7	31.7	44.6	92.9	134.8	114.5	60.6	
Meats and preparations	do	1,014.4	1,050.4	87.6	83.7	79.5	105.0	94.6	102.0	128.9	61.8	61.9	110.3	97.0	81.9	83.1	
Sugar	do	725.3	763.6	67.4	81.1	58.8	69.9	68.1	81.3	98.8	46.2	41.3	71.2	75.1	67.5	62.6	
Beverages and tobacco	do	855.0	875.5	69.0	70.4	74.6	92.7	83.1	86.9	104.4	61.4	50.5	63.3	83.5	84.8	80.9	
Crude materials, inedible, exc. fuels ♀	do	3,307.2	3,384.6	309.6	281.6	297.7	352.3	323.6	305.0	308.4	247.2	254.4	296.1	288.9	276.4	313.5	
Metal ores	do	1,148.9	1,043.6	94.8	86.1	105.2	126.7	125.4	97.2	81.2	74.9	83.7	80.5	70.3	57.2	76.2	
Paper base stocks	do	501.9	502.3	49.9	44.0	39.8	49.2	37.8	43.5	40.0	37.8	42.5	42.6	41.9	42.7	46.7	
Textile fibers	do	201.7	158.4	16.0	16.0	13.1	12.3	14.2	17.6	16.2	7.6	3.9	15.4	13.4	19.6	12.6	
Rubber	do	236.5	216.0	15.4	15.1	17.1	25.4	16.8	23.9	19.2	15.6	13.7	19.6	18.3	17.0	20.7	
Mineral fuels, lubricants, etc	do	3,074.7	3,714.7	315.6	269.3	297.0	303.0	303.8	327.2	333.1	309.8	331.7	400.9	398.4	375.4	427.4	
Petroleum and products	do	2,764.3	3,323.3	283.8	234.5	264.3	268.0	275.6	298.7	303.0	276.4	307.8	354.7	352.5	331.9	388.5	
Animal and vegetable oils and fats	do	159.6	171.8	16.1	17.6	15.8	13.9	12.0	11.0	17.6	13.5	12.1	14.8	14.8	21.1	15.4	
Chemicals	do	1,450.2	1,612.1	145.5	150.4	150.4	142.3	138.6	148.1	165.9	114.5	90.2	116.0	159.4	150.8	192.0	
Manufactured goods ♀	do	8,438.3	9,548.5	795.7	824.0	851.4	948.2	783.0	812.5	896.2	701.5	716.4	865.5	872.3	800.6	930.0	
Iron and steel	do	2,030.2	2,725.4	190.0	208.1	260.8	300.0	254.3	236.7	259.3	219.6	220.0	202.9	175.0	184.0	182.9	
Newsprint	do	929.6	988.5	83.8	89.6	83.2	85.2	74.2	75.6	88.2	83.1	92.1	94.8	81.9	77.7	83.7	
Nonferrous metals	do	1,655.6	1,552.7	136.4	152.7	130.3	149.5	122.9	135.8	149.4	95.5	101.4	150.6	150.8	142.2	177.1	
Textiles	do	1,135.3	1,392.0	127.1	128.4	120.9	132.3	113.2	112.8	134.0	82.2	82.7	151.4	148.1	120.4	134.7	
Machinery and transport equipment	do	11,171.7	13,903.8	1,236.9	1,200.6	1,168.5	1,313.2	986.9	1,031.7	1,219.8	1,157.3	1,218.7	1,304.1	1,269.2	1,334.0	1,668.7	
Machinery, total ♀	do	5,288.7	5,967.8	526.9	532.8	475.6	561.9	473.1	442.8	523.8	495.1	503.6	550.4	575.0	568.2	745.6	
Metalworking	do	163.7	106.8	9.1	10.7	9.4	11.2	8.4	8.8	8.6	9.4	4.1	6.9	9.9	9.1	14.3	
Electrical	do	2,271.2	2,556.6	211.9	217.6	204.0	239.7	187.6	185.3	222.6	236.0	241.7	251.2	232.6	211.9	310.0	
Transport equipment	do	5,883.0	7,936.0	709.9	667.8	692.8	751.2	513.8	588.9	696.0	662.2	715.1	753.7	694.2	765.8	923.1	
Automobiles and parts	do	5,067.6	6,846.5	617.2	562.0	599.1	652.5	443.9	504.2	600.6	580.2	620.9	650.9	588.0	651.3	758.7	
Miscellaneous manufactured articles	do	4,846.3	5,384.1	442.2	436.5	416.0	492.8	453.3	474.7	485.0	449.2	436.9	539.0	519.1	477.5	610.4	
Commodities not classified	do	1,273.8	1,475.8	122.1	125.0	127.3	124.1	132.6	120.5	112.6	127.1	116.9	140.3	127.2	116.0	133.0	

Indexes

Exports (U.S. mdse., excl. military grant-aid):																
Unit value	1967=100	110.7	p114.4	115.7	116.2	114.6	112.8	113.2	113.0	113.8	115.0	113.8	115.4	115.8	117.0	115.5	
Quantity	do	123.9	p122.5	137.4	126.8	131.7	125.8	114.0	115.0	143.5	94.5	109.3	135.8	127.4	124.6	144.1	
Value	do	137.1	p140.1	158.9	147.4	150.9	141.9	129.0	130.0	163.3	108.7	124.4	156.6	147.5	145.8	166.4	
General imports:																
Unit value	do	111.6	p117.6	117.9	116.1	116.9	117.2	117.8	118.0	117.4	119.8	120.4	118.4	118.7	r121.7	123.3	
Quantity	do	133.1	p144.3	148.0	149.9	146.7	163.1	140.2	145.5	161.7	129.3	130.8	161.5	161.0	r153.2	175.4	
Value	do	148.6	p169.7	174.6	173.9	171.6	191.1	165.1	171.7	189.8	154.9	157.6	191.1	191.0	186.4	216.2	

Shipping Weight and Value

Waterborne trade:																
Exports (incl. reexports):																
Shipping weight	thous. sh. tons	239,774	204,057	16,934	17,923	18,730	17,844	15,698	18,182	20,320	12,933	13,772	18,374	15,432			
Value	mil. $	24,394	22,581	2,129	2,045	2,029	1,929	1,857	1,865	2,434	989	1,312	2,161	2,044			
General imports:																
Shipping weight	thous. sh. tons	294,896	311,936	29,103	25,157	27,363	29,567	27,546	28,528	28,126	23,824	26,271	28,004	27,209			
Value	mil. $	24,339	26,983	2,347	2,399	2,381	2,710	2,365	2,379	2,603	1,735	1,624	2,377	2,519			

TRANSPORTATION AND COMMUNICATION

TRANSPORTATION

Air Carriers (Scheduled Service)

Certificated route carriers:																
Passenger-miles (revenue)	bil.	131.71	1135.65	10.17	11.17	10.84	12.09	13.66	14.06	11.14	11.10	10.00	11.98	11.74	10.27		
Passenger-load factor§	percent	49.7	48.5	43.7	49.1	46.2	50.7	54.5	55.8	47.4	47.5	45.2	50.9	49.6	46.3		
Ton-miles (revenue), total¶	mil.	18,166	118,685	1,428	1,519	1,483	1,605	1,775	1,840	1,573	1,617	1,485	1,710	1,563	1,439		
Operating revenues ♀ ⊙	mil. $	9,290	10,046	2,181			2,507			2,801			2,557				
Passenger revenues	do	7,627	8,221	1,789			2,073			2,306			2,053				
Freight and express revenues	do	750	826	172			192			220			242				
Mail revenues	do	306	288	71			70			66			81				
Operating expenses ⊙	do	9,247	9,714	2,332			2,407			2,482			2,494				
Net income after taxes ⊙	do	−201	36	−160			17			169			9				
Domestic operations:																
Passenger-miles (revenue)	bil.	104.15	106.29	8.18	9.01	8.39	9.44	10.30	10.74	8.32	8.61	8.03	9.66	9.30	8.19		
Express and freight ton-miles	mil.	2,215	2,275	177	175	181	186	185	211	223	227	204	216	172	189		
Mail ton-miles	do	715	707	63	61	59	55	54	53	54	56	58	80	55	55		
Operating revenues ⊙	mil. $	7,180	7,745	1,704			1,950			2,101			1,990				
Operating expenses ⊙	do	7,181	7,501	1,833			1,866			1,899			1,902				
Net income after taxes ⊙	do	−184	23	−125			21			100			28				
International and territorial operations:																
Passenger-miles (revenue)	bil.	27.56	29.36	1.99	2.16	2.46	2.65	3.37	3.31	2.81	2.49	1.97	2.32	2.44	2.08		
Express and freight ton-miles	mil.	1,299	1,520	116	113	111	109	123	127	139	174	164	148	119	129		
Mail ton-miles	do	766	617	55	52	48	47	46	44	44	49	59	67	42	39		
Operating revenues ⊙	mil. $	2,109	2,300	477			556			700			568				
Operating expenses ⊙	do	2,066	2,214	499			540			583			592				
Net income after taxes ⊙	do	−17	13	−35			−4			69			−19				

Local Transit Lines

Fares, average cash rate	cents	25.7	26.6	26.5	26.6	26.6	26.6	26.6	26.7	26.7	26.7	26.7	26.8	27.0	27.6	27.2	
Passengers carried (revenue)	mil.	5,903	r5,545	r521	504	484	471	416	422	444	463	464	460	436	437	488	

r Revised. p Preliminary. 1 Annual total reflects revisions not distributed to monthly or quarterly data.
♀ Includes data not shown separately.
¶ Applies to passengers, baggage, cargo, and mail carried.
§ Passenger-miles as a percent of available seat-miles in revenue service; reflects proportion of seating capacity actually sold and utilized. ⊙ Total revenues, expenses, and income for all groups of carriers also reflect nonscheduled service.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
TRANSPORTATION AND COMMUNICATION—Continued																
TRANSPORTATION—Continued																
Motor Carriers (Intercity)																
Carriers of property, class I:																
Number of reporting carriers	[1] 1,359					1,381										
Operating revenues, total mil. $	11,050					[8] 6,159										
Expenses, total do	10,655					[8] 5,812										
Freight carried (revenue) mil. tons	554					[8] 325										
Freight carried, volume indexes, class I and II (ATA):																
Common and contract carriers of property (qtrly.)♂ average same period, 1967=100	112.4	119.0	116.1			125.6			122.0			112.0				
Common carriers of general freight, seas. adj. 1967=100	111.1	124.5	124.3	124.7	130.3	129.2	127.6	128.7	121.5	119.9	125.0	124.9	125.7	[p] 133.1		
Carriers of passengers, class I:																
Number of reporting carriers	[1] 71					73										
Operating revenues, total mil. $	722.2					[8] 345.3										
Expenses, total do	638.4					[8] 320.9										
Passengers carried (revenue) mil.	173.5					[8] 81.2										
Class I Railroads																
Financial operations (qtrly.):																
Operating revenues, total ♀ mil. $	11,985		[2] 3,125			[2][7] 3,371			[2][7] 3,102							
Freight do	10,916		[2] 2,877			[2] 3,139			[2] 2,885							
Passenger do	420		[2] 91			[2][7] 69			[2][7] 56							
Operating expenses do	9,731		[2] 2,513			[2] 2,573			[2] 2,458							
Tax accruals and rents do	1,844		[2] 494			[2] 521			[2] 478							
Net railway operating income do	[2] 485		[2] 118			[2] 277			[2] 166							
Net income (after taxes) do	78		[2][6] 37			[2][6] 179			[2][6] 66							
Traffic:																
Ton-miles of freight (net), revenue and nonrevenue bil.	777.2					[8] 388.9										
Revenue ton-miles (qtrly.) do	764.8	[2] 738.3	[2] 185.0			[2] 197.8			[2] 179.3			[2] 176.1			[2] 185.2	[2][10] 60.5
Revenue per ton-mile cents	[4] 1.431					[9] 1.568										
Passengers (revenue) carried 1 mile mil.	[4] 10,770					[7][8] 3,834										
Travel																
Hotels and motor-hotels: §																
Average sale per occupied room dollars	13.25	13.56	12.72	14.37	13.26	13.94	12.41	14.01	14.23	15.06	13.52	12.36	[3] 18.33	18.02	18.73	
Rooms occupied % of total	55	54	56	56	56	55	54	56	55	62	53	41	[3] 53	58	62	
Restaurant sales index—same mo. 1951=100	114	114	128	119	131	124	116	108	116	117	108	116	103	109	132	
Foreign travel:																
U.S. citizens: Arrivals thous.	6,659	7,591	517	563	573	595	897	1,065	768	647	544	427	655	579		
Departures do	6,499	7,059	471	556	620	802	908	777	598	509	442	530	500	531		
Aliens: Arrivals do	4,065	4,325	306	312	334	352	493	514	453	365	305	320	403	294		
Departures do	3,449	3,567	239	247	299	317	362	449	325	313	269	322	285	238		
Passports issued do	2,219	2,399	275	290	270	317	239	203	147	106	113	121	158	227	327	314
National parks, visits¶ do	45,753	48,863	1,689	2,609	3,653	6,725	10,268	9,802	4,978	3,417	1,931	1,246	1,273	1,556	2,184	
COMMUNICATION (QTRLY.)																
Telephone carriers:																
Operating revenues ♀ mil. $	18,103	19,812	4,760			4,897			5,008			5,146				
Station revenues do	8,912	9,699	2,341			2,386			2,446			2,526				
Tolls, message do	6,947	7,655	1,845			1,909			1,941			1,959				
Operating expenses (excluding taxes) do	11,581	[c] 12,785	3,046			3,109			3,325			[c] 3,304				
Net operating income (after taxes) do	3,058	3,354	813			859			809			873				
Phones in service, end of period mil.	104.1	108.4	105.2			105.9			107.1			108.4				
Telegraph carriers:																
Domestic:																
Operating revenues mil. $	402.5	396.8	91.2			98.7			95.5			111.4				
Operating expenses do	334.6	337.0	78.8			85.3			82.7			90.2				
Net operating revenues (before taxes) do	34.0	31.7	6.8			4.8			4.4			15.7				
International:																
Operating revenues do	193.7	206.0	51.9			50.4			50.9			52.8				
Operating expenses do	144.9	150.8	36.6			37.6			37.8			38.9				
Net operating revenues (before taxes) do	39.3	44.3	12.7			10.1			10.2			11.3				
CHEMICALS AND ALLIED PRODUCTS																
CHEMICALS																
Inorganic chemicals, production:																
Acetylene‡ mil. cu. ft.	[r] 14,834	13,647	1,220	1,237	1,350	1,317	1,185	1,038	1,018	1,055	1,119	1,093	[r] 1,023	1,004		
Ammonia, synthetic anhydrous thous. sh. tons	13,098	13,719	1,144	1,248	1,256	1,140	1,061	1,149	1,099	1,166	1,151	1,245	1,108	1,142		
Carbon dioxide, liquid, gas, and solid‡ do	[r] 1,115	1,258	97	102	100	117	120	131	117	112	103	99	[r] 91	92		
Chlorine, gas (100% Cl_2)‡ do	9,755	9,349	790	778	765	777	784	788	772	808	808	842	[r] 786	772		
Hydrochloric acid (100% HCl) do	1,918	2,025	176	167	183	180	173	158	166	165	171	176	[r] 173	171		
Nitric acid (100% HNO_3) do	6,460	6,671	604	598	587	524	488	510	533	552	554	616	588	587		
Oxygen (high purity)‡ mil. cu. ft.	[r] 283,860	[5] 313,416	29,668	27,634	28,934	27,344	26,322	20,740	23,565	24,926	24,342	26,274	[r] 27,275	26,258		
Phosphoric acid (100% P_2O_5) thous. sh. tons	[4] 5,466	6,034	535	539	519	479	472	468	500	496	471	541	496	530		
Sodium carbonate (soda ash), synthetic (58% Na_2O) thous. sh. tons	4,414	4,275	376	363	346	362	350	354	341	360	356	411	[r] 322	355		
Sodium bichromate and chromate do	150	131	12	12	13	12	10	9	9	12	9	10	[r] 10	11		
Sodium hydroxide (100% NaOH) do	10,074	9,692	822	800	795	798	814	818	791	831	840	876	[r] 824	809		
Sodium silicate, anhydrous do	612	605	64	61	56	46	36	44	47	56	53	53	[r] 43	49		
Sodium sulfate, anhydrous do	1,362	1,350	115	119	123	120	112	101	106	110	111	113	[r] 109	110		
Sulfuric acid (100% H_2SO_4)‡ do	29,577	29,285	2,593	2,599	2,520	2,380	2,289	2,248	2,300	2,389	2,457	2,728	2,440	2,506		

[r] Revised. [p] Preliminary. [1] Number of carriers filing complete reports for the year. [2] Source: Association of American Railroads. [3] See note "§". [4] Annual total reflects revisions not distributed to the monthly or quarterly data. [5] Beginning 1971, includes low purity oxygen. [6] Before extraordinary and prior period items. [7] Reporting roads only; excludes AMTRAK operations. [8] For six months ending in month shown. [9] Based on six months ending in month shown. [10] For month shown. [c] Corrected.

♂Indexes are directly comparable for the identical quarter of each year (and from year to year).

♀Includes data not shown separately. ‡Revised monthly data back to 1969 will be shown later.

§Effective Jan. 1972, data reflect an expanded sample that includes many motor-hotels; comparable Mar. 1971 figures are as follows: Average sale per room, $18.29; occupancy, 61%.

¶Data include visits, effective Jan. and July 1971, to Guadalupe Mts. and Redwood National Parks, and effective Jan. 1972, to Arches and Capitol Reef National Parks.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
CHEMICALS AND ALLIED PRODUCTS—Continued																
CHEMICALS—Continued																
Organic chemicals, production:♂⊕																
Acetic anhydride, mil. lb.	----	[1] 1,545.8	140.6	133.5	137.0	127.0	126.4	120.6	123.0	116.0	115.1	113.5	120.3	116.0	----	----
Acetylsalicylic acid (aspirin), do.	35.1	31.7	2.9	2.8	2.6	2.3	2.3	2.6	2.9	3.0	2.4	2.7	3.4	2.7	----	----
Creosote oil, mil. gal.	109.6	119.2	9.6	10.3	10.7	12.1	12.6	9.0	7.2	10.7	9.7	10.6	8.8	10.0	----	----
Ethyl acetate (85%), mil. lb.	[1] 158.7	[1] 159.8	10.8	15.9	14.5	11.7	14.6	11.6	13.6	11.7	9.7	16.7	11.5	13.1	----	----
Formaldehyde (37% HCHO), do.	[4] 4,312.4	[1] 4,373.1	382.1	383.4	371.9	362.1	340.2	361.8	413.2	409.0	387.6	338.3	r 400.2	418.4	----	----
Glycerin, refined, all grades:																
Production, do.	336.1	340.0	30.3	27.0	28.6	29.4	26.9	30.3	28.8	28.5	29.8	26.4	26.7	29.5	29.3	----
Stocks, end of period, do.	29.6	28.2	29.2	23.5	25.5	23.4	20.9	24.2	26.8	27.8	27.3	28.2	27.2	r 29.4	28.1	----
Methanol, synthetic, mil. gal.	[1] 744.7	r [1] 754.7	56.0	65.8	60.3	65.4	54.3	61.6	57.8	60.9	67.8	72.9	67.5	67.1	----	----
Phthalic anhydride, mil. lb.	[1] 714.0	[1] 766.4	61.9	61.3	71.1	67.7	67.9	62.3	58.3	65.1	72.8	69.8	66.4	71.3	----	----
ALCOHOL																
Ethyl alcohol and spirits:‡																
Production, mil. tax gal.	r 630.5	553.8	41.7	44.4	43.4	48.6	43.7	43.6	46.9	56.4	51.6	46.9	38.0	43.8	----	----
Stocks, end of period, do.	r 164.0	132.8	155.1	151.2	148.2	150.1	151.9	146.1	138.8	135.0	136.7	132.8	126.5	123.3	----	----
Used for denaturation, do.	513.8	436.5	37.7	38.1	38.8	38.8	33.1	35.2	34.2	37.9	37.1	36.2	35.1	36.8	----	----
Taxable withdrawals, do.	r 84.7	88.0	7.4	6.6	6.5	7.7	7.0	7.7	7.9	8.2	9.0	7.5	6.7	6.5	----	----
Denatured alcohol:‡																
Production, mil. wine gal.	r 276.9	r 234.0	20.4	20.6	20.9	21.1	18.0	19.0	r 18.3	20.3	18.2	19.6	r 18.9	19.7	----	----
Consumption (withdrawals), do.	r 276.2	r 234.5	20.4	20.7	21.0	21.7	17.7	18.9	18.4	r 20.1	18.2	19.6	r 19.4	19.6	----	----
Stocks, end of period, do.	3.0	r 2.9	2.7	2.7	2.8	2.3	2.6	2.8	2.7	2.9	r 2.9	r 2.9	r 2.4	2.5	----	----
FERTILIZERS																
Exports, total ♀, thous. sh. tons	16,005	[1] 17,106	1,285	1,680	1,210	1,418	1,616	1,350	1,666	1,318	1,322	1,308	1,630	1,563	1,185	----
Nitrogenous materials, do.	1,133	1,050	67	94	61	92	82	129	95	111	64	133	137	92	123	----
Phosphate materials, do.	12,543	[1] 13,431	986	1,381	968	1,122	1,256	1,005	1,327	1,010	1,079	899	1,209	1,072	882	----
Potash materials, do.	966	1,033	83	72	90	108	91	85	101	88	78	85	109	121	67	----
Imports:																
Ammonium nitrate, do.	326	374	43	104	58	18	14	17	31	19	14	17	28	36	52	----
Ammonium sulfate, do.	218	229	40	18	20	6	7	21	11	34	15	13	28	34	36	----
Potassium chloride, do.	4,165	[1] 4,549	474	475	518	184	272	407	463	354	468	316	468	377	582	----
Sodium nitrate, do.	129	203	7	34	13	28	17	23	47	[3]	0	2	13	14	6	----
Potash deliveries (K_2O), do.	4,603	5,026	569	895	391	276	270	325	364	437	404	389	423	381	651	----
Superphosphate and other phosphatic fertilizers (100% P_2O_5):																
Production‡, thous. sh. tons	r 4,596	4,966	430	436	415	393	378	394	420	418	415	484	417	r 449	----	----
Stocks, end of period, do.	484	389	453	262	258	336	406	382	339	287	343	389	r 389	353	----	----
MISCELLANEOUS PRODUCTS																
Explosives (industrial), shipments, quarterly§, mil. lb.	2,046.5	2,120.0	480.0	----	----	585.4	----	----	567.7	----	----	486.9	----	----	522.6	----
Paints, varnish, and lacquer, factory shipments:																
Total shipments, mil. $	2,737.1	2,830.9	235.6	253.0	258.2	291.6	254.1	274.0	266.8	226.8	208.9	183.3	209.6	225.9	----	----
Trade products, do.	1,497.6	1,562.8	124.5	142.9	145.7	169.7	156.6	158.9	149.9	119.6	107.6	90.8	101.4	117.2	----	----
Industrial finishes, do.	1,239.4	1,268.2	111.1	110.2	112.5	121.9	97.5	115.1	116.9	107.2	101.3	92.5	108.2	108.7	----	----
Sulfur, native (Frasch) and recovered:																
Production, thous. lg. tons	r [4] 8,531	[5] 8,616	695	684	716	686	721	734	696	769	745	754	748	731	777	----
Stocks (producers'), end of period, do.	4,038	4,311	4,123	4,069	4,119	4,095	4,156	4,190	4,208	4,321	4,388	4,311	4,374	4,297	4,274	----
PLASTICS AND RESIN MATERIALS																
Production:																
Thermosetting resins:																
Alkyd resins, mil. lb.	r [1] 635.6	[2]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Polyester resins, do.	r [1] 569.3	[1] 637.7	59.4	60.7	63.6	66.7	62.2	67.4	71.9	62.2	58.2	55.8	[2]	----	----	----
Phenolic and other tar acid resins, do.	r [1] 1,185.9	[1] 1,141.8	93.7	91.2	90.7	91.4	81.0	93.2	107.0	108.1	105.1	94.2	r 117.8	129.5	----	----
Urea and melamine resins, do.	r [1] 746.2	[1] 683.4	53.2	55.6	55.8	59.1	52.3	57.9	64.2	64.9	60.6	56.8	[2]	----	----	----
Thermoplastic resins:																
Cellulose plastic materials, do.	r [1] 182.2	[2]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Coumarone-indene and petroleum polymer resins, mil. lb.	r [1] 282.6	[2]	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Styrene-type materials (polystyrene), do.	r [1] 3,549.7	[1] 3,749.8	303.9	287.1	345.4	326.5	314.6	331.5	328.3	315.3	326.9	338.8	r 318.5	326.3	----	----
Vinyl resins (resin content basis), do.	r [1] 3,756.4	[1] 4,075.8	321.4	306.8	344.7	328.9	284.7	338.9	347.5	381.4	363.4	372.6	r [6] 332.4	313.4	----	----
Polyethylene, do.	r [1] 5,844.1	[1] 6,395.8	491.7	543.4	541.9	529.2	514.5	545.1	557.2	561.0	557.1	579.6	573.5	566.8	----	----
ELECTRIC POWER AND GAS																
ELECTRIC POWER																
Production (utility and industrial), total, mil. kw.-hr.	1,638,010	1,717,520	141,605	131,045	133,925	150,674	154,142	154,507	146,241	139,845	139,231	148,369	153,445	----	----	----
Electric utilities, total, do.	1,529,581	1,613,936	132,657	122,301	125,073	141,896	145,708	146,075	137,819	131,043	130,857	139,724	144,575	----	----	----
By fuels, do.	1,282,253	1,347,616	107,833	99,308	101,347	118,983	123,513	123,923	118,840	111,367	110,427	115,941	120,078	----	----	----
By waterpower, do.	247,328	266,320	24,824	22,993	23,727	22,914	22,194	22,152	18,979	19,675	20,430	23,783	24,497	----	----	----
Privately and municipally owned util., do.	1,254,344	1,322,540	107,331	98,619	101,413	116,548	119,677	119,754	114,428	108,873	107,728	115,022	118,860	----	----	----
Other producers (publicly owned), do.	275,237	291,396	25,327	23,682	23,660	25,348	26,030	26,322	23,391	22,170	23,129	24,701	25,715	----	----	----
Industrial establishments, total, do.	108,429	103,585	8,947	8,744	8,852	8,778	8,434	8,432	8,422	8,802	8,374	8,645	8,870	----	----	----
By fuels, do.	105,146	100,325	8,628	8,448	8,545	8,484	8,196	8,198	8,197	8,553	8,120	8,381	8,597	----	----	----
By waterpower, do.	3,284	3,260	319	297	307	294	238	234	225	249	254	263	273	----	----	----

r Revised.
[1] Reported annual total reflecting revisions not distributed to the monthly data. [2] Series discontinued. [3] Less than 500 short tons. [4] Annual total reflects sulfur content, whereas monthly data are gross weight. [5] Gross weight. [6] Beginning Jan. 1972, data exclude polyvinyl acetale, polyvinyl alcohol, and other vinyl resins; comparable Dec. 1971 figure, 320.1 mil. lb.

⊕Scattered revisions have been made in the annual data back to 1967; monthly revisions are not available.
♂Data are reported on the basis of 100 percent content of the specified material unless otherwise indicated. ♀Includes data not shown separately.
§Data exclude black blasting powder.
‡Revised monthly data for 1970 will be shown later.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

ELECTRIC POWER AND GAS—Continued

ELECTRIC POWER—Continued																
Sales to ultimate customers, total (EEI) mil. kw.-hr.	1,391,359	1,466,440	119,704	115,975	113,830	119,699	128,746	128,685	130,062	123,996	119,753	123,145	128,150	127,924		
Commercial and industrial:																
Small light and power§ do	312,750	333,752	25,703	25,320	25,377	27,838	31,061	30,912	31,241	29,219	27,471	27,358	28,008	27,954		
Large light and power§ do	572,522	592,698	48,947	49,051	49,338	50,493	49,405	49,698	50,561	50,593	50,069	49,606	50,145	50,268		
Railways and railroads do	4,633	4,537	422	380	363	355	353	351	342	353	370	400	423	417		
Residential or domestic do	447,795	479,079	39,819	36,897	34,263	36,391	43,205	43,026	43,093	39,022	37,048	40,891	44,644	44,295		
Street and highway lighting do	11,183	11,674	973	933	888	859	863	904	965	1,018	1,063	1,117	1,120	1,046		
Other public authorities do	37,816	39,820	3,426	2,983	3,198	3,336	3,436	3,371	3,445	3,376	3,348	3,374	3,397	3,529		
Interdepartmental do	4,660	4,880	415	411	402	427	423	423	414	415	385	399	414	415		
Revenue from sales to ultimate customers (Edison Electric Institute) mil. $	22,065.9	24,725.2	1,955.3	1,912.6	1,900.1	2,014.7	2,193.9	2,207.2	2,253.8	2,148.9	2,062.0	2,121.0	2,213.9	2,221.3		
GAS																
Manufactured and mixed gas:																
Customers, end of period, total ♀ thous	571		574			572			557							
Residential do	535		538			536			522							
Industrial and commercial do	34		35			34			34							
Sales to consumers, total ♀ mil. therms	1,497		646			328			154							
Residential do	832		392			177			64							
Industrial and commercial do	632		238			143			88							
Revenue from sales to consumers, total ♀ mil. $	132.7		60.1			33.4			15.8							
Residential do	82.4		39.1			20.5			8.5							
Industrial and commercial do	47.6		19.5			12.1			7.0							
Natural gas:																
Customers, end of period, total ♀ thous	41,204		41,599			41,373			41,378							
Residential do	37,826		38,166			37,998			38,032							
Industrial and commercial do	3,326		3,382			3,337			3,307							
Sales to consumers, total ♀ mil. therms	158,921		53,770			39,458			31,183							
Residential do	48,394		22,940			10,759			4,186							
Industrial and commercial do	103,821		29,147			27,467			25,429							
Revenue from sales to consumers, total ♀ mil. $	10,145.0		4,002.7			2,613.6			1,774.6							
Residential do	5,122.0		2,315.0			1,251.2			620.5							
Industrial and commercial do	4,753.0		1,609.8			1,311.1			1,092.5							

FOOD AND KINDRED PRODUCTS; TOBACCO

ALCOHOLIC BEVERAGES																
Beer:																
Production mil. bbl	r 133.12	137.35	12.53	12.33	12.37	13.71	13.28	12.28	11.41	10.53	9.86	10.02	9.96	10.38		
Taxable withdrawals do	r 121.86	127.50	11.00	11.04	11.05	12.87	12.48	11.89	10.96	9.80	9.74	9.83	8.75	9.09		
Stocks, end of period do	12.26	12.23	13.81	14.07	14.40	14.25	14.18	13.64	13.31	13.31	12.78	12.23	12.97	13.64		
Distilled spirits (total):																
Production mil. tax gal	r 212.29	182.36	18.14	15.93	13.11	13.44	10.35	10.14	13.42	17.71	18.35	18.75	18.66	16.27		
Consumption, apparent, for beverage purposes mil. wine gal	r1371.52	r1382.85	r 31.49	29.76	29.22	33.79	28.98	30.65	r 30.37	31.37	38.64	47.28	26.03			
Taxable withdrawals mil. tax gal	r 173.69	r 181.94	15.64	13.78	13.41	16.73	12.41	16.99	17.45	17.92	18.26	15.52	13.97	12.52		
Stocks, end of period do	1,008.54	996.62	1,015.72	1,015.08	1,015.78	1,012.28	1,009.46	1,001.43	997.52	996.16	993.62	996.62	1,000.98	1,003.89		
Imports mil. proof gal	90.89	102.14	7.65	7.06	7.49	9.03	6.93	7.78	18.55	10.18	8.24	7.18	6.00	6.47	8.17	
Whisky:																
Production mil. tax gal	146.36	119.41	13.42	10.47	8.54	6.85	6.61	5.86	8.56	10.79	11.41	11.25	12.86	12.28		
Taxable withdrawals do	112.88	r 116.73	9.85	8.53	8.29	10.09	7.58	10.64	11.74	12.34	12.19	9.59	8.49	8.40		
Stocks, end of period do	954.58	945.80	964.24	963.43	964.97	960.51	958.57	952.85	949.82	947.17	944.54	945.80	949.31	952.82		
Imports mil. proof gal	75.59	1 89.29	6.75	6.21	4.08	8.08	6.04	6.59	15.75	8.89	7.46	6.48	5.14	5.54	7.10	
Rectified spirits and wines, production, total mil. proof gal	113.67	116.10	9.87	8.61	8.70	10.22	8.69	10.28	10.46	10.97	12.14	9.77	8.19	8.19		
Whisky do	64.37	63.05	5.10	4.30	4.58	5.80	5.02	5.54	5.88	6.17	6.85	4.95	3.69	4.22		
Wines and distilling materials:																
Effervescent wines:																
Production mil. wine gal	r 23.03	24.60	2.81	2.17	1.08	1.34	1.50	2.23	2.09	2.05	2.38	2.66	1.95	1.20		
Taxable withdrawals do	r 20.36	22.10	1.79	1.47	1.44	1.65	1.21	1.32	1.75	2.39	2.81	2.91	1.36	1.05		
Stocks, end of period do	7.38	8.57	9.06	9.69	9.24	8.84	9.01	9.80	10.01	9.54	8.99	8.57	9.07	9.09		
Imports do	1.79	1.88	.12	.14	.15	.15	.10	.17	.35	.22	.14	.12	.14	.15	.15	
Still wines:																
Production do	r 245.04	357.29	5.28	6.13	7.68	6.30	5.32	9.18	57.65	126.44	69.05	54.21	79.74	75.98		
Taxable withdrawals do	r 216.97	247.20	22.37	20.39	18.06	20.59	17.40	18.73	20.42	22.26	23.13	25.31	21.17	19.91		
Stocks, end of period do	293.32	366.35	241.99	225.62	215.71	198.93	186.28	173.30	209.01	310.06	347.50	366.35	350.63	335.34		
Imports do	28.23	1 34.28	2.65	2.61	3.09	3.38	3.12	3.59	5.38	2.99	1.49	2.09	3.03	3.62	3.57	
Distilling materials produced at wineries do	303.08	402.38	1.38	.62	5.96	2.80	1.31	4.32	113.99	176.09	73.30	16.45	4.04	6.76		
DAIRY PRODUCTS																
Butter, creamery:																
Production (factory) mil. lb	1,136.7	1,142.5	111.0	113.0	119.5	112.2	90.2	79.6	69.0	79.4	78.3	88.7	101.5	99.4	106.8	
Stocks, cold storage, end of period do	118.8	96.8	157.9	180.4	209.8	235.1	251.2	246.8	222.0	188.9	155.0	96.8	79.1	93.1	r 109.7	131.0
Price, wholesale, 92-score (N.Y.) $ per lb	.704	.693	.707	.688	.687	.688	.687	.687	.692	.688	.688	.690	.688	.688	.688	.688
Cheese:																
Production (factory), total‡ mil. lb	r 2,203.8	2,380.4	202.8	210.3	232.5	233.9	211.1	198.9	181.2	184.8	177.3	197.8	199.0	197.3	230.8	
American, whole milk‡ do	r 1,425.9	1,517.5	126.9	137.3	159.0	161.9	141.6	129.6	112.4	111.2	103.3	115.7	124.0	122.9	147.7	
Stocks, cold storage, end of period do	324.5	304.3	302.1	314.6	337.4	371.3	385.6	378.8	357.6	333.5	316.7	304.3	296.2	285.0	r 288.9	312.0
American, whole milk do	254.0	238.9	236.3	248.0	268.8	296.4	311.0	303.9	283.7	262.4	250.9	238.9	232.1	223.6	r 228.4	247.1
Imports do	r 161.3	95.5	8.8	7.9	8.1	6.4	7.6	8.9	14.0	6.4	3.4	9.7	13.8	17.2	12.7	
Price, wholesale, American, single daisies (Chicago) $ per lb	.649	.671	.678	.679	.678	.678	.673	.670	.669	.669	.669	.676	.684	.707	.727	.719

r Revised. 1 Reported annual total; revisions are not distributed to the monthly data.
§Data are not wholly comparable on a year to year basis because of changes from one classification to another. ♀ Includes data not shown separately.
‡Revised monthly data for 1969 and 1970 will be shown later.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

FOOD AND KINDRED PRODUCTS; TOBACCO—Continued

DAIRY PRODUCTS—Continued

Condensed and evaporated milk:																
Production, case goods♂ mil. lb.	1,268.3	1,235.4	109.0	116.5	134.2	141.5	115.8	105.8	84.5	79.5	79.5	92.0	84.0	85.0	104.5	
Stocks, manufacturers', case goods, end of month or year♂ mil. lb.	115.7	88.6	67.6	51.2	104.0	133.8	162.4	172.9	163.0	151.5	111.7	88.6	73.9	63.8	61.3	
Exports:																
Condensed (sweetened) do.	16.4	35.1	4.4	11.3	2.2	8.5			.2	.8	2.9	2.4	1.1	1.0	5.0	
Evaporated (unsweetened) do.	33.3	32.7	2.6	2.7	3.8	4.2	1.6	2.9	1.2	2.4	2.8	3.5	3.3	2.9	2.9	
Fluid milk:																
Production on farms mil. lb.	r117,149	118,640	10,223	10,440	11,189	10,836	10,316	9,903	9,365	9,419	8,950	9,423	9,635	9,346	10,440	
Utilization in mfd. dairy products do.	r8 59,023	r8 60,698	r 5,400	r 5,640	r 6,133	r 6,273	r 5,548	r 5,072	r 4,416	r 4,397	r 4,131	r 4,489	4,991	5,050	5,787	
Price, wholesale, U.S. average $ per 100 lb.	r 5.71	r 5.87	r 5.85	r 5.72	r 5.61	r 5.51	r 5.62	r 5.75	r 5.99	6.09	6.17	r 6.17	6.13	6.10	r 6.01	p 5.88
Dry milk:																
Production:																
Dry whole milk mil. lb.	68.7	77.8	7.0	9.0	9.3	8.4	4.7	5.6	5.3	6.5	4.9	4.7	7.0	6.5	8.2	
Nonfat dry milk (human food) do.	1,442.8	1,473.6	131.1	149.2	174.6	177.8	137.3	117.6	92.2	93.5	77.4	95.4	98.5	100.0	118.0	
Stocks, manufacturers', end of period:																
Dry whole milk do.	4.7	4.0	3.9	5.5	7.8	9.0	8.2	7.5	7.0	6.7	5.3	4.0	4.6	4.0	4.3	
Nonfat dry milk (human food) do.	r 898.5	87.3	r 74.4	104.9	136.9	157.6	164.1	155.6	119.7	106.5	91.3	87.3	76.3	68.7	62.2	
Exports:																
Dry whole milk do.	13.8	25.0	1.0	1.0	.7	3.4	1.9	5.4	3.6	1.5	3.3	1.6	3.5	3.3	3.9	
Nonfat dry milk (human food) do.	212.3	7 124.2	17.6	7.2	15.0	16.7	4.3	2.8	6.5	4.1	18.4	11.5	10.7	7.1	15.4	
Price, manufacturers' average selling, nonfat dry milk (human food) $ per lb.	.263	.307	.277	.304	.314	.318	.318	.320	.320	.320	.321	.319	.318	.320	.319	

GRAIN AND GRAIN PRODUCTS

Exports (barley, corn, oats rye, wheat) mil. bu.	1,337.5	7 1,204.5	105.5	94.2	108.5	79.8	92.1	81.7	134.5	62.6	110.9	122.3	106.2	109.6	110.5	
Barley:																
Production (crop estimate) do.	r2 409.8	2 462.5														
Stocks (domestic), end of period do.	r 380.7	r 391.3	257.1			3 156.2			487.7			r 391.3			283.1	
On farms do.	r 238.5	r 254.4	142.1			3 81.4			316.6			r 254.4			165.1	
Off farms do.	142.2	136.9	115.0			3 74.8			171.1			136.9			118.0	
Exports, including malt§ do.	55.1	7 53.2	7.6	4.0	9.2	1.6	.5	1.6	2.8	2.4	2.3	5.5	.2	.3	2.6	
Prices, wholesale (Minneapolis):																
No. 2, malting $ per bu.	1.14	1.21	1.26	1.26	1.29	1.26	1.19	1.11	1.09	1.16	1.15	1.16	1.19	1.18	1.16	1.16
No. 3, straight do.	1.13	1.20	1.25	1.26	1.28	1.26	1.17	1.11	1.09	1.16	1.16	1.16	1.18	1.18	1.16	1.16
Corn:																
Production (crop estimate, grain only) mil. bu.	r2 4,099	2 5,540														
Stocks (domestic), end of period, total mil. bu.	r 3,736	4,642	2,525			1,560			3 663			4,642			3,344	
On farms do.	r 2,723	r 3,493	1,854			1,167			3 423			r 3,493			2,447	
Off farms do.	1,013	1,148	670			394			3 240			1,148			897	
Exports, including meal and flour do.	572.0	7 511.7	34.6	35.3	26.6	27.6	40.1	37.3	68.3	25.9	66.7	65.8	63.9	58.6	48.7	
Prices, wholesale:																
No. 3, yellow (Chicago) $ per bu.	1.35	1.39	1.55	1.51	1.51	1.59	1.49	1.29	1.15	1.10	1.07	1.21	1.22	1.21	1.23	1.26
Weighted avg., 5 markets, all grades do.	1.33	1.36	1.52	1.48	4 1.54	1.52	1.43	1.29	1.13	1.11	1.09	1.20	1.22	1.21	1.21	1.23
Oats:																
Production (crop estimate) mil. bu.	2 909	2 876														
Stocks (domestic), end of period, total do.	r 913	r 937	702			3 512			1,086			r 937			731	
On farms do.	r 702	r 687	502			3 311			806			r 687			502	
Off farms do.	211	r 251	200			3 201			281			r 251			228	
Exports, including oatmeal do.	21.3	7.1	.3	.3	.5	.1	.3	.4	.6	.2	.2	3.1	2.6	1.7	6.6	
Price, wholesale, No. 2, white (Chicago) $ per bu.	5 .72	6 .75	.78	.75		.80	.68	.64	.68	.73		.78				
Rice:																
Production (crop estimate) mil. bags♀	r2 83.8	2 84.3														
California mills:																
Receipts, domestic, rough mil. lb.	1,755	2,004	268	161	202	323	76	126	119	287	117	129	91	85	107	
Shipments from mills, milled rice do.	1,393	1,446	184	180	113	264	66	60	86	218	88	82	61	66	40	
Stocks, rough and cleaned (cleaned basis), end of period mil. lb.	82	98	135	77	114	101	88	109	113	101	93	98	97	86	115	
Southern States mills (Ark., La., Tenn., Tex.):																
Receipts, rough, from producers mil. lb.	6,497	5,567	139	108	67	28	141	924	1,627	1,106	397	439	570	298	279	
Shipments from mills, milled rice do.	4,438	4,206	323	279	268	221	206	458	498	427	294	509	610	375	341	
Stocks, domestic, rough and cleaned (cleaned basis), end of period mil. lb.	1,748	1,737	1,258	1,009	809	629	528	829	1,504	1,840	1,869	1,737	1,566	1,423	1,290	
Exports do.	3,828	3,252	259	315	268	365	144	190	440	395	160	232	276	535	219	
Price, wholesale, Nato, No. 2 (New Orleans) $ per lb.	.085	.087	.086	.086	.084	.087	.087	.087	.087	.087	.087	.089	.089	.089	.089	.089
Rye:																
Production (crop estimate) mil. bu.	r2 38.8	2 50.9														
Stocks (domestic), end of period do.	r 41.6	r 54.9	34.8			3 28.0			65.1			54.9			49.1	
Price, wholesale, No. 2 (Minneapolis) $ per bu.	1.15	1.06	1.14	1.18	1.18	1.21	.95	.94	.95	.96	.92	.93	1.06	1.08	1.05	1.06
Wheat:																
Production (crop estimate), total mil. bu.	r2 1,370	2 1,640														
Spring wheat do.	2 260	476														
Winter wheat do.	r2 1,110	2 1,163														9 1,149
Distribution do.	r 1,492	1,502	352			334			489			328				
Stocks (domestic), end of period, total do.	r 1,415	r 1,554	1,064			3 730			1,881			r 1,554			1,215	
On farms do.	r 531	700	384			3 239			834			700			528	
Off farms do.	884	853	679			3 491			1,047			853			687	

r Revised. p Preliminary. 1 Less than 50 thousand pounds. 2 Crop estimate for the year. 3 Previous years' crop; new crop not reported until beginning of new crop year (July for barley, oats, rye, and wheat; Oct. for corn). 4 Effective May 1971, weighted average, 4 markets, all grades. 5 Average for Jan., April-Sept., and Dec. 6 Average for Jan.-April, June-Oct., and Dec. 7 Annual total reflects revisions not distributed to the months. 8 Monthly revisions for Jan. 1970-Feb. 1971 will be shown later. 9 May 1 estimate of 1972 crop.

♂Condensed milk included with evaporated to avoid disclosing operations of individual firms. §Excludes pearl barley. ♀Bags of 100 lbs.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
FOOD AND KINDRED PRODUCTS; TOBACCO—Continued																
GRAIN AND GRAIN PRODUCTS—Con.																
Wheat—Continued																
Exports, total, including flour—mil. bu.	689.1	627.1	62.7	53.7	70.3	50.0	51.2	41.5	62.1	34.0	41.6	47.7	39.5	49.0	52.5	-------
Wheat only—do	638.7	588.3	59.9	50.7	66.7	43.4	47.4	38.3	59.4	31.7	39.5	45.2	36.5	45.6	49.8	-------
Prices, wholesale:																
No. 1, dark northern spring (Minneapolis) $ per bu.	1.91	1.77	1.82	1.82	1.84	1.82	1.73	1.64	1.64	1.72	1.71	1.70	1.72	1.63	1.63	1.66
No. 2, hd. and dk. hd. winter (Kans. City)—do	1.54	1.61	1.62	1.62	1.62	1.64	1.56	1.56	1.65	1.58	1.60	1.60	1.62	1.61	1.61	1.63
Weighted avg., 6 markets, all grades—do	1.79	1.72	1.77	1.75	[2] 1.78	1.75	1.65	1.62	1.63	1.69	1.68	1.68	1.70	1.66	1.67	1.69
Wheat flour:																
Production:																
Flour—thous. sacks (100 lb.)	253,094	249,810	21,004	19,662	20,216	20,994	20,225	22,164	22,137	21,702	20,090	20,961	20,704	r 19,994	20,980	-------
Offal—thous. sh. tons	4,409	4,279	363	335	347	366	349	378	378	368	338	351	356	342	359	-------
Grindings of wheat—thous. bu.	563,714	555,092	46,705	43,525	44,970	46,658	45,164	49,403	49,301	48,166	44,492	46,265	45,942	r 44,464	46,792	-------
Stocks held by mills, end of period thous. sacks (100 lb.)	4,329	4,362	4,732	-------	-------	4,586	-------	-------	4,861	-------	-------	4,362	-------	-------	4,542	-------
Exports—do	21,596	16,637	1,188	1,282	1,536	2,841	1,627	1,374	1,178	982	908	1,060	1,318	1,472	1,169	-------
Prices, wholesale:																
Spring, standard patent (Minneapolis) $ per 100 lb.	6.179	6.145	6.250	6.238	6.225	6.200	6.113	6.063	5.975	6.000	6.013	6.000	6.000	5.988	5.913	5.913
Winter, hard, 95% patent (Kans. City)—do	5.569	5.446	5.500	5.488	5.500	5.588	5.475	5.313	5.275	5.325	5.338	5.350	5.338	5.338	5.313	5.338
LIVESTOCK																
Cattle and calves:																
Slaughter (federally inspected):																
Calves—thous. animals	r 3,024	2,806	299	248	203	207	205	220	239	231	233	238	226	217	255	-------
Cattle—do	30,793	31,419	2,681	2,544	2,536	2,797	2,725	2,720	2,788	2,667	2,564	2,528	2,556	2,457	2,698	-------
Receipts at public markets—do	[4] 11,993	[4] 11,903	[4] 1,075	r [4] 985	[3] 1,004	[3] 1,005	[3] 878	[4] 1,011	[4] 1,018	[4] 1,170	[4] 1,238	[4] 853	[4] 952	[4] 900	[4] 907	[4] 838
Prices, wholesale:																
Beef steers (Omaha)—$ per 100 lb.	29.03	32.04	31.42	31.96	32.35	31.91	31.90	32.77	32.21	32.11	33.30	33.92	35.35	35.74	34.73	34.20
Steers, stocker and feeder (Kansas City)—do	30.10	32.11	31.88	32.07	31.78	30.60	30.32	32.41	31.72	34.07	34.23	35.11	36.61	36.92	36.95	36.93
Calves, vealers (Natl. Stockyards, Ill.)—do	38.17	38.58	41.00	41.00	39.00	39.00	39.00	35.00	38.00	38.00	38.00	41.00	41.00	44.00	46.00	46.90
Hogs:																
Slaughter (federally inspected)—thous. animals	r 78,187	r 86,667	8,266	7,794	6,932	6,983	6,220	6,922	7,379	7,190	r 7,566	7,547	6,395	6,280	7,794	-------
Receipts at public markets—do	[4] 15,333	[4] 16,593	[4] 1,479	r [4] 1,528	[3] 1,399	[3] 1,438	[3] 1,163	[4] 1,296	[4] 1,308	[4] 1,357	[4] 1,462	[4] 1,384	[4] 1,252	[4] 1,115	[4] 1,312	[4] 1,241
Prices:																
Wholesale, average, all grades (Sioux City) $ per 100 lb.	22.11	17.95	16.88	16.04	17.00	17.68	18.85	18.14	18.28	19.19	18.59	19.94	24.02	25.10	23.19	22.62
Hog-corn price ratio (bu. of corn equal in value to 100 lb. live hog)	19.1	14.5	11.8	11.3	12.3	12.2	14.0	15.6	16.1	19.5	19.4	18.2	20.8	23.6	21.2	19.9
Sheep and lambs:																
Slaughter (federally inspected)—thous. animals	10,010	10,256	920	899	772	827	815	812	919	919	818	846	847	801	903	-------
Receipts at public markets—do	[4] 2,462	[4] 2,342	[4] 178	r [4] 141	[3] 186	[3] 255	[3] 205	[4] 212	[4] 233	[4] 229	[4] 209	[4] 184	[4] 167	[4] 136	[4] 143	147
Price, wholesale, lambs, average (Omaha) $ per 100 lb.	27.43	27.43	26.88	30.25	31.12	31.25	28.88	27.75	27.50	25.88	24.75	25.75	27.88	28.38	29.38	31.00
MEATS AND LARD																
Total meats:																
Production (carcass weight, leaf lard in), inspected slaughter—mil. lb.	r 34,574	36,211	r 3,233	3,075	2,940	3,104	2,879	2,966	3,116	3,026	3,072	3,062	2,860	2,747	3,190	-------
Stocks (excluding lard), cold storage, end of period—mil. lb.	759	796	789	866	897	891	832	772	775	768	756	796	774	708	r 742	826
Exports (meat and meat preparations)—do	518	[1] 547	49	35	46	43	39	51	48	39	43	69	40	37	44	-------
Imports (meat and meat preparations)—do	1,844	[1] 1,789	151	141	133	170	155	166	223	110	102	188	161	94	138	-------
Beef and veal:																
Production, inspected slaughter—do	r 19,489	19,696	1,693	1,608	1,599	1,739	1,682	1,667	1,720	1,662	1,612	1,606	1,634	c 1,562	1,706	-------
Stocks, cold storage, end of period—do	347	375	306	299	295	306	321	341	359	355	335	375	363	c 316	r 297	298
Exports—do	32	44	5	5	4	4	3	3	3	3	5	4	3	3	4	-------
Imports—do	1,319	[1] 1,264	99	99	87	124	111	127	173	88	70	143	103	95	89	-------
Price, wholesale, beef, fresh, steer carcasses, choice (600–700 lbs.) (New York)—$ per lb.	.490	.547	.536	.546	.561	.549	.546	.561	.549	.536	.559	.579	[5] .593	.598	.570	.557
Lamb and mutton:																
Production, inspected slaughter—mil. lb.	514	522	49	47	40	40	39	39	45	46	42	44	45	43	49	-------
Stocks, cold storage, end of period—do	19	19	20	20	23	23	21	19	21	20	19	19	17	13	12	14
Pork (including lard), production, inspected slaughter—mil. lb.	r 14,570	15,992	1,491	1,420	1,301	1,324	1,157	1,260	1,350	1,319	1,418	1,412	1,181	1,143	1,434	-------
Pork (excluding lard):																
Production, inspected slaughter—do	r 12,114	r 13,441	r 1,225	1,195	1,098	1,105	969	1,065	1,132	1,125	1,198	1,199	r 1,008	r 995	1,227	-------
Stocks, cold storage, end of period—do	336	330	387	464	495	477	402	330	307	310	325	330	308	287	r 331	399
Exports—do	67	72	3	4	5	5	4	7	7	7	13	10	3	4	4	-------
Imports—do	347	357	36	30	31	32	33	30	31	14	25	38	49	35	39	-------
Prices, wholesale:																
Hams, smoked composite—$ per lb.	[6] .542	.534	.513	.517	.521	.535	.515	.536	.501	.542	.567	.639	.604	.584	.644	.617
Fresh loins, 8–14 lb. average (New York)—do	.569	.498	.438	.432	.485	.501	.584	.515	.498	.526	.494	.501	.607	.638	.570	.548
Lard:																
Production, inspected slaughter—mil. lb.	1,776	1,839	193	162	146	158	136	142	158	140	159	153	r 123	r 105	149	-------
Stocks, dry and cold storage, end of period—do	82	100	81	80	91	101	89	82	77	83	82	100	78	66	68	-------
Exports—do	366	282	44	39	31	18	11	16	20	12	38	4	19	18	15	-------
Price, wholesale, refined (Chicago)—$ per lb.	.160	.147	.155	.150	.146	.143	.151	.158	.153	-------	.149	.143	.144	.144	.144	.144
POULTRY AND EGGS																
Poultry:																
Slaughter (commercial production)—mil. lb.	10,242	r 10,357	791	757	749	894	909	1,020	1,003	r 1,009	935	870	825	758	826	-------
Stocks, cold storage (frozen), end of period, total mil. lb.	391	378	296	265	251	287	354	462	547	636	467	378	359	322	r 266	238
Turkeys—do	219	223	146	119	111	140	203	308	389	475	309	223	211	180	r 146	121
Price, in Georgia producing area, live broilers $ per lb.	.123	.128	r .125	.125	r .140	r .145	r .150	.135	r .130	.115	.110	.105	.120	.135	.135	.120

r Revised. c Corrected.
[1] Annual total reflects revisions not distributed to the months.
[2] Effective May 1971, weighted average, 5 markets, all grades.
[3] Data are for 41 public markets. [4] Data are for 40 public markets.
[5] Beginning Jan. 1972, price for East Coast (New York and Philadelphia average).
[6] Average for Mar.–Dec.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

FOOD AND KINDRED PRODUCTS; TOBACCO—Continued

POULTRY AND EGGS—Continued																
Eggs:																
Production on farms, mil. cases⊙	r 195.1	r 199.3	17.2	16.7	17.2	16.4	16.6	16.4	15.9	16.6	16.5	r 17.2	17.3	16.2	17.5	
Stocks, cold storage, end of period:																
Shell, thous. cases⊙	51	60	139	80	101	98	148	141	134	135	94	60	52	49	r 80	78
Frozen, mil. lb.	50	74	54	60	67	75	80	81	84	82	80	74	71	70	r 70	72
Price, wholesale, large (delivered; Chicago), $ per doz.	.425	.332	.331	.330	.291	.298	.330	.345	.329	.324	.335	.370	.300	.288	.328	.295
MISCELLANEOUS FOOD PRODUCTS																
Cocoa (cacao) beans:																
Imports (incl. shells), thous. lg. tons	279.2	315.8	25.2	28.2	17.8	25.3	28.7	23.2	24.6	13.8	10.9	50.3	39.8	39.3	27.6	
Price, wholesale, Accra (New York), $ per lb.	.341	.268	.279	.273	.253	.268	.280	.286	.271	.250	.241	.234	.259	.256	.285	.285
Coffee (green):																
Inventories (roasters', importers', dealers'), end of period, thous. bags♂	2,593	r 4,000	2,537			3,027			5,198			r 4,000			4,211	
Roastings (green weight), do.	r 19,960	19,607	5,164			4,663			4,481			5,299			5,316	
Imports, total, do.	19,727	1 21,669	1,480	2,032	1,759	1,941	2,132	2,720	2,754	621	875	1,818	2,560	2,172	1,137	
From Brazil, do.	4,712	5,991	114	310	317	666	570	971	993	155	144	647	1,009	877	212	
Price, wholesale, Santos, No. 4 (N.Y.), $ per lb.	.557	2 .461	.480	.450	.438	.438	.430	.433	.433	.433	.440					.463
Confectionery, manufacturers' sales, mil. $	1,906	r 2,002	176	157	135	139	115	r 160	r 215	r 204	r 195	r 157	r 167	172		
Fish:																
Stocks, cold storage, end of period, mil. lb.	306	r 302	210	196	198	231	270	305	338	333	314	r 302	r 274	245	226	
Sugar (United States):																
Deliveries and supply (raw basis):§																
Production and receipts:																
Production, thous. sh. tons	r 4,712	4,588	151	150	170	103	97	107	170	659	1,073	929	687	395		
Entries from off-shore, total♀, do.	6,675	6,601	412	88	178	441	692	775	601	280	333	441	1,285	113	462	
Hawaii and Puerto Rico, do.	1,497	1,230	119	97	176	159	143	80	50	95	122	132	41	34	153	
Deliveries, total♀, do.	r 11,459	11,444	1,026	860	894	1,087	1,034	1,121	1,123	947	903	1,001	823	727		
For domestic consumption, do.	r 11,310	11,291	1,013	851	883	1,068	1,020	1,107	1,109	935	888	990	812	715		
Stocks, raw and ref., end of period, do.	r 2,792	2,683	2,701	2,660	2,524	2,157	1,932	1,629	1,450	1,582	2,134	2,683	3,008	r 3,059	p 2,897	
Exports, raw and refined, sh. tons	7,892	481	12	38	21	25	37	84	80	59	4	55	31	137	50	
Imports:																
Raw sugar, total♀, thous. sh. tons	5,217	5,262	477	550	412	479	476	559	675	327	281	464	498	436	408	
From the Philippines, do.	1,522	1 1,544	84	142	96	108	170	179	178	112	141	242	54	53	135	
Refined sugar, total, do.	35	48	7	6	2	1	3	2	6	4	1	10	3	3	11	
Prices (New York):																
Raw, wholesale, $ per lb.	.081	.085	.084	.082	.084	.086	.086	.086	.086	.085	.086	.088	.092	.090	.092	.090
Refined:																
Retail (incl. N.E. New Jersey), $ per 5 lb.	.674	.695	.687	.695	.695	.693	.689	.701	.703	.704	.704	.707	.704	.707	.709	
Wholesale (excl. excise tax), $ per lb.	.112	.117	.117	.116	.116	.116	.118	.118	.118	.118	.118	.118	.118	.122	.122	.124
Tea, imports, thous. lb.	135,202	175,432	15,073	18,078	15,128	16,529	20,150	25,141	19,427	4,631	3,828	11,862	12,914	16,907	10,276	
FATS, OILS, AND RELATED PRODUCTS																
Baking or frying fats (incl. shortening):																
Production, mil. lb.	3,587.6	3,515.1	300.0	272.4	277.1	290.4	261.5	305.6	309.4	301.4	306.5	290.1	279.4	r 289.1	299.7	
Stocks, end of period⊕, do.	132.9	127.6	134.7	134.4	128.0	136.7	111.0	120.7	118.1	122.0	118.8	127.6	124.9	r 122.2	129.9	
Salad or cooking oils:																
Production, do.	r 3,389.1	3,499.8	292.0	270.1	288.6	332.6	290.5	309.9	300.2	276.5	265.3	308.4	314.2	r 301.0	348.9	
Stocks, end of period⊕, do.	75.6	76.1	70.7	72.0	81.1	82.2	71.2	79.0	66.5	77.3	74.5	76.1	85.9	r 80.2	89.6	
Margarine:																
Production, do.	r 2,230.5	2,290.2	195.9	181.0	176.4	185.9	163.4	173.3	194.7	188.2	210.1	219.4	207.6	r 194.7	201.9	
Stocks, end of period⊕, do.	45.6	57.1	57.7	55.9	61.2	61.6	72.9	65.5	63.5	64.3	60.7	57.1	68.9	r 71.4	69.0	
Price, wholesale (colored; mfr. to wholesaler or large retailer; delivered), $ per lb.	.289	.308	.305	.305	.305	.305	.308	.312	.310	.310	.310	.312	.312	.315	.313	.313
Animal and fish fats:△																
Tallow, edible:																
Production (quantities rendered), mil. lb.	558.2	541.6	51.7	43.2	42.8	45.3	40.2	40.8	47.6	42.1	43.5	45.2	42.2	r 40.3	45.6	
Consumption in end products, do.	r 569.7	598.6	53.3	44.4	44.9	46.6	40.4	50.1	51.0	53.5	53.5	47.7	46.9	r 58.5	53.6	
Stocks, end of period¶, do.	46.7	41.3	37.0	34.9	42.4	45.6	49.9	57.6	63.1	38.8	36.7	41.3	41.6	r 38.0	38.3	
Tallow and grease (except wool), inedible:																
Production (quantities rendered), do.	4,876.8	4,967.7	438.5	392.0	399.7	439.9	393.5	403.1	438.3	409.9	406.4	438.5	397.2	r 376.0	431.7	
Consumption in end products, do.	r 12,553.5	2,622.7	233.5	216.4	227.1	231.4	200.5	222.2	236.9	208.7	207.0	219.8	221.7	r 229.5	246.5	
Stocks, end of period¶, do.	396.1	379.7	380.6	363.9	374.0	401.9	441.5	424.5	409.7	401.2	397.4	379.7	411.8	r 392.7	378.7	
Fish and marine mammal oils:																
Production, do.	r 206.9	257.0	.6	9.2	21.8	54.8	55.3	58.5	30.4	16.8	6.0	1.6	1.4			
Consumption in end products, do.	r 69.6	56.9	4.7	4.0	4.3	5.3	5.6	4.5	5.4	4.1	4.5	4.4	3.4	r 3.8	3.5	
Stocks, end of period¶, do.	103.5	134.9	60.0	65.8	88.0	132.0	148.1	155.1	138.8	156.7	147.2	134.9	96.7	r 56.0	55.9	
Vegetable oils and related products:																
Coconut oil:																
Production: Crude, mil. lb.	3 247.1	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	(d)	
Refined, do.	544.0	553.3	50.6	49.5	45.0	49.4	39.9	36.2	47.9	56.0	46.8	39.2	45.0	r 44.0	56.8	
Consumption in end products, do.	r 750.2	740.7	68.9	64.3	63.4	68.4	52.1	53.4	60.8	63.1	62.3	59.2	57.4	r 63.0	66.3	
Stocks, crude and ref., end of period¶, do.	r 202.8	191.1	182.5	169.3	167.1	167.6	177.3	153.1	143.9	154.2	166.9	191.1	191.5	r 174.5	187.7	
Imports, do.	584.2	628.6	52.9	54.9	47.5	45.5	35.3	30.2	79.3	67.8	28.2	16.1	22.0	144.6	67.9	
Corn oil:																
Production: Crude, do.	474.0	485.1	43.7	41.4	41.0	42.7	42.4	40.1	42.0	42.4	40.7	33.4	38.7	38.7	44.0	
Refined, do.	440.9	440.4	38.2	34.2	37.2	34.6	39.1	33.7	42.2	33.9	35.7	40.0	35.9	40.8	36.7	
Consumption in end products, do.	449.6	447.4	35.2	35.5	33.5	38.2	36.0	35.9	38.4	35.2	40.7	44.8	37.9	40.0	38.6	
Stocks, crude and ref., end of period¶, do.	r 43.3	57.1	47.9	56.8	57.9	64.7	65.6	63.8	58.3	65.0	69.6	57.1	59.0	r 55.4	58.9	

r Revised. p Preliminary. d Data withheld to avoid disclosure of operations of individual firms. 1 Reflects revisions not available by months. 2 Average for Jan.–Nov. 3 Monthly data not available. 4 Series discontinued.

⊙Cases of 30 dozen. ♂Bags of 132.276 lb. §Monthly data reflect cumulative revisions for prior periods. ♀Includes data not shown separately; see also note "§". △For data on lard, see p. S-28. ⊕Producers' and warehouse stocks. ¶Factory and warehouse stocks.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

FOOD AND KINDRED PRODUCTS; TOBACCO—Continued

FATS, OILS, AND RELATED PRODUCTS—Continued

Vegetable oils and related products—Continued																
Cottonseed cake and meal:																
Production, thous. sh. tons	r 1,726.3	1,720.7	192.2	145.3	111.1	86.1	61.1	66.4	50.3	161.2	208.9	219.8	212.7	r 191.1	217.2	
Stocks (at oil mills), end of period, do	85.8	93.1	136.4	134.5	148.9	136.0	109.5	101.9	81.9	87.8	99.5	93.1	103.6	r 107.7	128.9	
Cottonseed oil:																
Production: Crude, mil. lb	r 1,211.5	1,209.4	134.0	103.3	78.8	61.0	43.5	47.0	34.3	111.8	149.0	154.0	151.1	r 134.9	154.0	
Refined, do	1,019.2	985.8	119.8	77.2	80.4	73.2	44.9	51.2	44.8	60.9	102.9	113.3	104.0	90.8	106.5	
Consumption in end products, do	r 931.9	728.5	69.4	56.1	61.2	70.9	50.1	57.8	50.8	52.9	57.4	60.5	53.2	r 49.7	67.1	
Stocks, crude and refined (factory and warehouse), end of period, mil. lb	184.3	188.3	246.9	265.7	279.7	224.6	167.2	142.9	93.8	130.0	159.5	188.3	239.4	r 277.3	295.0	
Exports (crude and refined), do	369.8	2 400.7	40.3	18.2	21.4	31.7	69.8	14.3	26.2	3.1	36.3	58.5	23.1	47.4	50.4	
Price, wholesale (N.Y.), $ per lb	.175	.190	.195	.193	.188	1.88	1.93	2.06	.201	.182	.177	.174	.168	.168	.168	.168
Linseed oil:																
Production, crude (raw), mil. lb	314.5	412.2	34.9	36.7	36.8	41.4	25.9	34.7	35.4	36.5	32.3	33.3	38.2	36.5	44.8	
Consumption in end products, do	r 191.4	213.7	18.4	19.6	19.6	22.7	17.9	19.4	18.0	17.6	15.3	16.0	17.3	r 17.6	19.1	
Stocks, crude and refined (factory and warehouse), end of period, mil. lb	148.5	224.9	180.7	192.8	187.2	203.8	193.2	177.1	179.9	203.7	210.8	224.9	236.7	245.3	264.0	
Price, wholesale (Minneapolis), $ per lb	.109	.089	.090	.088	.088	.088	.088	.088	.088	.088	.088	.088	.088	.088	.088	.088
Soybean cake and meal:																
Production, thous. sh. tons	r 17,379.5	17,096.2	1,463.2	1,458.9	1,464.8	1,401.6	1,429.7	1,473.8	1,257.1	1,362.0	1,366.4	1,471.3	1,463.3	r 1,387.3	1,474.3	
Stocks (at oil mills), end of period, do	112.2	119.8	138.4	152.0	198.7	149.4	192.4	189.7	121.4	177.9	167.2	119.8	131.3	r 115.6	136.8	
Soybean oil:																
Production: Crude, mil. lb	8,085.9	8,081.5	695.9	695.7	696.4	670.9	674.9	692.2	597.5	645.2	644.2	690.6	689.9	r 658.9	707.6	
Refined, do	6,276.3	6,297.9	557.9	495.0	506.7	526.7	482.9	532.8	568.6	534.5	504.2	534.1	525.5	523.4	559.7	
Consumption in end products, do	r 6,322.3	6,322.9	535.0	497.9	505.6	556.3	497.3	537.3	554.0	522.0	522.2	554.8	549.5	r 527.6	582.9	
Stocks, crude and refined (factory and warehouse), end of period, mil. lb	r 755.6	802.2	756.0	765.8	758.0	719.0	745.3	819.2	772.6	725.9	808.7	802.2	782.8	847.1	873.5	
Exports (crude and refined), do	1,372.4	21,611.7	156.0	168.0	191.8	140.9	189.0	78.1	122.2	143.0	43.5	153.8	157.8	71.3	59.3	
Price, wholesale (refined; N.Y.), $ per lb	.133	.151	.145	.135	.137	.146	.159	.172	.155	.154	.157	.139	.135	.139	.141	.143
TOBACCO																
Leaf:																
Production (crop estimate), mil. lb	r 1 1,908	r 1 1,709														
Stocks, dealers' and manufacturers' end of period, mil. lb	5,006	4,828	4,763			4,371			4,474			4,828			4,531	
Exports, incl. scrap and stems, thous. lb	510,325	2 474,209	52,352	44,458	47,415	39,778	35,404	41,791	76,841	3,509	2,375	59,622	95,447	86,990	28,581	
Imports, incl. scrap and stems, do	235,428	2 248,529	17,252	18,136	31,305	20,413	17,256	15,686	49,965	19,561	16,265	14,829	19,363	22,128	22,549	
Manufactured:																
Consumption (withdrawals):																
Cigarettes (small):																
Tax-exempt, millions	51,166	49,200	3,954	3,366	4,142	4,454	4,270	6,852	7,251	2,198	2,688	2,939	4,755	4,365		
Taxable, do	532,764	528,858	43,360	43,590	43,474	46,582	39,596	45,595	45,765	47,049	46,061	39,634	43,295	45,633		
Cigars (large), taxable, do	r 6,705	r 6,489	556	558	571	552	497	552	558	595	616	418	452	459		
Exports, cigarettes, do	29,147	31,802	2,381	2,258	2,476	3,038	3,033	4,234	5,753	768	1,246	2,048	2,568	3,642	2,577	

LEATHER AND PRODUCTS

HIDES AND SKINS

Exports:																
Value, total ♀, thous. $	145,200	155,821	14,933	11,512	13,124	12,851	7,118	11,583	12,517	15,158	16,198	17,201	13,489	12,917	19,226	
Calf and kip skins, thous. skins	1,316	2,222	189	289	258	254	131	198	127	123	117	220	193	128	124	
Cattle hides, thous. hides	15,222	15,962	1,611	1,239	1,304	1,235	694	1,166	1,338	1,565	1,696	1,656	r 1,272	1,153	1,686	
Imports:																
Value, total ♀, thous. $	51,300	52,100	6,200	7,400	5,000	6,900	4,900	4,300	4,000	1,800	800	3,900	4,100	5,800	6,600	
Sheep and lamb skins, thous. pieces	18,701	19,283	2,879	3,591	1,670	2,774	1,877	1,151	920	531	196	1,314	1,021	2,160	2,119	
Goat and kid skins, do	3,028	1,956	180	317	170	185	133	81	134	136	19	342	289	314	285	
Prices, wholesale, f.o.b. shipping point:																
Calfskins, packer, heavy, 9½/15 lb, $ per lb	.331	.294	.275	.300	.300	.300	.300	.300	.280	.280	.280	.320	.330	.450	.450	.575
Hides, steer, heavy, native, over 53 lb, do	.129	.145	.115	.158	.168	.141	.148	.148	.155	.153	.168	.163	.178	.190	.233	

LEATHER

Production:																
Calf and whole kip, thous. skins	2,717	1,621	129	128	132	142	83	123	142	142	163	150	117	126	142	
Cattle hide and side kip, thous. hides and kips	20,353	r 20,477	r 1,874	r 1,850	r 1,747	r 1,823	r 1,283	r 1,650	r 1,726	r 1,776	r 1,780	1,677	r 1,635	1,740	1,833	
Goat and kid, thous. skins	3,979	r 3,148	r 183	r 211	r 267	r 352	r 202	r 260	r 316	r 347	r 335	r 344	285	216	245	
Sheep and lamb, do	23,598	21,385	1,768	1,848	1,663	1,894	1,458	1,900	1,833	1,781	1,827	1,790	r 1,502	1,773	1,741	
Exports:																
Upper and lining leather, thous. sq. ft	79,365	82,944	7,784	7,256	7,391	8,144	5,534	6,540	6,830	4,810	5,976	9,198	7,727	8,379	9,816	
Prices, wholesale, f.o.b. tannery:																
Sole, bends, light, index, 1967=100	114.0	114.4	111.8	116.4	116.4	114.1	114.1	114.1	114.1	114.1	114.1	119.5	121.8	124.1	136.4	152.5
Upper, chrome calf, B and C grades, index, 1967=100	84.3	81.8	79.4	82.7	85.2	87.7	87.7	87.7	77.2	77.2	77.2	79.6	86.8	86.8	100.1	104.6

LEATHER MANUFACTURES

Shoes and slippers:																
Production, total, thous. pairs	562,318	533,857	50,153	46,747	43,916	46,490	37,556	46,092	45,399	44,936	40,525	42,720	44,525	r 44,310	48,585	
Shoes, sandals, and play shoes, except athletic, thous. pairs	451,816	425,135	40,650	37,432	34,477	36,403	30,885	35,567	34,446	34,589	31,789	35,574	36,766	r 36,206	39,102	
Slippers, do	96,181	96,534	8,245	8,104	8,422	9,086	5,962	9,654	9,904	9,361	7,775	6,222	6,939	r 1,230	8,445	
Athletic, do	8,955	9,620	937	919	781	781	592	728	879	820	795	794	680	r 728	844	
Other footwear, do	5,366	2,833	321	292	236	220	117	143	170	166	166	130	140	152	194	
Exports, do	2,154	2,106	175	167	146	211	144	163	226	163	156	167	161	151	203	
Prices, wholesale, f.o.b. factory:																
Men's and boys' oxfords, dress, elk or side upper, Goodyear welt, index, 1967=100	113.3	117.5	117.1	117.1	117.1	117.1	117.1	118.3	118.3	118.3	118.3	118.3	120.1	121.3	122.6	125.5
Women's oxfords, elk side upper, Goodyear welt, index, 1967=100	116.2	120.1	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2	120.2	121.5	121.5	124.1
Women's pumps, low-medium quality, do	117.1	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	121.2	124.3	127.4

r Revised. 1 Crop estimate for the year.
2 Annual total reflects revisions not distributed to the monthly data.
♀ Includes data for items not shown separately.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
LUMBER AND PRODUCTS																
LUMBER—ALL TYPES♀																
National Forest Products Association:																
Production, total mil. bd. ft.	34,462	36,617	3,339	3,451	3,168	3,384	3,194	3,220	3,242	3,199	3,028	2,924	2,832	3,076	3,383	
Hardwoods do.	7,023	6,334	509	577	599	613	590	502	532	574	536	481	450	467	506	
Softwoods do.	27,439	30,283	2,830	2,874	2,569	2,771	2,604	2,718	2,710	2,625	2,492	2,443	2,382	2,609	2,877	
Shipments, total do.	33,490	37,677	3,472	3,560	3,313	3,537	3,209	3,345	3,294	3,336	3,067	3,015	2,942	3,186	3,566	
Hardwoods do.	6,195	6,828	637	644	659	587	584	583	583	607	554	531	542	610	583	
Softwoods do.	27,295	30,849	2,835	2,916	2,654	2,950	2,625	2,762	2,711	2,729	2,513	2,484	2,400	2,576	2,983	
Stocks (gross), mill, end of period, total do.	6,326	5,266	6,143	6,042	5,895	5,741	5,723	5,594	5,532	5,397	5,358	5,266	5,155	5,040	4,857	
Hardwoods do.	1,478	984	1,355	1,287	1,225	1,250	1,253	1,145	1,084	1,053	1,035	984	891	743	666	
Softwoods do.	4,848	4,282	4,788	4,755	4,670	4,491	4,470	4,449	4,448	4,344	4,323	4,282	4,264	4,297	4,191	
Exports, total sawmill products do.	1,266	1,081	91	90	88	95	79	85	72	88	131	95	92	101	152	
Imports, total sawmill products do.	6,095	7,599	683	563	650	761	767	624	797	516	582	679	757	703	768	
SOFTWOODS																
Douglas fir:																
Orders, new mil. bd. ft.	7,398	8,471	691	853	614	814	695	685	735	696	775	668	819	657	915	
Orders, unfilled, end of period do.	457	566	593	673	633	677	787	715	735	704	740	566	722	644	689	
Production do.	7,475	8,247	755	741	639	723	605	769	715	657	713	696	685	764	826	
Shipments do.	7,427	8,362	716	773	654	770	585	757	715	727	739	702	663	735	870	
Stocks (gross), mill, end of period do.	1,058	943	1,107	1,075	1,060	1,013	1,033	1,045	1,045	975	949	943	965	994	950	
Exports, total sawmill products do.	380	329	35	36	27	36	9	17	12	21	58	21	25	13	49	
Sawed timber do.	87	88	8	11	5	10	2	6	3	4	21	3	8	3	15	
Boards, planks, scantlings, etc. do.	292	240	27	24	22	25	6	12	8	17	37	19	17	10	34	
Prices, wholesale:																
Dimension, construction, dried, 2″ x 4″, R. L. $ per M bd. ft.	92.22	[1] 117.68	110.95	111.50	112.12	116.72	125.72	129.92	128.88	128.59	127.45	130.23	134.97	135.33	135.70	137.42
Flooring, C and better, F. G., 1″ x 4″, R. L. $ per M bd. ft.	226.76	[1] 227.78	228.10	228.10	224.99	224.22	224.22	232.02	232.02	231.87	226.28	225.35	[2]			
Southern pine:																
Orders, new mil. bd. ft.	7,316	8,640	704	790	702	771	749	724	690	744	693	696	819	740	808	
Orders, unfilled, end of period do.	373	421	425	448	447	454	463	440	405	385	406	421	519	525	517	
Production do.	7,295	8,432	710	750	694	731	718	721	715	756	694	688	691	730	782	
Shipments do.	7,267	8,592	751	767	703	764	740	747	725	764	672	681	721	734	816	
Stocks (gross), mill and concentration yards, end of period mil. bd. ft.	1,376	1,216	1,312	1,295	1,286	1,253	1,231	1,205	1,195	1,187	1,209	1,216	1,186	1,182	1,148	
Exports, total sawmill products M bd. ft.	78,418	64,923	6,232	5,173	6,091	6,931	8,563	5,140	6,973	1,760	1,338	7,050	4,058	5,883	4,521	
Prices, wholesale, (indexes):																
Boards, No. 2 and better, 1″ x 6″, R. L. 1967=100	107.9	133.7	124.5	127.1	130.7	133.2	140.7	143.2	143.2	143.2	143.0	143.4	144.2	146.0	149.1	153.4
Flooring, B and better, F. G. ,1″ x 4″, S. L. 1967=100	122.9	132.8	129.6	131.3	131.3	132.6	136.0	136.0	136.0	136.0	136.0	136.0	136.9	138.1	138.7	141.8
Western pine:																
Orders, new mil. bd. ft.	9,341	10,458	869	925	845	973	940	872	971	906	786	847	778	782	968	
Orders, unfilled, end of period do.	334	362	374	386	356	374	437	368	365	374	341	362	433	407	424	
Production do.	9,378	10,175	924	931	823	876	868	914	974	887	806	794	705	820	940	
Shipments do.	9,371	10,430	919	913	875	955	877	941	974	897	819	826	707	808	951	
Stocks (gross), mill, end of period do.	1,634	1,382	1,583	1,601	1,549	1,470	1,461	1,437	1,437	1,427	1,414	1,382	1,380	1,392	1,381	
Price, wholesale, Ponderosa, boards, No. 3, 1″ x 12″, R. L. (6′ and over) $ per M bd. ft.	83.79	96.44	84.94	101.21	99.29	92.70	96.40	106.24	109.10	106.57	105.14	108.28	113.20	117.69	121.77	127.01
HARDWOOD FLOORING																
Oak:																
Orders, new mil. bd. ft.	304.4	322.5	25.6	25.2	27.7	32.1	32.3	27.0	26.9	27.8	24.0	24.0	24.9	23.7	26.8	
Orders, unfilled, end of period do.	9.1	8.1	9.4	9.3	9.3	11.6	14.5	10.0	8.4	8.7	7.4	8.1	10.1	11.4	13.7	
Production do.	315.2	315.9	28.7	28.2	24.7	25.4	25.0	28.3	37.3	25.2	22.7	22.7	21.8	20.5	21.5	
Shipments do.	306.7	321.6	26.8	25.2	27.7	29.9	29.4	31.3	27.8	27.1	24.4	24.4	22.5	22.6	24.2	
Stocks (gross), mill, end of period do.	33.3	22.0	35.4	38.1	35.2	32.5	28.1	25.1	24.6	23.2	21.4	22.0	21.3	18.8	16.1	
METALS AND MANUFACTURES																
IRON AND STEEL																
Exports:																
Steel mill products thous. sh. tons	7,053	2,827	186	189	183	249	298	164	286	172	248	397	208	221	261	
Scrap do.	10,365	6,256	472	526	642	579	440	552	794	373	284	494	332	519	588	
Pig iron do.	310	34	3	7	1	5	5	4	3	1	[3]	3	1	2	1	
Imports:																
Steel mill products do.	13,364	18,322	1,254	1,363	1,792	2,112	1,688	1,554	1,780	1,437	1,472	1,336	1,093	1,129	1,095	
Scrap do.	346	325	24	26	20	30	24	33	37	28	27	31	29	31	30	
Pig iron do.	266	320	7	31	26	40	37	39	54	18	24	35	7	54	5	
Iron and Steel Scrap																
Production thous. sh. tons	[4] 52,575	49,177	5,145	5,022	5,066	4,771	4,012	2,556	3,201	3,498	3,420	3,557	3,795	r 3,949	p 4,335	
Receipts, net do.	[4] 34,148	32,870	3,319	3,069	3,084	3,180	2,416	2,116	2,419	2,821	2,490	2,391	2,926	r 2,938	p 3,547	
Consumption do.	[4] 85,559	81,612	8,373	8,304	8,308	7,565	6,252	4,583	5,624	5,966	5,822	6,023	6,950	r 6,913	p 7,850	
Stocks, end of period do.	7,668	8,298	7,518	7,301	7,195	7,597	7,780	7,863	7,898	8,260	8,357	8,298	8,251	r 8,219	p 8,251	
Prices, steel scrap, No. 1 heavy melting:																
Composite (5 markets) $ per lg. ton	40.72	33.19	36.26	33.33	34.29	31.62	31.24	29.90	31.78	31.53	29.70	28.93	31.03	32.84	33.66	32.74
Pittsburgh district do.	42.00	36.80	39.00	37.00	37.50	36.50	35.50	36.00	36.00	35.00	34.00	33.00	36.00	38.00	36.00	35.50

r Revised. p Preliminary. [1] Beginning Jan. 1971, data reflect changes in size specifications, and are not comparable with those for earlier periods. [2] Series discontinued. [3] Less than 500 tons. [4] Annual data: monthly revisions are not available. ♀ Totals include data for types of lumber not shown separately.

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	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

METALS AND MANUFACTURES—Continued

IRON AND STEEL—Continued

Ore

Iron ore (operations in all U.S. districts):																
Mine production, thous. lg. tons	89,760	r 82,161	5,898	6,345	9,158	9,071	9,011	6,737	8,325	6,309	5,507	5,360	r 4,585	4,586		
Shipments from mines, do	88,011	r 79,531	2,646	5,439	10,495	11,047	10,623	8,264	9,001	7,969	5,989	3,891	r 2,037	1,649		
Imports, do	44,876	40,124	3,678	3,049	4,643	5,361	5,124	3,969	2,920	3,166	3,220	2,161	1,317	1,701	1,732	
U.S. and foreign ores and ore agglomerates:																
Receipts at iron and steel plants, do	125,107	114,051	4,880	8,684	14,169	16,042	14,780	11,153	11,695	10,144	8,355	5,879	3,479	3,190	4,188	
Consumption at iron and steel plants, do	123,261	108,966	11,495	11,054	11,703	10,535	9,158	5,041	6,902	7,388	7,130	8,006	8,668	9,001	10,505	
Exports, do	5,494	3,061	373	366	351	325	355	187	203	281	119	163	20	14	149	
Stocks, total, end of period, do	[1] 71,500	78,714	59,898	57,762	59,124	62,929	67,306	71,854	76,262	78,040	79,187	78,714	75,822	72,723		
At mines, do	[1] 15,316	17,552	24,372	25,301	24,001	22,057	20,498	18,605	17,945	16,398	15,942	17,552	20,130	23,156		
At furnace yards, do	52,781	57,738	33,860	31,490	33,957	39,463	45,085	51,197	55,941	58,697	59,922	57,738	52,550	46,730	40,412	
At U.S. docks, do	3,403	3,424	1,666	971	1,166	1,409	1,723	2,052	2,376	2,945	3,323	3,424	3,142	2,837	1,826	
Manganese (mn. content), general imports, do	990	1,019	74	93	93	114	143	119	99	40	41	102	104	92	87	

Pig Iron and Iron Products

Pig iron:																
Production (excluding production of ferroalloys), thous. sh. tons	91,435	81,305	8,518	8,421	8,783	7,930	6,851	3,701	5,148	5,532	5,350	5,930	6,617	6,598	7,708	
Consumption, do	[1] 90,126	80,319	8,492	8,387	8,714	7,883	6,751	3,339	5,146	5,473	5,384	5,901	6,584	r 6,379	p 7,565	
Stocks, end of period, do	2,082	1,777	1,885	1,860	1,835	1,859	1,888	1,940	1,886	1,829	1,801	1,777	1,783	r 1,742	p 1,738	
Prices:																
Composite, $ per lg. ton	69.33	76.03	73.70	73.70	73.70	77.70	77.70	77.70	77.70	77.70	77.70	77.70	77.70	77.70	77.70	
Basic (furnace), do	69.26	75.83	73.33	73.33	73.33	73.33	78.33	78.33	78.33	78.33	78.33	78.33	78.33	78.33	78.33	78.33
Foundry, No. 2, Northern, do	70.33	77.00	74.50	74.50	74.50	74.50	79.50	79.50	79.50	79.50	79.50	79.50	79.50	79.50	79.50	79.50
Castings, gray iron:																
Orders, unfilled, for sale, end of period, thous. sh. tons	888	827	r [3] 913	r 924	r 862	r 839	r 798	r 770	r 745	779	806	827	809	860		
Shipments, total, do	13,945	13,840	1,325	1,292	1,278	1,290	1,004	985	1,111	1,174	1,098	1,014	1,174	1,194		
For sale, do	8,173	r 7,428	r [3] 661	r 672	r 680	r 703	r 603	r 598	r 600	640	595	548	568	577		
Castings, malleable iron:																
Orders, unfilled, for sale, end of period, thous. sh. tons	78	r 88	73	67	65	68	75	83	82	80	84	r 88	79	87		
Shipments, total, do	852	r 882	82	77	76	78	54	72	74	79	72	r 70	77	80		
For sale, do	521	505	45	44	43	46	33	42	46	46	40	42	42	44		

Steel, Raw and Semifinished

Steel (raw):																
Production, thous. sh. tons	[1] 131,514	120,211	12,645	12,565	12,920	11,491	9,942	5,774	7,678	8,211	8,053	8,784	10,001	9,980	r 11,588	p 11,590
Index, daily average 1967=100	103.4	94.5	117.0	120.2	119.6	109.9	92.0	53.4	73.4	76.0	77.0	81.3	92.6	98.7	r 107.3	p 110.8
Steel castings:																
Orders, unfilled, for sale, end of period, thous. sh. tons	321	r 281	338	325	311	303	310	299	293	278	261	r 281	300	318		
Shipments, total, do	1,724	r 1,587	157	145	141	154	109	112	132	129	114	r 129	121	135		
For sale, total, do	1,416	r 1,290	128	120	113	125	88	91	109	103	92	r 104	99	111		

Steel Mill Products

Steel products, net shipments:																
Total (all grades), thous. sh. tons	[1] 90,798	[1] 87,038	9,026	9,470	9,341	9,810	9,163	3,703	4,522	5,183	5,791	6,104	6,588	6,649	7,927	
By product:																
Semifinished products, do	7,387	4,962	530	558	452	497	454	144	354	371	387	385	323	322	417	
Structural shapes (heavy), steel piling, do	6,060	5,666	541	530	554	617	631	190	313	351	352	384	347	378	491	
Plates, do	8,065	7,939	835	761	802	860	871	267	395	450	430	492	538	547	641	
Rails and accessories, do	1,590	1,564	175	155	156	167	161	65	89	95	100	135	131	140	158	
Bars and tool steel, total, do	14,577	14,156	1,592	1,554	1,447	1,472	1,430	703	810	888	903	940	1,091	1,113	1,393	
Bars: Hot rolled (incl. light shapes), do	8,107	8,179	1,008	949	861	844	796	310	354	471	505	552	642	689	850	
Reinforcing, do	4,891	4,521	431	441	441	476	509	307	336	319	296	287	272	294	387	
Cold finished, do	1,490	1,378	147	157	138	146	118	79	82	91	95	95	170	123	148	
Pipe and tubing, do	7,778	7,574	730	1,013	750	769	815	492	428	440	470	489	450	526	709	
Wire and wire products, do	2,998	2,791	248	289	289	310	312	138	170	202	198	195	202	214	257	
Tin mill products, do	7,243	6,811	551	635	749	865	1,040	229	328	361	576	476	410	462	533	
Sheets and strip (incl. electrical), total, do	35,101	35,574	3,823	3,974	4,141	4,252	3,448	1,475	1,634	2,026	2,375	2,609	3,096	2,946	3,327	
Sheets: Hot rolled, do	12,319	11,760	1,216	1,224	1,315	1,394	1,228	471	562	744	825	920	978	1,030	1,161	
Cold rolled, do	14,250	14,898	1,673	1,802	1,825	1,825	1,345	545	569	728	945	1,034	1,454	1,188	1,324	
By market (quarterly shipments):																
Service centers and distributors, do	[1] 17,678	[1] 16,184	4,482			4,916			3,480			3,392	[2] 1,192	[2] 1,278	[1] 1,528	
Construction, incl. maintenance, do	[1] 10,565	[1] 9,541	2,511			3,155			2,117			1,710	[2] 579	[2] 642	[1] 878	
Contractors' products, do	[1] 4,440	[1] 4,946	1,285			1,642			1,035			952	[2] 344	[2] 351	[1] 412	
Automotive, do	[1] 14,475	[1] 17,483	5,268			6,653			2,637			2,940	[2] 1,531	[2] 1,421	[1] 1,622	
Rail transportation, do	[1] 3,098	3,004	929			950			556			567	[2] 226	[2] 230	[1] 272	
Machinery, industrial equip., tools, do	[1] 5,169	4,903	1,501			1,636			873			885	[2] 377	[2] 389	[1] 550	
Containers, packaging, ship. materials, do	[1] 7,775	7,212	1,739			2,412			1,638			1,427	[2] 456	[2] 506	[1] 578	
Other, do	[1] 27,598	[1] 23,765	6,420			7,256			5,051			5,205	[2] 1,885	[2] 1,832	[1] 2,188	
Steel mill products, inventories, end of period:																
Consumers' (manufacturers only), mil. sh. tons	9.4	10.0	10.5	11.7	13.0	14.6	15.9	14.6	13.1	11.6	10.6	10.0	10.0	9.5	9.1	
Receipts during period, do	67.1	67.6	7.2	7.3	7.3	7.9	6.3	3.8	4.1	3.9	4.3	4.3	5.3	5.1	5.7	
Consumption during period, do	67.5	67.0	6.4	6.1	6.0	6.3	5.0	5.1	5.6	5.4	5.3	4.9	5.3	5.6	6.1	
Service centers (warehouses), do	7.2	r 7.4	7.0	7.6	7.5	7.4	7.9	8.0	7.5	7.2	7.2	r 7.4	r 7.1	7.1		
Producing mills:																
In process (ingots, semifinished, etc.), do	12.8	10.7	12.3	11.8	11.7	10.9	10.2	10.4	10.8	11.1	10.9	10.7	11.3	11.2	11.1	
Finished (sheets, plates, bars, pipe, etc.), do	10.5	9.0	11.3	11.0	10.5	9.3	7.5	7.8	8.6	9.0	9.0	9.0	9.2	9.6	9.7	
Steel (carbon), finished, composite price, $ per lb	.1014	.1089	.1046	.1056	.1056	.1069	.1100	.1123	.1129	.1129	.1129	.1134	.1171	.1180	.1191	

r Revised. p Preliminary. [1] Annual data: monthly or quarterly revisions are not available. [2] For month shown. [3] Revisions for Jan. and Feb. 1971 are as follows (thous. sh. tons): Orders, 887; 888; shipments for sale, 571; 557.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

METALS AND MANUFACTURES—Continued

NONFERROUS METALS AND PRODUCTS																
Aluminum:																
Production, primary (dom. and foreign ores) thous. sh. tons	3,976.1	3,925.2	338.8	327.1	341.8	325.0	329.5	333.4	325.8	329.0	314.2	324.5	326.1	313.6	-------	-------
Recovery from scrap (aluminum content) do	[1]940.0	852.0	78.0	75.0	72.0	74.0	59.0	76.0	65.0	77.0	72.0	75.0	77.0	-------	-------	-------
Imports (general):																
Metal and alloys, crude do	350.2	560.4	44.7	95.7	63.4	60.9	46.6	38.1	43.7	31.5	24.0	48.5	46.8	43.9	70.0	-------
Plates, sheets, etc do	78.7	71.0	6.0	6.4	7.5	7.1	6.8	5.7	7.4	4.2	3.1	5.5	10.7	5.3	9.0	-------
Exports, metal and alloys, crude do	408.5	112.3	11.0	11.3	8.0	10.3	3.6	5.6	12.6	4.0	7.7	6.9	13.4	3.5	6.7	-------
Price, primary ingot, 99.5% minimum $ per lb	.2872	.2900	.2900	.2900	.2900	.2900	.2900	.2900	.2900	.2900	.2900	.2900	.2900	.2900	.2900	.2900
Aluminum products:																
Shipments:																
Ingot and mill prod. (net ship.) mil. lb	9,952.5	r10,245.6	943.9	1,067.5	1,119.8	746.8	689.7	814.7	874.8	761.5	772.2	840.5	r 879.6	912.1	-------	-------
Mill products, total do	7,358.0	[1] 7,836.7	741.8	769.6	839.1	580.1	564.1	656.6	674.6	611.7	615.1	625.2	r 670.3	724.5	-------	-------
Sheet and plate do	3,688.6	[1] 3,976.4	397.3	416.1	467.1	258.2	278.1	343.9	346.5	301.9	304.0	321.8	r 354.1	372.9	-------	-------
Castings do	1,506.5	1,577.2	145.4	134.9	134.1	140.8	97.1	124.3	134.2	143.4	138.1	135.5	r 149.3	152.8	-------	-------
Inventories, total (ingot, mill prod., and scrap), end of period mil. lb	4,387	5,020	4,477	4,443	4,274	4,465	4,662	4,736	4,764	4,957	4,986	5,020	r 5,017	5,031	-------	-------
Copper:																
Production:																
Mine, recoverable copper thous. sh. tons	1,719.7	1,533.1	143.8	143.1	147.2	152.2	49.2	104.5	113.4	136.3	137.6	136.9	130.2	r 139.0	146.9	-------
Refinery, primary do	1,765.1	1,591.8	170.5	160.0	150.0	166.4	42.6	74.0	103.1	138.6	145.9	149.7	141.2	146.3	173.7	-------
From domestic ores do	1,521.2	1,410.5	144.8	141.6	136.4	148.4	38.7	63.2	90.9	124.3	130.6	137.5	127.1	133.5	152.3	-------
From foreign ores do	243.9	181.3	25.7	18.4	13.7	18.0	4.0	10.9	12.1	14.3	15.3	12.2	14.1	12.9	21.4	-------
Secondary, recovered as refined do	475.0	371.0	33.9	28.8	34.7	31.8	15.2	24.5	29.8	37.0	35.9	31.4	36.1	27.3	36.9	-------
Imports (general):																
Refined, unrefined, scrap (copper cont.) do	394.2	365.8	26.1	26.4	21.9	35.4	28.9	37.0	41.5	21.3	18.2	49.2	29.0	26.2	38.9	-------
Refined do	132.1	162.1	9.9	11.6	7.4	9.9	12.4	23.2	20.2	15.5	13.4	17.8	12.6	8.6	16.1	-------
Exports:																
Refined and scrap do	348.9	283.0	38.6	37.0	32.9	24.8	8.5	10.1	16.4	7.4	15.6	29.4	18.8	34.8	33.1	-------
Refined do	222.0	187.7	26.3	23.7	23.9	17.5	4.6	5.4	10.4	4.1	9.4	20.8	10.5	26.6	22.8	-------
Consumption, refined (by mills, etc.) do	[1] 2,042	2,014	187.6	192.0	205.7	202.6	107.4	154.5	151.9	174.6	167.2	155.1	p 161.8	-------	-------	-------
Stocks, refined, end of period do	[1] 348.0	277.4	380.6	365.3	334.3	294.1	264.0	229.8	224.4	242.8	260.7	277.4	p 293.0	-------	-------	-------
Fabricators' do	[1] 187.0	174.4	216.3	234.1	223.9	223.8	204.2	168.9	143.6	142.1	154.0	174.4	p 161.7	-------	-------	-------
Price, electrolytic (wirebars), dom., delivered $ per lb	[2].583	[2].5201	.5055	.5283	.5284	.5284	-------	.5290	.5289	.5284	.5224	.5032	.5032	.5061	.5257	-------
Copper-base mill and foundry products, shipments (quarterly total):																
Brass mill products mil. lb	2,513	2,711	647	-------	-------	754	-------	-------	641	-------	-------	669	-------	-------	-------	-------
Copper wire mill products (copper cont.) do	2,329	2,354	564	-------	-------	649	-------	-------	557	-------	-------	584	-------	-------	-------	-------
Brass and bronze foundry products do	751	705	174	-------	-------	187	-------	-------	164	-------	-------	180	-------	-------	-------	-------
Lead:																
Production:																
Mine, recoverable lead thous. sh. tons	571.8	573.4	52.8	47.2	45.6	45.6	45.2	48.1	48.9	48.4	48.9	55.6	r 48.8	53.2	-------	-------
Recovered from scrap (lead cont.) do	[1] 597.4	572.7	47.0	50.8	48.1	46.4	42.4	46.1	49.1	51.6	50.6	46.0	45.3	41.8	-------	-------
Imports (general), ore (lead cont.), metal do	357.1	261.7	21.7	21.2	24.3	18.5	18.7	13.9	24.4	18.6	20.7	23.5	26.6	18.9	42.5	-------
Consumption, total do	1,360.6	1,392.4	119.5	117.4	116.2	115.9	94.8	119.5	127.7	125.0	118.9	114.4	115.5	116.7	-------	-------
Stocks, end of period:																
Producers', ore, base bullion, and in process (lead content), ABMS thous. sh. tons	179.4	154.7	186.3	190.3	186.1	182.5	169.5	163.1	165.9	158.9	153.3	154.7	141.0	145.4	-------	-------
Refiners' (primary), refined and antimonial (lead content) thous. sh. tons	97.9	51.8	88.8	84.7	83.6	76.6	87.3	74.3	63.1	57.1	48.2	51.8	57.9	50.2	-------	-------
Consumers' (lead content) ♂ do	[1]133.5	118.7	120.2	121.8	121.5	131.8	133.8	126.4	122.8	114.1	116.9	118.7	122.7	121.5	-------	-------
Scrap (lead-base, purchased), all smelters (gross weight) thous. sh. tons	[1]73.3	72.1	65.7	65.8	65.0	64.5	68.3	66.7	63.7	66.3	64.6	72.1	74.2	74.8	74.8	-------
Price, common grade △ $ per lb	.1562	.1380	.1350	.1350	.1350	.1365	.1413	.1412	.1412	.1416	.1388	.1402	.1400	.1460	.1550	
Tin:																
Imports (for consumption):																
Ore (tin content) lg. tons	4,667	3,060	0	10	430	0	1,091	12	597	920	0	0	197	469	441	-------
Metal, unwrought, unalloyed do	50,554	[1] 46,940	4,543	4,478	4,100	5,441	2,059	5,206	5,207	1,858	3,180	5,414	4,971	5,975	3,019	-------
Recovery from scrap, total (tin cont.) do	[1] 20,001	[1] 17,973	1,765	1,805	1,680	1,373	1,305	1,720	1,685	1,680	1,595	1,485	1,665	1,710	-------	-------
As metal do	[1] 2,574	[1] 2,870	280	255	285	280	255	245	260	250	265	260	205	250	-------	-------
Consumption, total do	[1] 73,829	70,545	6,355	6,305	6,175	6,240	5,605	5,185	5,870	5,910	5,800	5,610	5,370	5,470	6,190	-------
Primary do	[1] 53,027	[1] 52,415	4,715	4,710	4,615	4,625	4,335	3,760	4,455	4,465	4,155	3,920	4,125	4,100	4,605	-------
Exports, incl. reexports (metal) do	4,966	2,306	570	138	125	79	376	398	400	19	9	23	51	86	118	-------
Stocks, pig (industrial), end of period do	11,318	9,610	8,155	8,495	9,510	10,600	10,340	11,205	10,905	9,025	8,520	9,610	12,005	12,670	11,247	-------
Price, pig, Straits (N.Y.), prompt $ per lb	1.7414	1.6734	1.6701	1.6888	1.6602	1.6448	1.6644	1.6607	1.6729	1.6770	1.7539	1.7436	1.7131	1.7200	1.7981	1.8198
Zinc:																
Mine prod., recoverable zinc thous. sh. tons	[1] 534.1	491.6	43.7	41.4	43.8	43.5	38.0	41.2	38.2	40.1	40.8	39.3	r 37.8	40.2	-------	-------
Imports (general):																
Ores (zinc content) do	525.8	342.6	37.5	32.9	25.8	40.9	21.0	18.1	24.0	23.8	20.3	27.7	33.2	31.0	23.4	-------
Metal (slab, blocks) do	270.4	319.6	29.1	22.7	21.2	27.1	30.3	28.5	41.7	17.6	25.5	43.4	27.3	31.3	53.5	-------
Consumption (recoverable zinc content):																
Ores do	[1] 124.8	123.4	8.6	10.8	10.0	11.0	10.8	10.8	15.7	7.5	10.1	11.2	11.3	11.7	-------	-------
Scrap, all types do	[1] 259.9	228.8	19.9	19.2	18.9	18.4	20.3	21.1	20.7	21.6	21.0	20.5	20.5	21.1	-------	-------
Slab zinc:																
Production (primary smelter), from domestic and foreign ores thous. sh. tons	[1] 880.6	765.7	74.2	75.8	74.5	65.7	50.1	51.7	45.7	61.2	61.4	64.5	62.0	56.2	-------	-------
Secondary (redistilled) production do	74.4	74.5	7.4	6.8	6.3	6.6	5.3	5.6	5.7	6.3	5.9	5.9	6.0	5.6	-------	-------
Consumption, fabricators do	[1] 1,187.0	1,259.0	111.5	116.7	115.6	110.6	95.3	97.5	101.2	104.6	100.5	105.8	106.6	113.4	-------	-------
Exports do	.3	13.3	1.7	1.1	1.3	2.1	0	(3)	0	.1	(3)	(3)	.7	.6	1.5	-------
Stocks, end of period:																
Producers', at smelter (ZI) ⊙ do	[1] 98.3	50.6	99.4	84.3	80.7	68.5	65.2	62.6	56.9	51.1	52.9	50.6	50.5	37.8	29.4	23.4
Consumers' do	[1] 89.6	98.4	89.7	99.2	90.6	109.3	114.8	100.9	94.6	91.3	97.1	98.4	r 95.0	92.4	-------	-------
Price, Prime Western $ per lb	.1532	.1613	.1507	.1550	.1578	.1600	.1619	.1700	.1700	.1700	.1700	.1700	.1700	.1700	.1733	-------

r Revised. p Preliminary. [1] Annual data; monthly revisions are not available.
[2] Average for 11 months. [3] Less than 50 tons.
△ Effective Dec. 1971, nationwide delivered price substituted for N.Y.-basis price.
♂ Includes secondary smelters' lead stocks in refinery shapes and in copper-base scrap.
⊙ Producers' stocks elsewhere, end of Apr. 1972, 11,200 short tons.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

METALS AND MANUFACTURES—Continued

MACHINERY AND EQUIPMENT

Foundry equipment (new), new orders, net mo. avg. shipments 1967=100	155.6	84.2	82.4	102.7	54.9	73.1	80.2	53.2	48.4	79.5	69.1	117.6	72.9	70.5	90.8	
Heating, combustion, atmosphere equipment, new orders (domestic), net, qtrly. mil. $	[1] 88.5	63.7	15.8			19.4			14.1			14.4			16.2	
Electric processing heating equip. do.	[1] 50.9	7.5	2.2			1.3			1.8			2.2			2.5	
Fuel-fired processing heating equip. do.		30.3	6.9			11.6			5.9			5.9			7.4	
Material handling equipment (industrial): Orders (new), index, seas. adj.† 1967=100	103.3	99.6	96.2	86.0	90.3	99.2	120.3	105.6	110.8	85.6	111.7	108.4	111.6	116.0		
Industrial trucks (electric), shipments:																
Hand (motorized) number	13,816	12,644	1,161	1,179	984	1,080	969	934	1,112	1,211	953	1,198	1,004	1,093	1,297	
Rider-type do.	14,811	14,621	1,470	1,299	1,120	1,129	1,210	889	1,299	1,509	1,229	1,451	1,128	1,205	1,404	
Industrial trucks and tractors (internal combustion engines), shipments number	41,194	49,289	4,890	4,233	3,605	3,612	4,668	3,441	4,209	4,838	3,900	4,771	[c] 2,764	[c] 3,022	3,282	
Industrial supplies, machinery and equipment: New orders index, seas. adjusted* 1967–69=100	101.0	102.6	95.6	97.6	102.9	104.4	104.4	106.3	106.5	105.2	104.3	106.7	107.2	105.8	108.0	
Industrial suppliers distribution: Sales index, seas. adjusted* 1967=100	105.9	104.7	108.0	103.7	99.3	106.3	101.5	105.7	110.1	102.4	112.0	117.2	108.0	114.2	119.4	112.8
Machine tools:																
Metal cutting type tools:																
Orders, new (net), total mil. $	651.30	608.75	43.00	42.30	46.85	64.20	55.15	60.40	49.85	45.00	55.45	70.80	51.15	60.80	[p] 96.15	
Domestic do.	506.75	524.10	36.50	36.60	41.30	50.90	45.85	54.50	44.15	41.75	50.80	62.75	47.95	55.25	[p] 77.55	
Shipments, total do.	992.90	672.30	64.85	71.75	52.55	60.75	45.30	40.90	58.90	47.90	41.70	70.65	39.60	46.40	[p] 57.30	
Domestic do.	827.35	554.20	51.75	60.15	44.20	49.85	39.55	33.35	47.40	38.75	35.45	62.60	33.65	40.10	[p] 48.40	
Order backlog, end of period do.	470.7	407.5	407.6	378.2	372.5	376.0	385.9	405.4	396.4	393.5	407.3	407.5	419.0	433.4	[p] 472.3	
Metal forming type tools:																
Orders, new (net), total do.	261.25	252.40	25.25	13.30	24.90	20.85	22.85	17.90	25.40	21.05	22.60	20.75	19.60	24.95	[p] 21.55	
Domestic do.	226.60	223.20	22.65	12.60	23.00	17.85	20.35	14.65	24.60	16.25	18.45	19.95	17.95	21.80	[p] 19.90	
Shipments, total do.	450.15	325.60	30.25	26.25	26.50	28.45	19.45	21.65	21.90	27.30	26.40	34.80	16.35	22.70	[p] 33.15	
Domestic do.	411.60	285.60	28.30	24.75	22.50	26.90	17.15	16.90	18.65	20.75	20.00	32.40	13.70	19.30	[p] 28.35	
Order backlog, end of period do.	234.8	161.8	204.7	191.8	190.2	182.6	186.0	182.3	185.8	179.6	175.8	161.8	165.0	167.3	[p] 155.7	
Tractors used in construction:																
Tracklaying, total units	[1] 19,433	18,414	5,313			4,895			4,051			4,155	[r3] 1,831	[r3] 1,938		
mil. $	[1] 464.6	499.6	150.2			141.3			109.2			99.0	[r3] 52.2	[3] 53.3		
Wheel (contractors' off-highway) units	[1] 5,099	[2] 3,642	[2] 945			[2] 1,102			[2] 908			[2] 687				
mil. $	[1] 170.5	[2] 133.3	[2] 35.0			[2] 39.1			[2] 33.2			[2] 25.9				
Tractor shovel loaders (integral units only), wheel and tracklaying types units	[1] 24,622	[r] 26,952	[r] 6,693			7,470			6,295			6,494				
mil. $	[1] 581.1	646.6	172.7			177.7			156.1			140.1				
Tractors, wheel (excl. garden and contractors' off-highway types) units	[1] 175,309	163,350	37,894			40,448			41,526			43,482	[r3] 15,594	[3] 16,984		
mil. $	[1] 847.0	911.0	214.5			238.1			212.2			246.2	[3] 90.6	[3] 98.7		

ELECTRICAL EQUIPMENT

Batteries (auto. replacement), shipments thous.	37,863	39,144	2,516	1,943	2,192	2,528	2,848	3,606	4,402	4,310	4,264	4,160	3,804	[r] 3,654	2,915	
Electronic components, factory sales:																
Semiconductors:																
Discrete devices mil. $	[1] 686.0	[1] 621.2	53.4	50.4	48.8	55.5	45.5	48.3	56.5	52.8	51.7	56.7	53.8	54.4	63.7	
Integrated circuits do.	523.7	[1] 534.0	42.8	40.9	41.8	45.7	39.6	44.6	50.7	46.4	47.5	51.7	47.9	52.7	57.9	
Tubes, selected power and spec. purpose do.	290.6	260.9	64.3			65.5			60.1			71.0				
Microwave do.	142.4	122.5	31.7			31.0			27.8			32.0				
Electro-optical do.	74.3	65.7	16.1			16.5			14.7			18.3				
High vacuum, gas, and vapor do.	73.9	72.7	16.4			18.0			17.6			20.7				
Capacitors do.	483.0	434.9	37.9	36.3	35.1	37.7	34.9	35.4	38.8	37.4	34.5	39.5	33.5	33.4		
Motors and generators:																
New orders, index, qtrly. 1967=100	98.3	87.0	85.5			90.7			85.5			86.5			85.5	
Radio sets, total, production thous.	16,406	18,579	[4] 1,864	1,498	1,487	[4] 1,690	983	1,149	[4] 1,843	1,725	1,535	[4] 1,928	1,276	1,336	[4] 1,857	1,616
Television sets (incl. combination), prod. do.	9,483	11,197	[4] 1,016	867	889	[4] 1,114	705	844	[4] 1,195	912	941	[4] 1,184	1,002	956	[4] 1,286	1,012
Household electrical appliances, factory sales:																
Air conditioners (room) thous.	5,886	[1] 5,438	846.4	763.0	743.7	750.8	305.1	149.5	118.3	120.8	258.6	320.8	476.3	541.9	611.9	704.2
Dishwashers* do.	2,116	2,477	217.6	189.3	161.8	208.0	194.9	232.8	220.9	299.9	266.5	200.4	206.4	227.9	242.6	263.2
Disposers (food waste)* do.	1,976	[1] 2,294	[r] 183.9	181.9	163.8	199.1	186.2	200.0	239.2	219.0	228.2	199.8	201.6	212.2	259.3	210.7
Ranges do.	2,362	2,714	[r] 223.5	212.0	212.3	234.8	228.8	254.5	233.0	286.3	260.8	232.2	244.1	238.3	245.2	274.3
Refrigerators do.	5,286	[1] 5,691	[r] 474.1	457.6	470.8	562.5	585.6	576.7	507.8	550.0	477.5	406.5	428.8	446.2	471.9	515.5
Washers do.	4,093	[1] 4,608	370.0	303.4	304.4	398.8	399.3	424.3	495.0	446.2	409.2	366.3	412.8	381.5	425.0	373.7
Dryers (incl. gas) do.	2,981	3,377	250.1	182.4	177.4	259.6	259.2	324.0	370.1	385.3	354.7	315.8	347.4	304.6	304.3	248.8
Vacuum cleaners do.	7,382	7,973	653.1	655.8	535.5	628.0	570.9	692.2	827.5	825.7	712.7	623.8	748.8	884.7	743.1	

GAS EQUIPMENT (RESIDENTIAL)

Furnaces, gravity and forced-air, shipments* thous.	1,471	1,795	128.8	131.8	141.2	134.0	158.9	167.0	187.9	197.1	158.3	147.5	161.7	[r] 159.8	164.9	
Ranges, total, sales* do.	2,362	2,549	243.9	204.1	198.2	242.4	171.8	232.5	254.2	223.0	213.7	215.0	181.9	[r] 210.9	255.4	
Water heaters (storage), automatic, sales* do.	2,785	3,083	256.3	296.3	267.2	280.0	267.2	262.1	235.8	262.8	230.2	218.8	267.0	291.9	288.7	

PETROLEUM, COAL, AND PRODUCTS

COAL

Anthracite:																
Production thous. sh. tons	[1] 9,481	8,699	777	793	779	738	618	810	765	708	683	654	558	518	596	467
Exports do.	789	671	69	75	92	66	36	76	105	17	36	66	29	64	26	
Price, wholesale, chestnut, f.o.b. car at mine $ per sh. ton	16.565	17.673	18.365	18.365	17.581	16.856	17.346	17.346	17.444	17.346	17.346	17.346	17.738	17.738	17.738	17,738
Bituminous:																
Production thous. sh. tons	602,932	[1] 555,000	56,755	55,575	50,640	51,615	38,965	55,075	53,225	13,130	26,095	55,055	47,520	46,325	[r] 51,040	50,195

[r] Revised. [p] Preliminary. [1] Annual data; monthly or quarterly revisions are not available. [2] Excludes figures for rubber-tired dozers (included for other periods). [3] For month shown. [4] Data cover 5 weeks; other periods, 4 weeks. [c] Corrected.

†Effective with the Apr. 1972 SURVEY, index reflects new seasonal factors. Revisions for 1969–71 appear at bottom of p. S–34 of the Apr. 1972 SURVEY.

*New series, *Industrial supplies* (marketed through distributors)—*orders* index (American Supply & Machinery Mfrs. Assn.), based on 2-month moving average of selected members' new orders, is also adjusted for number of working days. *Sales* index (National and Southern Industrial Distributors Assns.) is based on selected panel of members' operations which cover national sales for maintenance, repair, and operations for all types of industries. *Dishwashers* and *disposers* (Assn. of Home Appliance Mfrs.) and *gas equipment* (Gas Appliance Mfrs. Assn.) reflect total industry sales. Monthly data prior to 1971 are available upon request.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

PETROLEUM, COAL, AND PRODUCTS—Continued

COAL—Continued																
Bituminous—Continued																
Industrial consumption and retail deliveries, total ♀ thous. sh. tons	[4] 517,158	[2] 494,873	45,513	40,895	39,755	41,926	40,634	38,558	38,313	36,379	36,417	40,832	44,399			
Electric power utilities do	[4] 320,460	[2] 326,280	28,040	25,103	24,807	28,154	28,004	27,783	27,051	25,167	25,944	28,294	30,074			
Mfg. and mining industries, total do	[4] 184,328	[2] 157,035	16,849	15,522	14,784	13,642	12,439	10,079	10,281	9,971	9,150	11,087	12,572			
Coke plants (oven and beehive) do	[4] 96,009	[2] 82,820	8,380	8,157	8,307	7,723	7,007	5,164	5,817	5,699	4,679	6,152	6,872			
Retail deliveries to other consumers do	[4] 12,072	[2] 11,351	619	245	138	100	162	670	950	1,224	1,315	1,443	1,753			
Stocks, industrial and retail dealers', end of period, total thous. sh. tons	(3)	[3] 94,021										94,021	92,908			
Electric power utilities do	r 71,295	76,987	69,982	77,527	83,432	87,423	85,147	91,722	97,457	86,360	74,946	76,987	75,788			
Mfg. and mining industries, total do	(3)	[3] 16,759										16,759	16,730			
Oven-coke plants do	8,924	7,199	8,966	9,804	10,642	10,849	8,517	10,369	11,818	7,988	5,381	7,199	7,850			
Retail dealers do	(3)	[3] 275										275	390			
Exports do	70,908	56,633	4,261	4,984	6,140	5,679	4,174	7,107	6,766	3,450	1,318	4,204	3,660	3,631	4,624	
Prices, wholesale:																
Screenings, indust. use, f.o.b. mine $ per sh. ton	7.641	9.696	9.316	9.810	9.719	9.719	9.719	9.719	9.719	9.719	9.719	10.131	10.266	10.266	10.266	10.146
Domestic, large sizes, f.o.b. mine do	9.647	11.209	11.658	11.200	11.200	11.200	10.890	10.890	10.890	10.940	10.940	11.388	11.446	11.446	c 11.446	11.120
COKE																
Production:																
Beehive thous. sh. tons	[4] 871	[2] 730	78	68	77	76	67	55	54	38	32	56	49	53		
Oven (byproduct) do	[4] 65,654	[2] 56,664	5,752	5,621	5,693	5,268	4,816	3,455	3,976	3,961	3,220	4,200	4,763	4,651		
Petroleum coke § do	[4] 21,574	21,823	1,853	1,832	1,803	1,821	1,835	1,950	1,787	1,853	1,783	1,853	1,898	1,883		
Stocks, end of period:																
Oven-coke plants, total do	4,113	3,510	3,842	3,599	3,343	3,153	3,401	3,818	4,070	4,143	3,596	3,510	3,585	3,611		
At furnace plants do	4,018	3,385	3,803	3,560	3,295	3,097	3,309	3,715	3,939	4,000	3,483	3,385	3,446	3,466		
At merchant plants do	95	125	39	39	48	56	92	103	131	143	113	125	139	146		
Petroleum coke do	1,059	1,489	1,170	1,151	1,248	1,192	1,319	1,539	1,900	1,793	1,584	1,489	1,610	1,760		
Exports do	2,514	1,509	199	125	95	126	171	175	136	92	36	42	68	63	77	
PETROLEUM AND PRODUCTS																
Crude petroleum:																
Oil wells completed number	[2] 13,020	11,804	1,227	880	969	998	925	886	959	921	967	1,330	807	965	1,210	923
Price at wells (Oklahoma) $ per bbl	3.23	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41	3.41
Runs to stills mil. bbl	3,967.5	4,087.8	345.1	336.2	332.8	344.5	355.0	352.4	334.0	345.5	333.6	351.5	353.1	329.4		
Refinery operating ratio % of capacity	[4] 90	86	88	86	83	89	88	87	85	85	85	86	85	85		
All oils, supply, demand, and stocks:																
New supply, total ♂ mil. bbl	[4] 5,377.7	r 5,532.7	r [5] 476.7	r 453.9	r 462.7	r 453.5	r 466.8	r 465.2	r 447.6	r 460.7	r 455.6	r 497.4	483.3	460.6		
Production:																
Crude petroleum do	[4] 3,517.4	3,478.2	305.0	295.1	301.0	290.1	295.3	293.8	276.0	286.0	276.0	284.0	282.6	268.9		
Natural-gas plant liquids do	612.2	[2] 623.9	52.8	51.3	52.8	51.1	52.6	52.7	50.9	52.8	51.2	56.1	52.9	50.8		
Imports:																
Crude and unfinished oils do	522.6	658.6	45.9	48.5	49.6	53.9	59.2	63.4	61.4	64.0	63.4	71.3	68.9	64.5		
Refined products do	[4] 725.5	r 758.7	r [5] 72.5	r 58.6	r 58.8	r 57.6	r 59.0	r 53.7	r 57.5	r 56.3	r 63.8	r 84.1	77.1	74.7		
Change in stocks, all oils (decrease, –) do	37.7	26.1	−9.4	11.3	40.2	17.6	32.4	29.7	17.8	13.9	−22.2	−31.3	−30.0	−49.8		
Demand, total do	[4] 5,332.2	r 5,497.2	r [5] 484.3	r 443.9	r 421.4	r 435.9	r 434.1	r 435.4	r 429.2	r 443.9	r 476.3	r 525.2	r 512.5	513.2		
Exports:																
Crude petroleum do	5.0	.5	(1)	.3	(1)	0	0	0	.1	(1)	0	0	0	0		
Refined products do	[4] 89.5	81.2	7.7	8.0	6.9	7.2	5.5	6.7	5.7	5.9	8.1	6.6	5.2	4.7		
Domestic demand, total ♀ do	[4] 5,237.7	r 5,415.5	r [5] 476.6	r 435.6	r 414.5	r 428.7	r 428.6	r 428.7	r 423.4	r 438.0	r 468.2	r 518.6	c 507.3	508.5		
Gasoline do	[4] 2,131.3	2,213.2	182.6	187.6	184.5	195.1	201.0	197.0	183.6	188.6	184.6	189.3	173.2	166.9		
Kerosene do	96.0	90.9	8.8	6.3	3.9	4.5	4.4	4.5	5.9	6.8	8.5	11.3	11.8	10.7		
Distillate fuel oil do	927.2	r 971.3	r [5] 99.1	r 79.1	r 65.7	r 60.1	r 54.4	r 56.1	r 61.2	r 65.6	r 85.4	r 113.6	115.4	121.2		
Residual fuel oil do	804.3	r 837.9	r [5] 82.6	r 66.9	r 60.0	r 59.5	r 59.6	r 55.7	r 62.2	r 59.8	r 77.2	r 87.2	87.3	92.0		
Jet fuel do	[4] 353.0	r 366.6	r [5] 30.7	r 28.7	r 29.4	r 31.2	r 30.5	r 32.0	r 30.3	r 32.2	r 30.5	r 32.3	31.6	33.1		
Lubricants do	49.7	49.4	4.1	4.5	4.0	4.8	4.6	4.3	3.6	4.5	3.8	3.9	3.8	4.1		
Asphalt do	153.5	158.5	8.1	10.4	14.0	19.9	19.4	21.9	19.3	17.2	12.2	6.4	5.7	6.1		
Liquefied gases do	[4] 446.8	[2] 456.8	38.2	31.3	29.2	30.1	30.4	33.5	35.0	39.4	44.2	51.8	53.7	50.4		
Stocks, end of period, total do	1,017.9	1,043.9	934.4	945.7	986.0	1,003.5	1,036.0	1,065.7	1,083.5	1,097.4	1,075.2	1,043.9	1,013.9	964.1		
Crude petroleum do	276.4	259.6	267.2	271.4	284.3	279.3	273.2	272.4	269.8	265.9	265.6	259.6	251.0	252.9		
Unfinished oils, natural gasoline, etc do	106.0	106.8	96.8	105.4	107.5	109.5	110.4	107.0	105.9	109.8	110.3	106.8	109.2	105.6		
Refined products do	635.5	677.5	570.4	568.8	594.1	614.7	652.4	686.3	707.8	721.7	699.4	677.5	653.8	605.5		
Refined petroleum products:																
Gasoline (incl. aviation):																
Production do	2,105.3	2,202.6	180.8	170.4	174.3	181.4	192.7	196.6	186.1	188.2	183.1	196.9	192.6	175.2		
Exports do	1.4	1.6	.1	.2	.1	.1	.1	.1	.3	(1)	.1	.1	.1	.1		
Stocks, end of period do	214.3	223.8	250.6	235.0	226.2	214.0	207.2	208.4	212.3	212.9	213.6	223.8	244.6	254.8		
Prices (excl. aviation):																
Wholesale, ref. (Okla., group 3) $ per gal	.119	.120	.113	.110	.125	.120	.120	.120	.120	.118	.118	.118	.118	.115	.115	.120
Retail (regular grade, excl. taxes), 55 cities (1st of following mo.) $ per gal	.246	.252	.238	.234	.248	.254	.268	.264	.266	.244	.257	.251	.255	.233	.238	.228
Aviation gasoline:																
Production mil. bbl	19.7	18.5	1.4	1.5	1.5	1.5	1.5	1.9	2.1	1.6	1.5	1.1	1.6	1.2		
Exports do	.9	1.2	.1	.1	.1	.1	.1	.1	.2	(1)	.1	.1	.1	(1)		
Stocks, end of period do	5.1	4.4	4.9	4.6	4.5	4.4	4.2	4.1	4.4	4.4	4.6	4.4	4.7	4.6		
Kerosene:																
Production do	95.7	87.5	8.3	6.7	6.0	6.5	7.2	6.1	5.6	7.2	7.1	8.9	8.7	6.8		
Stocks, end of period do	27.8	24.4	19.2	19.5	21.6	23.6	26.4	28.0	27.8	28.2	26.8	24.4	21.3	17.4		
Price, wholesale, bulk lots (N.Y. Harbor) $ per gal	.118	.126	.121	.127	.127	.127	.127	.127	.127	.127	.127	.127	.127	.127	.127	.127

r Revised. c Corrected.
[1] Less than 50 thousand barrels. [2] Reflects revisions not available by months.
[3] Data for 1970 not available; monthly data for 1971 will be shown later.
[4] Corresponding monthly revisions will be shown later.
[5] Revisions for Jan. and Feb., respectively: New supply, 463.9, 428,6; imports, 71.7, 65.1; total demand, 504.2, 463.3; domestic demand—total, 498.1, 456.5; distillate, 123.7, 107.3; residual, 86.5, 80.7; jet fuel, 29.3, 29.6.
♂ Includes small amounts of "other hydrocarbons and hydrogen refinery input," not shown separately.
♀ Includes data not shown separately. § Includes nonmarketable catalyst coke.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

PETROLEUM, COAL, AND PRODUCTS—Continued

PETROLEUM AND PRODUCTS—Continued																
Refined petroleum products—Continued																
Distillate fuel oil:																
Production, mil. bbl.	897.1	912.1	78.0	76.7	75.1	76.8	77.8	77.9	71.3	74.8	72.2	78.4	78.8	77.0		
Imports, do.	r 53.8	r 55.8	r [3] 5.6	r 3.2	r 2.9	r 3.5	r 3.3	r 2.8	r 3.0	3.7	5.1	r 11.0	6.1	6.4		
Exports, do.	.9	2.8	.4	.2	.2	.4	.3	.3	.1	.1	.2	.1	.1	.1		
Stocks, end of period, do.	195.3	190.6	112.9	113.7	125.8	145.8	172.4	197.0	210.1	223.0	214.8	190.6	160.1	122.2		
Price, wholesale (N.Y. Harbor, No. 2 fuel), $ per gal.	.108	.116	.111	.117	.117	.117	.117	.117	.117	.117	.117	.117	.117	.117	.117	.117
Residual fuel oil:																
Production, mil. bbl.	257.5	274.7	26.5	22.2	19.0	20.0	20.0	19.2	19.7	19.7	22.3	27.6	28.6	27.9		
Imports, do.	557.8	r 577.5	r [3] 57.6	r 47.2	r 46.6	r 43.5	r 45.2	r 39.7	r 43.5	r 42.6	r 47.1	r 59.5	58.7	55.8		
Exports, do.	19.8	13.2	1.5	1.7	1.2	1.1	1.0	1.4	.9	.9	1.2	.5	.5	.5		
Stocks, end of period, do.	54.0	59.7	49.4	50.6	55.4	58.7	63.7	65.9	66.5	68.5	59.9	59.7	59.4	50.9		
Price, wholesale (Okla., No. 6), $ per bbl.	2.25	2.37	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35	2.35
Jet fuel:																
Production, mil. bbl.	301.9	304.7	26.3	25.1	25.8	25.3	24.4	24.9	25.0	26.3	26.1	25.8	24.3	26.1		
Stocks, end of period, do.	27.6	27.7	27.1	27.3	28.5	28.8	28.8	27.7	28.1	27.2	27.9	27.7	25.9	25.2		
Lubricants:																
Production, do.	66.2	65.5	5.8	5.7	5.7	5.8	5.7	5.6	5.2	5.5	5.1	5.2	5.5	4.9		
Exports, do.	r 16.1	15.8	1.4	1.5	1.4	1.0	1.4	1.6	1.3	1.1	1.3	1.2	1.4	1.0		
Stocks, end of period, do.	14.7	15.0	15.5	15.2	15.4	15.4	15.1	14.8	15.0	14.9	14.9	15.0	15.3	15.1		
Price, wholesale, bright stock (midcontinent, f.o.b., Tulsa), $ per gal.	.270	.270	.270	.270	.270	.270	.270	.270	.270	.270	.270	.270				
Asphalt:																
Production, mil. bbl.	146.7	157.0	10.1	12.1	14.1	16.3	17.4	17.4	16.2	15.0	12.8	9.8	8.2	8.1		
Stocks, end of period, do.	15.8	21.2	25.5	27.7	28.3	25.2	23.8	20.2	18.1	16.5	17.6	21.2	24.1	26.6		
Liquefied gases (incl. ethane and ethylene):																
Production, total, mil. bbl.	525.6	547.9	46.5	45.0	45.9	44.5	45.5	47.1	44.4	46.2	45.0	50.0	47.2	45.7		
At gas processing plants (L.P.G.), do.	399.6	417.6	35.1	34.0	34.9	33.1	34.0	35.3	34.3	35.8	35.1	38.8	36.7	35.3		
At refineries (L.R.G.), do.	126.0	130.2	11.4	11.0	11.0	11.4	11.5	11.8	10.1	10.4	10.0	11.1	10.5	10.4		
Stocks (at plants and refineries), do.	67.0	94.7	51.0	60.3	72.9	83.9	95.1	104.0	108.1	109.4	103.6	94.7	82.4	71.9		
Asphalt and tar products, shipments:																
Asphalt roofing, total, thous. squares	r 83,179	93,365	6,426	6,314	8,102	8,790	8,296	8,928	9,583	9,051	7,672	6,766	[4]			
Roll roofing and cap sheet, do.	r 34,756	35,684	2,653	2,354	2,676	3,091	3,042	3,348	3,767	3,500	2,986	2,772	[4]			
Shingles, all types, do.	r 48,423	57,682	3,773	3,960	5,427	5,700	5,254	5,580	5,816	5,551	4,686	3,994	[4]			
Asphalt siding, do.	r 260	189	16	21	18	15	11	15	14	12	13	15	[4]			
Insulated siding, do.	334	374	25	35	34	32	39	35	32	36	33	29	[4]			
Saturated felts, thous. sh. tons	r 848	899	73	69	77	81	78	76	80	81	71	73	[4]			

PULP, PAPER, AND PAPER PRODUCTS

PULPWOOD AND WASTE PAPER																
Pulpwood:																
Receipts, thous. cords (128 cu. ft.)	r 68,897	63,661	5,318	5,450	5,052	5,540	5,180	5,473	5,503	5,621	5,238	5,229	5,254	5,296		
Consumption, do.	r 67,524	64,331	5,434	5,415	5,382	5,463	5,074	5,445	5,185	5,671	5,434	5,084	5,663	5,422		
Stocks, end of period, do.	5,873	5,371	5,249	5,258	4,891	4,982	5,195	5,134	5,460	5,423	5,207	5,371	4,909	4,819		
Waste paper:																
Consumption, thous. sh. tons	r 10,530	10,265	908	868	867	877	755	885	883	939	861	828	r 874	905		
Stocks, end of period, do.	571	r 558	509	518	492	491	516	482	506	499	499	558	r 522	496		
WOODPULP																
Production:																
Total, all grades, thous. sh. tons	r 43,663	43,960	3,696	3,699	3,712	3,679	3,450	3,805	3,593	4,072	3,808	3,499	3,866	3,765		
Dissolving and special alpha, do.	r 1,705	1,684	159	158	135	130	128	138	127	145	140	138	149	140		
Sulfate, do.	r 29,519	28,790	2,503	2,416	2,436	2,427	2,282	2,483	2,313	2,617	2,446	2,219	2,544	2,494		
Sulfite, do.	r 2,294	2,062	168	172	160	160	148	174	161	191	173	159	162	164		
Groundwood, do.	r 4,404	4,778	401	359	378	373	335	386	432	483	467	423	440	419		
Defibrated or exploded, do.	r 2,095	2,814	143	285	288	275	257	292	240	278	236	240	270	242		
Soda, semichem., screenings, etc., do.	r 3,646	3,832	321	308	315	314	300	331	322	358	346	320	302	306		
Stocks, end of period:																
Total, all mills, do.	r 923	1,093	974	1,045	985	1,076	1,063	1,073	1,044	1,003	1,154	1,093	r 1,077	1,024		
Pulp mills, do.	r 384	623	508	558	584	611	612	609	582	637	697	623	632	589		
Paper and board mills, do.	r 470	398	388	404	328	386	380	387	385	288	381	398	r 379	373		
Nonpaper mills, do.	69	71	78	83	73	79	71	77	78	78	76	71	r 65	62		
Exports, all grades, total, do.	[1] 3,755	2,175	236	194	172	199	117	162	240	112	142	235	185	171	171	
Dissolving and special alpha, do.	[1] 869	790	88	74	57	78	42	59	95	48	52	76	73	61	59	
All other, do.	[1] 2,886	1,385	148	120	115	121	75	103	145	161	89	159	112	110	113	
Imports, all grades, total, do.	[1] 3538	3,515	341	310	287	338	270	296	275	262	307	298	309	300	340	
Dissolving and special alpha, do.	[1] 273	313	30	21	32	31	30	28	22	27	15	25	15	30	24	
All other, do.	[1] 3,265	3,202	311	290	255	308	240	269	254	289	322	274	294	270	316	
PAPER AND PAPER PRODUCTS																
Paper and board:																
Production (Bu. of the Census):																
All grades, total, unadjusted, thous. sh. tons	52,210	54,180	4,686	4,576	4,513	4,604	4,218	4,622	4,411	4,897	4,580	4,299	r 4,769	4,721		
Paper, do.	22,975	23,440	2,029	1,987	1,924	1,967	1,796	1,959	1,883	2,134	1,992	1,900	r 2,087	2,036		
Paperboard, do.	24,943	25,846	2,238	2,172	2,177	2,214	2,027	2,233	2,109	2,318	2,182	2,009	r 2,288	2,257		
Wet-machine board, do.	158	156	17	16	15	15	13	13	11	10	9	9	10	10		
Construction paper and board, do.	4,135	4,737	403	400	396	408	382	416	409	435	398	381	r 384	418		
Wholesale price indexes:																
Book paper, A grade, 1967=100	109.2	110.6	112.0	112.0	112.0	112.0	109.2	109.2	109.2	109.2	109.2	109.2	109.2	109.2	109.2	108.5
Paperboard, do.	101.1	102.4	102.5	103.0	102.6	102.8	102.8	102.8	102.8	102.9	102.9	102.7	102.7	103.5	103.6	105.6
Building paper and board, do.	101.2	103.0	101.4	101.7	102.7	103.2	103.6	104.3	104.5	104.6	104.7	104.6	104.7	104.7	105.6	106.1

r Revised.
[1] Reported annual total; revisions not allocated to the months.
[2] Less than 50 thousand barrels.
[3] Revisions for Jan. and Feb., respectively: Distillate, 6.5, 5.2; residual, 55.2, 49.6.
[4] Series discontinued.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.

PULP, PAPER, AND PAPER PRODUCTS—Continued

PAPER AND PAPER PRODUCTS—Con.																
Selected types of paper (API):																
Groundwood paper, uncoated:																
Orders, new thous. sh. tons	1,245	1,241	114	104	102	114	109	98	99	117	99	102	r 113	105		
Orders, unfilled, end of period do	90	81	92	104	94	110	130	120	117	119	90	81	r 86	83		
Shipments do	1,240	1,244	107	93	104	103	92	109	102	114	116	116	r 103	104		
Coated paper:																
Orders, new do	3,163	3,245	296	271	253	288	287	273	255	286	273	256	r 289	281		
Orders, unfilled, end of period do	183	r 245	239	256	229	261	302	299	285	286	277	245	r 249	238		
Shipments do	3,260	3,231	296	266	262	263	246	278	268	282	283	276	r 279	272		
Book paper, uncoated:																
Orders, new do	2,396	2,665	267	230	218	216	212	216	219	231	212	215	r 220	218		
Shipments do	2,476	2,572	237	223	226	223	195	221	205	222	213	211	r 221	212		
Writing and related papers:																
Orders, new do	2,869	2,931	267	256	252	249	248	264	236	243	213	237	r 238	237		
Shipments do	2,873	2,936	268	259	245	251	221	254	246	252	238	235	r 239	231		
Unbleached kraft packaging and industrial converting papers:																
Orders, new do	3,714	3,868	358	311	300	336	296	328	319	339	349	307	r 346	310		
Orders, unfilled, end of period do	111	156	135	126	121	148	127	152	169	170	171	156	167	164		
Shipments do	3,755	3,741	335	310	294	328	280	302	312	325	339	313	324	309		
Tissue paper, production do	3,671	3,765	341	307	309	321	269	310	300	348	327	308	320	315		
Newsprint:																
Canada:																
Production do	8,607	8,297	711	670	665	638	643	678	692	786	758	698	725	663	685	
Shipments from mills do	8,592	8,210	683	692	666	654	621	697	680	760	762	784	604	619	673	
Stocks at mills, end of period do	236	323	410	388	387	371	394	375	387	413	409	323	445	489	501	
United States:																
Production do	3,310	3,296	289	270	285	277	252	279	254	289	285	257	289	278	290	
Shipments from mills do	3,303	3,288	309	257	265	273	259	277	267	280	302	292	277	266	288	
Stocks at mills, end of period do	33	41	67	80	100	103	96	98	85	94	76	41	53	66	68	
Consumption by publishers♂ do	7,130	7,057	597	600	627	569	529	558	580	653	643	629	570	571	642	
Stocks at and in transit to publishers, end of period thous. sh. tons	749	705	753	741	672	687	672	699	685	682	704	705	711	699	664	
Imports do	6,635	6,881	570	617	570	640	501	547	608	607	610	635	591	504	550	
Price, rolls, contract, f.o.b. mill, freight allowed or delivered $ per sh. ton	150.50	157.00	153.70	158.10	158.10	158.10	158.10	158.10	158.10	158.10	158.10	158.10	159.70	161.70	163.70	
Paperboard (American Paper Institute):																
Orders, new (weekly avg.) thous. sh. tons	349	474	518	523	527	509	497	531	500	536	532	474	521	560	583	574
Orders, unfilled § do	742	917	758	801	867	830	975	1,039	1,000	1,003	1,003	917	976	1,010	1,087	1,199
Production, total (weekly avg.) do	489	501	507	508	511	510	463	516	494	528	517	461	504	539	559	552
Paper products:																
Shipping containers, corrugated and solid fiber, shipments mil. sq. ft. surf. area	184,426	190,705	14,283	14,466	18,668	16,924	15,467	15,222	15,538	20,169	16,297	16,074	14,749	15,534	16,285	15,938
Folding paper boxes thous. sh. tons	2,490.0	2,445.0	211.5	202.2	196.0	209.6	186.7	204.4	208.4	208.8	204.9	216.1	r 203.7	r 192.2	217.8	
mil $	1,225.0	1,250.0	107.6	102.5	100.2	106.6	95.2	105.9	109.5	109.5	r 105.0	109.5	r 105.3	r 100.1	112.9	

RUBBER AND RUBBER PRODUCTS

RUBBER																
Natural rubber:																
Consumption thous. lg. tons	559.32	602.33	54.43	49.74	49.68	52.18	43.45	50.86	53.60	54.10	49.77	50.04	55.31	54.83		
Stocks, end of period do	102.60	135.06	102.65	98.59	105.88	104.93	121.96	125.61	131.35	124.92	126.36	135.06	128.01	130.04		
Imports, incl. latex and guayule do	549.92	612.72	41.15	42.77	49.77	74.53	47.62	69.57	54.25	44.68	42.07	56.40	57.89	51.72	63.95	
Price, wholesale, smoked sheets (N.Y.) $ per lb	.218	.180	.183	.194	.200	.178	.166	.180	.179	.176	.173	.171	.180	.178	.170	.165
Synthetic rubber:																
Production thous. lg. tons	2,197.00	2,241.16	181.79	184.12	196.59	182.09	187.49	186.97	187.01	194.00	194.89	196.13	199.99	192.96		
Consumption do	1,917.85	2,079.01	185.45	171.78	171.72	181.97	149.86	174.00	183.40	187.28	170.60	176.19	182.77	184.94		
Stocks, end of period do	514.78	486.16	497.56	491.19	501.78	487.79	505.30	483.90	468.25	462.10	480.28	486.16	487.44	481.84		
Exports (Bu. of Census) do	290.06	269.82	27.28	24.41	25.91	20.78	24.41	29.41	35.01	14.22	9.76	15.51	26.84	26.72	20.02	
Reclaimed rubber:																
Production do	200.56	199.03	19.47	17.88	16.64	16.64	14.78	15.30	16.35	16.86	15.79	15.86	15.76	17.21		
Consumption do	199.57	194.84	19.19	17.19	16.39	16.33	12.78	16.20	16.60	17.41	14.88	15.68	16.42	16.56		
Stocks, end of period do	27.58	22.31	26.57	27.12	26.17	25.71	26.31	25.44	23.51	21.85	22.50	22.31	21.00	21.05		
TIRES AND TUBES																
Pneumatic casings, automotive:																
Production thous.	190,403	213,110	r 19,693	17,752	17,775	18,643	15,739	17,351	18,889	19,113	17,134	17,589	19,074	19,143	20,456	
Shipments, total do	194,541	211,217	r 18,621	21,362	19,012	21,546	16,355	17,478	20,280	18,503	16,392	13,814	15,091	16,062	20,317	
Original equipment do	46,135	55,860	r 5,675	4,840	4,931	4,993	2,649	4,047	5,138	5,170	4,936	4,318	5,038	r 5,245	6,019	
Replacement equipment do	146,508	153,405	r 12,694	16,329	13,889	16,388	13,552	13,248	15,008	13,248	11,345	9,315	9,849	10,644	14,130	
Exports do	1,898	1,952	r 252	193	192	164	154	183	133	86	111	180	203	173	167	
Stocks, end of period do	50,175	54,992	r 57,656	54,089	53,121	50,546	50,189	50,231	49,245	49,927	50,824	54,992	59,394	62,705	63,186	
Exports (Bu. of Census) do	1,531	1,589	283	167	161	139	103	113	122	108	92	113	129	136	160	
Inner tubes, automotive:																
Production do	35,687	35,562	3,375	2,941	2,945	2,801	2,523	2,792	3,210	3,112	2,847	2,863	3,390	3,477	3,749	
Shipments do	41,005	40,476	3,427	3,270	3,275	3,760	3,317	3,278	3,746	3,639	3,092	3,035	3,607	3,532	4,041	
Stocks, end of period do	9,718	8,271	9,736	9,683	9,576	8,872	8,477	8,242	8,003	7,891	8,110	8,271	8,627	8,877	9,056	
Exports (Bu. of Census) do	1,002	979	85	124	72	86	73	46	81	59	79	99	101	79	74	

r Revised. p Preliminary. e Corrected.
♂As reported by publishers accounting for about 75 percent of total newsprint consumption.
§Monthly data are averages for the 4-week period ending on Saturday nearest the end of the month; annual data are as of Dec. 31.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
STONE, CLAY, AND GLASS PRODUCTS																
PORTLAND CEMENT																
Shipments, finished cement, thous. bbl.	[1] 390,461	[1] 419,197	28,308	36,185	37,771	44,[r]49	42,212	45,136	42,617	43,069	35,954	26,212	22,399	23,910	32,227	.....
CLAY CONSTRUCTION PRODUCTS																
Shipments:																
Brick, unglazed (common and face), mil. standard brick	6,496.0	7,569.7	590.9	687.6	691.1	757.8	677.5	741.7	733.9	720.2	651.6	561.3	[r]507.2	537.7	.....	.....
Structural tile, except facing, thous. sh. tons	[r]181.0	157.7	15.9	17.7	15.8	13.8	12.8	13.3	12.4	11.9	11.8	9.9	[r]9.2	10.7	.....	.....
Sewer pipe and fittings, vitrified, do.	[r]1,622.3	1,717.6	131.4	159.0	159.9	175.6	173.0	173.4	155.1	148.5	140.1	113.9	[r]109.9	109.0	.....	.....
Facing tile (hollow), glazed and unglazed, mil. brick equivalent	173.0	155.4	14.1	14.9	13.2	14.0	12.9	13.9	12.7	13.0	12.2	11.1	[r]9.2	8.8	.....	.....
Floor and wall tile and accessories, glazed and unglazed, mil. sq. ft.	250.4	276.2	23.5	23.2	21.5	25.5	23.2	25.2	24.4	24.3	23.8	22.2	[r]22.7	22.7	.....	.....
Price index, brick (common), f.o.b. plant or N.Y. dock, 1967=100	112.2	117.4	117.0	117.4	117.4	117.4	117.4	118.4	118.4	118.4	118.4	118.4	118.3	121.2	121.4	122.0
GLASS AND GLASS PRODUCTS																
Flat glass, mfrs.' shipments, thous. $	382,969	453,982	99,183	.....	.....	109,682	.....	.....	118,957	.....	.....	126,160	.....	.....	.....	.....
Sheet (window) glass, shipments, do.	131,551	150,274	32,946	.....	.....	35,589	.....	.....	40,773	.....	.....	40,966	.....	.....	.....	.....
Plate and other flat glass, shipments, do.	251,418	303,708	66,237	.....	.....	74,093	.....	.....	78,184	.....	.....	85,194	.....	.....	.....	.....
Glass containers:																
Production, thous. gross	267,411	261,543	23,030	21,770	22,882	23,445	21,754	24,975	21,779	23,321	19,791	18,149	20,731	[r]21,533	23,024	.....
Shipments, domestic, total, do.	264,483	253,107	22,197	21,230	21,286	24,384	22,289	28,733	21,104	19,761	18,975	20,407	19,160	[r]20,185	25,957	.....
Narrow-neck containers:																
Food, do.	24,806	24,238	2,262	1,950	1,893	2,047	1,894	3,295	2,626	1,664	1,599	1,566	1,869	[r]2,150	2,431	.....
Beverage, do.	69,254	66,952	5,562	5,793	5,869	7,348	6,878	6,976	5,161	4,703	5,080	5,024	4,789	[r]5,238	7,154	.....
Beer, do.	52,626	53,189	4,803	4,882	4,951	5,483	5,336	5,937	4,053	3,624	3,455	3,918	3,433	3,522	4,928	.....
Liquor and wine, do.	20,638	20,036	1,872	1,598	1,501	1,721	1,350	2,130	1,669	1,766	1,732	1,757	1,748	[r]1,664	2,076	.....
Wide-mouth containers:																
Food (incl. packer's tumblers, jelly glasses, and fruit jars), thous. gross	58,632	57,208	4,792	4,345	4,443	5,096	4,693	7,030	4,999	5,219	4,476	4,704	4,600	[r]4,668	5,873	.....
Dairy products, do.	379	305	30	25	19	20	21	29	27	26	[r]30	24	23	17	22	.....
Narrow-neck and Wide-mouth containers:																
Medicinal and toilet, do.	34,252	27,645	2,539	2,329	2,302	2,348	1,822	2,907	2,293	2,478	2,324	2,169	2,391	[r]2,547	3,063	.....
Household and industrial, do.	3,896	3,534	337	308	308	321	295	429	276	281	279	245	307	[r]379	410	.....
Stocks, end of period, do.	30,084	35,369	38,263	38,642	39,999	38,866	38,220	34,117	34,243	37,285	38,104	35,369	36,229	[r]37,593	34,416	.....
GYPSUM AND PRODUCTS (QTRLY)																
Crude gypsum, total:																
Imports, thous. sh. tons	6,128	6,262	1,273	.....	.....	1,617	.....	.....	1,806	.....	.....	1,565	.....	.....	.....	.....
Production, do.	9,462	10,437	2,210	.....	.....	2,622	.....	.....	2,816	.....	.....	2,788	.....	.....	.....	.....
Calcined, production, total, do.	8,654	10,224	2,194	.....	.....	2,509	.....	.....	2,798	.....	.....	2,723	.....	.....	.....	.....
Gypsum products sold or used, total:																
Uncalcined uses, do.	4,219	[1] 4,305	746	.....	.....	1,264	.....	.....	1,216	.....	.....	1,101	.....	.....	.....	.....
Industrial uses, do.	265	268	63	.....	.....	69	.....	.....	67	.....	.....	69	.....	.....	.....	.....
Building uses:																
Plasters:																
Base-coat, do.	408	381	94	.....	.....	102	.....	.....	98	.....	.....	88	.....	.....	.....	.....
All other (incl. Keene's cement), do.	588	[1] 534	119	.....	.....	140	.....	.....	149	.....	.....	128	.....	.....	.....	.....
Lath, mil. sq. ft.	749	477	117	.....	.....	116	.....	.....	126	.....	.....	118	.....	.....	.....	.....
Wallboard, do.	8,764	[1] 11,176	2,359	.....	.....	2,741	.....	.....	3,074	.....	.....	2,996	.....	.....	.....	.....
All other, do.	228	292	60	.....	.....	72	.....	.....	85	.....	.....	76	.....	.....	.....	.....
TEXTILE PRODUCTS																
WOVEN FABRICS																
Woven fabrics (gray goods), weaving mills:																
Production, total ♀, mil. linear yd.	11,545	11,117	[2] 1,119	870	885	[2] 1,073	657	848	[2] 1,062	892	882	[2] 1,009	905	921	.....	.....
Cotton, do.	6,395	6,281	[2] 646	490	499	[2] 598	353	474	[2] 598	503	493	[2] 564	504	508	.....	.....
Manmade fiber, do.	4,991	4,735	[2] 462	370	376	[2] 465	297	367	[2] 457	383	383	[2] 438	394	406	.....	.....
Stocks, total, end of period ♀ ♂, do.	1,471	1,094	1,356	1,346	1,288	1,301	1,233	1,208	1,202	1,141	1,095	1,094	[r]1,096	1,107	.....	.....
Cotton, do.	592	482	547	571	539	549	507	517	521	507	480	482	491	496	.....	.....
Manmade fiber, do.	867	604	795	760	736	740	714	679	668	624	605	604	[r]596	601	.....	.....
Orders, unfilled, total, end of period ♀ ¶, do.	2,434	2,717	2,642	2,711	2,768	2,703	2,701	2,599	2,425	2,393	2,552	2,717	2,884	3,068	.....	.....
Cotton, do.	1,525	1,523	1,640	1,638	1,686	1,617	1,596	1,507	1,395	1,352	1,446	1,523	1,608	1,760	.....	.....
Manmade fiber, do.	866	1,168	964	1,036	1,046	1,055	1,078	1,068	1,007	1,018	1,081	1,168	1,252	1,280	.....	.....
COTTON																
Cotton (excluding linters):																
Production:																
Ginnings△, thous. running bales	10,112	10,227	[5] 10,112	.....	.....	.....	127	365	880	4,605	7,916	[3] 8,217	[4] 9,744	.....	[6] 10,227	.....
Crop estimate, 480-pound bales, net weight, thous. bales	10,192	10,468	[5] 10,192	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	[6] 10,468	.....
Consumption, do.	7,878	8,128	[2] 815	637	646	[2] 797	515	637	[2] 771	633	642	[2] 727	632	649	[r2] 808	617
Stocks in the United States, total, end of period, thous. bales	11,900	10,185	8,049	6,955	5,992	4,896	4,252	14,276	13,165	12,162	11,247	10,185	9,088	7,642	[r]6,474	.....
Domestic cotton, total, do.	11,886	10,166	8,031	6,940	5,975	4,880	4,236	14,261	13,144	12,146	11,232	10,166	9,064	7,614	[r]6,448	.....
On farms and in transit, do.	1,482	2,389	778	569	541	451	400	11,052	10,403	7,123	3,747	2,389	1,399	878	602	.....
Public storage and compresses, do.	9,257	6,547	5,577	4,606	3,672	2,700	2,206	1,707	1,488	3,957	6,462	6,547	6,315	5,140	[r]4,047	3,252
Consuming establishments, do.	1,147	1,230	1,677	1,764	1,762	1,730	1,630	1,502	1,253	1,066	1,023	1,230	1,350	1,596	[r]1,799	1,874
Foreign cotton, total, do.	14	19	18	15	17	16	15	15	21	16	15	19	24	28	26	28

[r] Revised. [1] Reported annual total; revisions not allocated to the months or quarter. [2] Data cover 5 weeks; other months, 4 weeks. [3] Ginnings to Dec. 13. [4] Ginnings to Jan. 16. [5] Crop for the year 1970. [6] Crop for the year 1971. ♀ Includes data not shown separately.

♂ Stocks (owned by weaving mills and billed and held for others) exclude bedsheeting, toweling, and blanketing, and billed and held stocks of denims.

¶ Unfilled orders cover wool apparel (including polyester-wool) finished fabrics; production and stocks exclude figures for such finished fabrics. Orders also exclude bedsheeting, toweling, and blanketing.

△ Total ginnings to end of month indicated, except as noted.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
TEXTILE PRODUCTS—Continued																
COTTON—Continued																
Cotton (excluding linters)—Continued																
Exports, thous. bales	2,982	[5] 4,128	562	467	327	307	214	162	310	195	272	417	337	402	437	
Imports, do	37	38	8	3	3	2	1	3	5	0	(3)	4	15	16	5	
Price (farm), American upland⊙, cents per lb	[1] 21.9	[6] 28.5	22.5	23.1	22.9	23.1	22.8	27.0	27.0	27.6	28.7	29.1	30.2	30.3	27.8	31.3
Price, middling 1", avg. 12 markets⊙, do	[1] 23.6	[6] 30.6	23.6	23.8	24.5	25.1	25.3	26.8	27.3	27.7	28.0	30.1	32.9	33.4	33.8	35.2
COTTON MANUFACTURES																
Spindle activity (cotton system spindles):																
Active spindles, last working day, total, mil	18.6	18.4	18.6	18.6	18.5	18.5	18.5	18.4	18.4	18.5	18.4	18.4	18.3	18.2	r 18.3	18.3
Consuming 100 percent cotton, do	11.6	11.4	11.6	11.5	11.5	11.5	11.5	11.4	11.4	11.4	11.4	11.4	11.2	11.1	11.0	11.0
Spindle hours operated, all fibers, total, bil	113.0	113.8	[2] 11.3	8.9	9.1	[2] 11.3	7.2	8.9	[2] 10.8	9.1	9.0	[2] 10.2	9.1	9.1	r [2] 11.5	9.2
Average per working day, do	.435	.438	.450	.445	.456	.450	.365	.443	.433	.456	.450	.407	.453	.457	r .460	.461
Consuming 100 percent cotton, do	70.4	70.3	[2] 7.0	5.5	5.6	[2] 6.9	4.5	5.5	[2] 6.7	5.6	5.5	[2] 6.2	5.5	5.5	r [2] 6.9	5.5
Cotton yarn, price, 36/2, combed, knit, $ per lb	1.008	1.061	1.036	1.054	1.059	1.066	1.068	1.078	1.082	1.082	1.082	1.088	1.096	1.107	1.107	1.115
Cotton cloth:																
Cotton broadwoven goods over 12" in width:																
Production (qtrly.), mil. lin. yd	6,246	6,157	1,607			1,609			1,405			1,535				
Orders, unfilled, end of period, as compared with avg. weekly production, No. weeks' prod	15.4	16.9	14.9	15.7	15.7	15.8	20.8	14.4	13.4	12.5	14.3	16.9	16.1	16.3	17.1	
Inventories, end of period, as compared with avg. weekly production, No. weeks' prod	5.5	4.5	5.0	5.3	4.9	5.0	6.3	4.7	4.5	4.3	4.2	4.5	4.3	4.2	4.1	
Ratio of stocks to unfilled orders (at cotton mills), end of period, seasonally adjusted‡	.37	.28	.34	.34	.31	.31	.31	.32	.34	.34	.32	.28	.26	.25	.24	
Exports, raw cotton equiv, thous. bales	274.3	312.6	25.9	25.4	26.3	23.5	24.4	28.1	36.3	13.0	23.7	45.3	33.9	31.6	37.7	
Imports, raw cotton equiv, do	543.3	569.5	37.6	48.3	41.9	51.3	48.2	52.2	76.2	27.3	21.2	85.7	75.0	59.1	58.5	
Mill margins:																
Carded yarn cloth average, cents per lb	43.57	44.40	43.48	43.45	43.68	44.61	44.68	45.56	45.24	44.76	44.77	44.88	44.96	45.68	46.33	45.51
Prices, wholesale:																
Print cloth, 38½-inch, 64 x 54, cents per yard		15.8	15.0	15.0	15.0	15.5	15.6	16.4	16.4	16.4	16.4	17.5	17.5	17.8	18.0	18.0
Sheeting, class B, 40-inch, 48 x 44-48, do		22.2	19.8	19.8	20.3				21.8	21.8	22.0	23.0	23.2	24.0	24.0	24.0
MANMADE FIBERS AND MANUFACTURES																
Fiber production, qtrly. total, mil. lb	5,391.7	6,124.2	1,413.3			1,500.4			1,574.3			1,636.2				
Filament yarn (rayon and acetate), do	730.8	752.9	191.8			200.2			181.9			179.0				
Staple, incl. tow (rayon), do	607.4	611.7	141.3			147.3			154.9			168.2				
Noncellulosic, except textile glass:																
Yarn and monofilaments, do	1,793.4	2,186.8	477.8			520.6			580.3			608.1				
Staple, incl. tow, do	1,792.8	2,104.3	500.0			520.1			531.0			553.2				
Textile glass fiber, do	467.3	468.5	102.4			112.2			126.2			127.7				
Exports: Yarns and monofilaments, thous. lb	148,843	130,511	14,640	13,220	13,482	11,245	11,387	10,518	10,896	5,609	5,490	9,186	9,851	9,971	9,500	
Staple, tow, and tops, do	152,871	181,612	16,041	18,688	15,202	16,589	15,728	18,236	25,155	6,967	7,505	12,446	14,441	16,080	20,279	
Imports: Yarns and monofilaments, do	137,054	249,819	24,252	25,509	25,815	24,711	19,622	19,449	23,982	18,220	8,878	22,329	20,302	15,508	20,387	
Staple, tow, and tops, do	140,075	175,306	17,648	20,422	15,088	17,773	15,202	16,216	20,601	15,702	4,048	9,399	8,738	13,808	10,985	
Stocks, producers', end of period:																
Filament yarn (rayon and acetate), mil. lb	75.0	65.2	74.1			70.8			70.3			65.2				
Staple, incl. tow (rayon), do	76.0	40.7	58.5			43.8			41.4			40.7				
Noncellulosic fiber, except textile glass:																
Yarn and monofilaments, do	288.3	295.6	272.9			254.4			263.1			295.6				
Staple, incl. tow, do	242.6	252.2	251.8			235.8			246.6			252.2				
Textile glass fiber, do	103.8	89.4	94.4			75.4			84.1			89.4				
Prices, manmade fibers, f.o.b. producing plant:																
Staple: Polyester, 1.5 denier, $ per lb	.61	.61	.61	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62	.62
Yarn: Rayon (viscose), 150 denier, do	[4] .93											1.03	1.03	1.05	1.01	1.01
Acrylic (spun), knitting, 2/20, 3-6D, do	1.39	1.26	1.28	1.28	1.26	1.25	1.25	1.25	1.24	1.21	1.21	1.19	1.19	1.18	1.18	1.20
Manmade fiber and silk broadwoven fabrics:																
Production (qtrly.), total ♀, mil. lin. yd	5,028.2	4,876.4	1,225.4			1,237.3			1,147.8			1,265.9				
Filament yarn (100%) fabrics ♀, do	1,461.4	1,422.0	339.3			362.6			343.0			377.1				
Chiefly rayon and/or acetate fabrics, do	639.7	517.9	135.5			129.1			125.5			127.8				
Chiefly nylon fabrics, do	271.4	295.4	70.9			80.3			71.5			72.7				
Spun yarn (100%) fab., exc. blanketing ♀, do	2,871.6	2,777.9	722.1			711.1			639.0			705.7				
Rayon and/or acetate fabrics and blends, do	444.8	382.7	111.6			98.1			83.3			89.7				
Polyester blends with cotton, do	1,962.8	2,002.5	508.9			515.6			462.3			515.7				
Filament and spun yarn fabrics (combinations and mixtures), mil. lin. yd	472.6	449.0	106.5			108.2			109.3			125.0				
WOOL																
Wool consumption, mill (clean basis):																
Apparel class, mil. lb	163.7	116.2	[2] 13.0	9.4	9.7	[2] 12.1	7.3	8.0	[2] 10.7	8.8	7.7	[2] 9.8	9.5	10.4	[2] 14.1	
Carpet class, do	76.6	74.8	[2] 6.7	5.3	5.3	[2] 7.2	4.8	6.6	[2] 7.5	7.0	6.4	[2] 7.2	7.6	7.2	[2] 8.3	
Wool imports, clean yield, do	153.1	126.6	11.2	11.1	11.5	10.4	13.8	17.0	13.3	5.3	1.0	10.7	7.1	10.5	7.2	
Duty-free (carpet class), do	73.3	83.9	6.2	6.9	6.3	7.0	11.3	13.4	8.4	2.9	.8	9.9	5.0	9.0	5.4	
Wool prices, raw, clean basis, Boston:																
Good French combing and staple:																
Graded territory, fine, $ per lb	1.024	.664	.757	.708	.630	.597	.590	.595	.610	.610	.605	.615	.625	.640	.708	.744
Graded fleece, ⅜ blood, do	.872	.656	.685	.658	.640	.640	.640	.640	.640	.621	.593	.525	.525	.550	.577	.696
Australian, 64s, warp and half-warp, do	.941	.802	.790	.790	.800	.828	.802	.795	.795	.780	.805	.839	.890	1.030	1.001	1.095
WOOL MANUFACTURES																
Knitting yarn, worsted, 2/20s-50s/56s, American system, wholesale price, 1967=100	101.4	94.4	97.6	96.3	95.4	95.0	93.3	93.3	92.0	91.1	91.1	88.3	89.2	89.2	90.2	92.6
Wool broadwoven goods, exc. felts:																
Production (qtrly.), mil. lin. yd	178.6	113.6	37.0			32.6			22.7			21.3				
Price (wholesale), suiting, flannel, men's and boys', f.o.b. mill, 1967=100	101.3		101.3	101.3	101.3	100.1										

r Revised. [1] Season average. [2] For 5 weeks; other months, 4 weeks. [3] Less than 500 bales. [4] Average for 4 months, Sept.–Dec. [5] Revised total; revisions not distributed by months. [6] Season average through Apr. 1972. ⊙Beginning Aug 1971, prices are on 480-lb. net-weight bale basis (for earlier months, on 500-lb. gross-weight bale basis); to compute comparable prices for earlier months' multiply farm price by 1.04167 and market price by 1.0438. ‡Revisions for 1967–70 are available. ♀Includes data not shown separately.

Unless otherwise stated in footnotes below, data through 1970 and descriptive notes are as shown in the 1971 edition of BUSINESS STATISTICS	1970	1971	1971										1972			
	Annual		Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
TEXTILE PRODUCTS—Continued																
APPAREL																
Hosiery, shipments, thous. doz. pairs	231,795	209,726	17,595	16,720	16,975	20,684	18,750	18,643	18,750	19,690	16,640	13,835	15,172	15,932	19,325	
Men's apparel, cuttings:‡																
Tailored garments:																
Suits, thous. units	17,694	13,430	1,317	1,317	1,264	1,067	672	1,188	1,135	1,120	1,063	1,029	1,208	1,171	1,320	
Coats (separate), dress and sport, do	11,750	11,503	890	959	996	974	656	1,023	1,086	1,232	1,076	1,067	1,088	1,198	1,279	
Trousers (separate), dress and sport, do	173,599	179,732	17,683	16,188	15,186	15,209	13,463	15,080	14,721	14,696	15,087	13,430	15,503	14,889	17,476	
Shirts (woven), dress and sport, thous. doz	20,792	19,741	1,692	1,776	1,628	1,785	1,274	1,618	1,772	1,824	1,722	1,603	1,770	r 1,713	1,797	
Women's, misses', juniors' apparel, cuttings:‡																
Coats, thous. units	21,769	17,033	1,218	1,140	1,145	1,518	1,475	1,606	1,661	1,795	1,717	1,289	1,344	r 1,245	1,128	
Dresses, do	251,540	240,266	23,085	24,128	19,534	20,739	17,737	19,405	19,784	20,841	19,323	16,327	18,386	r 23,872	23,686	
Blouses and shirts, thous. doz	13,250	12,590	1,311	1,205	1,056	1,045	951	988	1,031	1,112	981	786	1,106	r 1,196	1,266	
Skirts, do	6,927	5,494	466	389	404	539	464	481	535	587	421	402	509	r 592	594	
TRANSPORTATION EQUIPMENT																
AEROSPACE VEHICLES																
Orders, new (net), qtrly. total, mil. $	21,161	21,614	5,171			4,153			6,671			5,619				
U.S. Government, do	15,116	14,744	3,466			2,677			4,948			3,653				
Prime contract, do	19,010	19,200	4,629			3,640			5,062			4,869				
Sales (net), receipts, or billings, qtrly. total, do	24,752	21,625	5,424			6,154			4,816			5,231				
U.S. Government, do	16,407	14,066	3,479			4,024			3,266			3,297				
Backlog of orders, end of period ♀, do	24,705	21,808	24,489			22,458			24,026			21,808				
U.S. Government, do	12,882	13,330	12,972			11,581			13,109			13,330				
Aircraft (complete) and parts, do	13,264	9,561	12,926			11,419			12,315			9,561				
Engines (aircraft) and parts, do	2,449	2,272	2,447			2,185			2,343			2,272				
Missiles, space vehicle systems, engines, propulsion units, and parts, mil. $	4,522	4,664	4,335			3,971			4,509			4,664				
Other related operations (conversions, modifications), products, services, mil. $	2,791	2,979	2,575			2,658			2,777			2,979				
Aircraft (complete):																
Shipments, do	3,605.0	3,297.5	389.8	243.9	418.6	306.9	154.9	119.1	195.0	211.1	388.0	430.5	358.1	r 480.9	635.3	
Airframe weight, thous. lb	59,436	48,818	6,333	4,414	6,968	4,431	2,299	2,125	2,847	3,480	3,822	4,687	r 3,303	r 3,781	6,188	
Exports, commercial, mil. $	1,527.2	1 1,906.8	313.4	207.6	253.6	105.0	72.8	108.4	122.8	126.3	112.4	195.9	144.8	142.7	298.1	
MOTOR VEHICLES																
Factory sales (from plants in U.S.), total, thous	8,239.3	10,637.7	1,057.4	921.6	930.8	1,008.2	608.6	639.9	951.1	988.3	963.3	786.1	889.1	954.3	1,038.3	2 997.5
Domestic, do	7,753.0	10,036.0	992.4	863.0	867.9	945.9	577.2	602.1	892.3	943.1	917.0	745.0	847.2	910.0	983.4	
Passenger cars, total, do	6,546.8	8,584.6	865.2	750.4	767.3	809.8	490.5	484.8	757.8	793.5	773.5	623.4	698.0	748.3	806.5	2 777.7
Domestic, do	6,187.3	8,121.7	815.9	703.6	716.7	761.3	468.9	457.6	712.0	758.6	736.6	593.2	666.0	716.1	765.2	
Trucks and buses, total, do	1,692.4	2,053.1	192.2	171.2	163.4	198.4	118.1	155.1	193.3	194.8	189.8	162.7	191.1	206.1	231.8	2 219.8
Domestic, do	1,565.7	1,914.3	176.5	159.4	151.2	184.6	108.3	144.5	180.2	184.5	180.4	151.8	181.2	193.9	218.3	
Retail sales, new passenger cars:																
Total, not seasonally adjusted, thous	8,405	10,252	897	885	890	956	817	725	884	1,051	962	741	721	813	913	899
Domestics△, do	7,119	8,681	756	737	748	798	668	566	756	934	848	649	610	698	772	774
Imports△, do	1,285	1,570	141	148	142	158	149	160	129	117	114	92	111	115	141	125
Total, seasonally adjusted at annual rates, mil			10.0	10.0	9.8	9.8	9.8	10.1	12.2	11.3	10.9	9.3	10.3	10.4	10.3	10.6
Domestics△, do			8.5	8.3	8.2	8.1	8.1	8.3	10.8	10.0	9.4	8.0	8.8	8.9	8.7	9.1
Imports△, do			1.6	1.7	1.6	1.7	1.7	1.9	1.5	1.4	1.5	1.3	1.5	1.5	1.6	1.5
Retail inventories, new cars (domestics), end of period:△																
Not seasonally adjusted, thous	1,220	1,447	1,683	1,707	1,753	1,799	1,582	1,569	1,591	1,481	1,446	1,447	1,588	1,684	1,741	1,782
Seasonally adjusted, do	1,294	1,590	1,530	1,557	1,579	1,609	1,580	1,681	1,691	1,660	1,595	1,590	1,521	1,566	1,578	1,628
Inventory-sales ratio, new cars (domestics)△, ratio			2.2	2.2	2.3	2.4	2.3	2.4	1.9	2.0	2.0	2.4	2.1	2.1	2.2	2.2
Exports (Bureau of the Census):																
Passenger cars (new), assembled, thous	285.04	386.64	41.52	35.12	48.62	40.75	21.27	19.97	37.95	29.73	32.04	26.62	25.11	28.22	34.56	
To Canada, do	245.62	348.40	37.14	31.58	46.07	38.47	19.48	18.74	32.86	27.02	29.39	22.44	22.13	25.00	31.59	
Trucks and buses (new), assembled, do	93.87	100.04	10.76	9.42	9.34	9.34	6.96	6.67	9.98	7.71	7.53	8.50	7.37	9.99	10.16	
Imports (Bureau of the Census):																
Passenger cars (new), complete units, do	2,013.42	2,587.48	233.92	222.70	230.00	242.53	183.42	205.45	227.04	194.65	215.30	229.09	215.64	226.78	258.77	
From Canada, total, do	692.78	802.28	81.09	69.01	77.64	84.73	37.34	49.64	67.53	72.35	77.81	67.78	59.30	75.75	81.44	
Trucks and buses, complete units, do	1 115.82	160.87	12.77	10.38	10.38	12.07	8.83	7.83	13.32	16.18	21.33	25.66	20.14	6 21.95	21.73	
Truck trailers (complete), shipments, number	105,709	103,784	7,852	8,347	7,467	8,672	8,505	8,469	9,620	10,598	9,652	10,721	9,947	r 11,309	13,045	
Vans, do	71,274	65,785	4,748	4,897	4,415	5,244	5,260	5,367	6,353	7,315	6,483	7,260	7,039	r 7,770	9,032	
Trailer bodies and chassis (detachable), sold separately, number	26,138	18,509	1,523	1,192	1,240	1,122	1,723	2,576	1,844	1,483	1,833	1,878	2,147	2,207	2,836	
Registrations (new vehicles):⊙																
Passenger cars, thous	5 8,388.2	14 9,729.1	5 820.3	833.5	4 838.7	4 897.0	4 806.0	4 780.6	4 791.0	4 922.3	4 934.7	4 885.0	4 685.1	4 680.0	4 828.1	
Imports, incl. domestically sponsored, do	5 1,231.0	14 1,465.7	5 132.6	3 127.8	4 129.7	4 142.1	4 134.3	4 145.4	4 128.6	4 115.9	4 103.7	4 98.2	4 91.4	4 97.1	4 122.5	
Trucks, do	1 5 1,790.2	14 1,981.3	5 158.2	3 168.4	4 171.5	4 178.1	4 177.6	4 166.7	4 153.9	4 183.4	4 193.9	4 206.8	4 165.0	4 165.7	4 203.1	
RAILROAD EQUIPMENT																
Freight cars (all railroads and private car lines):																
Shipments, number	1 66,185	1 55,307	5,026	5,497	5,252	5,401	3,305	3,329	4,701	4,865	4,159	4,807	4,211	3,567	4,580	
Equipment manufacturers, do	1 52,411	1 47,990	4,262	4,431	4,381	4,205	2,696	2,852	4,144	4,569	4,046	4,551	3,965	3,327	4,351	
New orders, do	1 50,293	1 52,482	5,304	4,107	6,670	8,521	3,807	1,211	1,534	7,473	3,518	3,933	3,780	2,125	3,662	
Equipment manufacturers, do	1 42,530	1 46,913	3,885	3,782	6,570	6,321	3,652	1,211	1,534	6,873	3,418	3,633	2,320	2,025	3,462	
Unfilled orders, end of period, do	27,552	22,221	25,193	23,563	24,944	27,977	28,547	26,429	23,113	25,863	25,213	22,221	21,865	19,490	18,592	
Equipment manufacturers, do	22,320	18,753	19,948	19,059	21,227	23,256	24,280	22,639	19,880	22,426	21,789	18,753	17,183	14,948	14,079	
Freight cars (revenue), class 1 railroads (AAR):§																
Number owned, end of period, thous	1,423	1,422	1,430	1,431	1,431	1,431	1,430	1,428	1,427	1,426	1,426	1,422	1,422	1,441	1,439	
Held for repairs, % of total owned	5.7	5.6	5.6	5.6	5.5	5.5	5.4	5.7	5.7	5.6	5.7	5.6	5.8	5.7	5.8	
Capacity (carrying), aggregate, end of period, mil. tons	95.64	97.14	96.38	96.70	96.82	96.95	96.96	96.92	97.00	97.15	97.22	97.14	97.33	98.82		
Average per car, tons	67.19	68.29	67.37	67.55	67.66	67.76	67.82	67.91	67.98	68.13	68.19	68.29	68.44	68.56		

r Revised. 1 Annual total includes revisions not distributed by months. 2 Estimate of **production.** 3 Omits data for three States. 4 Omits data for two States. 5 Omits data for one State. 6 Effective Feb. 1972, imports include trucks valued less than $1,000 each.
‡Monthly revisions (1970) appear in Census report, Apparel Survey, 1970, MA–23A(70)–1.
♀ Total includes backlog for nonrelated products and services and basic research.
△Domestics include U.S.-type cars produced in the United States and Canada; imports cover foreign-type cars and captive imports, and exclude domestics produced in Canada.
⊙Courtesy of R. L. Polk & Co.; republication prohibited.
§Excludes railroad-owned private refrigerator cars and private line cars.

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MAY 1972 / VOLUME 52 NUMBER 5 PART II

SURVEY OF CURRENT BUSINESS

The Measurement of Productivity

U.S. DEPARTMENT OF COMMERCE
Social and Economic tistics Administration
EAU OF ECONOMIC ANALYSIS

MAY 1972 / VOLUME 52 NUMBER 5 PART II

SURVEY OF CURRENT BUSINESS

CONTENTS

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This month's issue of the SURVEY OF CURRENT BUSINESS appears in two parts. This usual contents of the SURVEY appear in Part I.

The Measurement of Productivity

In the May 1969 SURVEY OF CURRENT BUSINESS, Part II, BEA published a critique by Edward F. Denison of a study of U.S. productivity change by Dale W. Jorgenson and Zvi Griliches. The Jorgenson-Griliches study, "The Explanation of Productivity Change," was reprinted in that volume. The present volume concludes the discussion between Denison and Jorgenson-Griliches and, for the convenience of the reader, reprints in full the contents of the earlier issue of the SURVEY.

Differences in concepts and methodology used by Jorgenson-Griliches and Denison at the time of the earlier publication led to striking differences in their results. According to Denison, a substantial part of the postwar growth of national output was due to an increase in productivity; according to Jorgenson and Griliches, almost all of the increase was due to an increase in factor inputs.

In "Issues in Growth Accounting: A Reply to Edward F. Denison," Jorgenson and Griliches now assign a much larger role to productivity in the explanation of economic growth, and in several respects have come closer to the concepts and methodology advocated by Denison. But substantial differences remain, and they argue that Denison is using inconsistent procedures in his treatment of capital. Denison's "Final Comment" is a detailed and comprehensive discussion of the basic issues relating to the measurement of capital inputs that divide experts who share the marginal productivity approach to the analysis of output, input, and productivity. In their "Final Reply," Jorgenson and Griliches restate their position.

The present volume will be indispensable to all economists and statisticians who are seriously interested in productivity. BEA is pleased to be able to provide a forum for the discussion between these distinguished experts, and to provide readers the opportunity to make up their own minds on the remaining unsettled issues.

The contents of this volume are as follows

The Explanation of Productivity Change

By D. W. JORGENSON
and
Z. GRILICHES

Reprinted with corrections from
The Review of
Economic Studies
Vol. XXXIV (3), No. 99
(July 1967)

The Explanation of Productivity Change[1]

But part of the job of economics is weeding out errors. That is much harder than making them, but also more fun.—R. M. SOLOW

1. INTRODUCTION

Measurement of total factor productivity is based on the economic theory of production. For this purpose the theory consists of a production function with constant returns to scale together with the necessary conditions for producer equilibrium. Quantities of output and input entering the production function are identified with real product and real factor input as measured for social accounting purposes. Marginal rates of substitution are identified with the corresponding price ratios. Employing data on both quantities and prices, movements along the production function may be separated from shifts in the production function. Shifts in the production function are identified with changes in total factor productivity.

Our point of departure is that the economic theory underlying the measurement of real product and real factor input has not been fully exploited. As a result a number of significant errors of measurement have been made in compiling data on the growth of real product and the growth of real factor input. The result of these errors is to introduce serious biases in the measurement of total factor productivity. The allocation of changes in real product and real factor input between movements along a given production function and shifts of the production function must be corrected for bias due to errors of concept and measurement.

The purpose of this paper is to examine a hypothesis concerning the explanation of changes in total factor productivity. This hypothesis may be stated in two alternative and equivalent ways. In the terminology of the theory of production, if quantities of output and input are measured accurately, growth in total output is largely explained by growth in total input. Associated with the theory of production is a system of social accounts for real product and real factor input. The rate of growth of total factor productivity is the difference between the rate of growth of real product and the rate of growth of real factor input. Within the framework of social accounting the hypothesis is that if real product and real factor input are accurately accounted for, the observed growth in total factor productivity is negligible.

We must emphasize that our hypothesis concerning the explanation of real output is testable. By far the largest portion of the literature on total factor productivity is devoted to problems of measurement rather than to problems of explanation. In recognition of this fact changes in total factor productivity have been given such labels as The Residual or The Measure of Our Ignorance. Identification of measured growth in total factor productivity with embodied or disembodied technical change provides methods for measuring technical change, but provides no genuine explanation of the underlying changes in real output and input.[2] Simply relabelling these changes as Technical Progress or Advance of Knowledge leaves the problem of explaining growth in total output unsolved.

[1] The authors' work has been supported by grants from the National Science and Ford Foundations.
[2] See Jorgenson [35] for details.

The plan of this paper is as follows: We first discuss the definition of changes in total factor productivity from the point of view of the economic theory of production. Second, we provide operational definitions for the measurement of prices and quantities that enter into the economic theory of production. These definitions generate a system of social accounts for real product and real factor input and for the measurement of total factor productivity. Within this system we provide an operational definition of total factor productivity. This definition is fundamental to an empirical test of the hypothesis that if real product and real factor input are accurately accounted for, the observed rate of growth of total factor productivity is negligible.

Within our system of social accounts for real product and real factor input we can assess the consequences of errors of measurement that arise from conceptual errors in the separation of the value of transactions into price and quantity. Errors in making this separation may affect real product, real factor input, or both; for example, an error in the measurement of the price of investment goods results in a bias in total output and a bias in the capital accounts that underlie the measurement of total input. Within this system of social accounts we can suggest principles for correct aggregation of inputs and outputs and indicate the consequences of incorrect aggregation. Many of the most important errors of measurement in previous compilations of data on real product and real factor input arise from incorrect aggregation.

Given a system of social accounts for the measurement of total factor productivity we attempt to correct a number of common errors of measurement of real product and real factor input by introducing data that correspond more accurately to the concepts of output and input of the economic theory of production. After correcting for errors of measurement we examine the validity of our hypothesis concerning changes in total factor productivity. We conclude with an evaluation of past research and a discussion of implications of our findings for further research.

2. THEORY

Our definition of changes in total factor productivity is the conventional one. The rate of growth of total factor productivity is defined as the difference between the rate of growth of real product and the rate of growth of real factor input. The rates of growth of real product and real factor input are defined, in turn, as weighted averages of the rates of growth of individual products and factors. The weights are relative shares of each product in the value of total output and of each factor in the value of total input. If a production function has constant returns to scale and if all marginal rates of substitution are equal to the corresponding price ratios, a change in total factor productivity may be identified with a shift in the production function. Changes in real product and real factor input not accompanied by a change in total factor productivity may be identified with movements along a production function.

Our definition of change in total factor productivity is the same as that suggested by Abramovitz (1), namely, "... the effect of 'costless' advances in applied technology managerial efficiency, and industrial organization (cost—the employment of scarce resources with alternative uses—is, after all, the touchstone of an 'input') ..." [1] Of course, changes in total factor productivity or shifts in a given production function may be accompanied by movements along a production function. For example, changes in applied technology may be associated with the construction of new types of capital equipment. The alteration in patterns of productive activity must be separated into the part which is "costless", representing a shift in the production function, and the part which represents the employment of scarce resources with alternative uses, representing movements along the production function.

[1] Abramovitz [1, p. 764].

On the output side the quantitites that enter into the economic theory of production correspond to real product as measured for the purposes of social accounting. Similarly, on the input side these quantities correspond to real factor input, also as measured for the purposes of social accounting. The prices that enter the economic theory of production are identified with the implicit deflators that underlie conversion of the value of total output and total input into real terms. The notion of real product is a familiar one to social accountants and has been adopted by most Western countries as the appropriate measure of the level of aggregate economic activity. The notion of real factor input is somewhat less familiar, since social accounting for factor input is usually carried out only in value terms or current prices. However, it is obvious that income streams recorded in value terms correspond to transactions in the services of productive factors. The value of these transactions may be separated into price and quantity and the resulting data may be employed to construct social accounts for factor input in constant prices. This type of social accounting is implicit in all attempts to measure total factor productivity.

The prices and quantities that enter into the economic theory of production will be given in terms of social accounts for total output and total input in current and constant prices. We observe that our measurement of total factor productivity is subject to all the well-known limitations of social accounting. Only the results of economic activities with some counterpart in market transactions are included in the accounts. No attempt is made to measure social benefits or social costs if these diverge from the corresponding private benefits or private costs. Throughout this study we adhere to the basic framework of social accounting. The measurement of both output and input is based entirely on market transactions; all prices reflect private benefits and private costs. That part of any alteration in the pattern of productive activity that is " costless " from the point of view of market transactions is attributed to change in total factor productivity. Thus the social accounting framework provides a definition of total factor productivity as the ratio of real product to real factor input.

To represent the system of social accounts that provides the basis for measuring total factor productivity, we introduce the following notation:

Y_i — quantity of the ith output,
X_j — quantity of the jth input,
q_i — price of the ith output,
p_j — price of the jth input.

Where there are m outputs and n inputs, the fundamental identity for each accounting period is that the value of output is equal to the value of input:

$$q_1Y_1+q_2Y_2+\ldots+q_mY_m = p_1X_1+p_2X_2+\ldots+p_nX_n. \qquad \ldots(1)$$

This accounting identity is important in defining an appropriate method for measuring total factor productivity; it also provides a useful check on the consistency of any proposed definitions of total output and total input.

To define total factor productivity we first differentiate (1) totally with respect to time and divide both sides by the corresponding total value. The result is an identity between a weighted average of the sum of rates of growth of output prices and quantities and a weighted average of the sum of rates of growth of input prices and quantities:

$$\Sigma w_i\left[\frac{\dot{q}_i}{q_i}+\frac{\dot{Y}_i}{Y_i}\right] = \Sigma v_j\left[\frac{\dot{p}_j}{p_j}+\frac{\dot{X}_j}{X_j}\right], \qquad \ldots(2)$$

with weights $\{w_i\}$ and $\{v_j\}$ given by the relative shares of the value of the ith output in the value of total output and the value of jth input in the value of total input:

$$w_i = \frac{q_iY_i}{\Sigma q_iY_i}, \quad v_j = \frac{p_jX_j}{\Sigma p_jX_j}.$$

To verify that both sides of (2) are weighted averages, we observe that:

$$w_i \geqq 0, i = 1...m;$$
$$v_j \geqq 0, j = 1...n;$$
$$\Sigma w_i = \Sigma v_j = 1.$$

A useful index of the quantity of total output may be defined in terms of the weighted average of the rates of growth of the individual outputs from (2); denoting this index of output by Y, the rate of growth of this index is

$$\frac{\dot{Y}}{Y} = \Sigma w_i \frac{\dot{Y}_i}{Y_i};$$

an analogous index of the quantity of total input, say X, has rate of growth

$$\frac{\dot{X}}{X} = \Sigma v_j \frac{\dot{X}_j}{X_j}.$$

These quantity indexes are familiar as Divisia quantity indexes; the corresponding Divisia price indexes for total output and total input, say q and p, have rates of growth:

$$\frac{\dot{q}}{q} = \Sigma w_i \frac{\dot{q}_i}{q_i},$$

$$\frac{\dot{p}}{p} = \Sigma v_j \frac{\dot{p}_j}{p_j},$$

respectively.[1]

In terms of Divisia index numbers a natural definition of total factor productivity, say P, is the ratio of the quantity of total output to the quantity of total input:

$$P = \frac{Y}{X}. \qquad ...(3)$$

Using the definitions of Divisia quantity indexes, Y and X, the rate of growth of total factor productivity may be expressed as:

$$\frac{\dot{P}}{P} = \frac{\dot{Y}}{Y} - \frac{\dot{X}}{X} = \Sigma w_i \frac{\dot{Y}_i}{Y_i} - \Sigma v_j \frac{\dot{X}_j}{X_j}. \qquad ...(4)$$

or, alternatively, as:

$$\frac{\dot{P}}{P} = \frac{\dot{p}}{p} - \frac{\dot{q}}{q} = \Sigma v_j \frac{\dot{p}_j}{p_j} - \Sigma w_i \frac{\dot{q}_i}{q_i}.$$

These two definitions of total factor productivity are dual to each other and are equivalent by (2). In general, any index of total factor productivity can be computed either from indexes of the quantity of total output and total input or from the corresponding price indexes.[2]

Up to this point we have defined total factor productivity as the ratio of certain index numbers of total output and total input. An economic interpretation of this definition may be obtained from the theory of production. The theory includes a production function

[1] Divisia [17, 19]. Application of these indexes to the measurement of total factor productivity is suggested by Divisia in a later publication [18, pp. 53-54]. The economic interpretation of Divisia indexes of total factor productivity has been discussed by Solow [61] and Richter [52].

[2] The basic duality relationship for indexes of total factor productivity has been discussed by Siegel, 57, 58].

characterized by constant returns to scale; writing this function in implicit form, we have:

$$F(Y_1, Y_2, \ldots, Y_m; X_1, X_2, \ldots, X_n) = 0.$$

Shifts in the production function may be defined in terms of appropriate weighted average rates of growth of outputs and inputs,

$$G\dot{F} = \sum\left(\frac{F_iY_i}{\Sigma F_iY_i} \cdot \frac{\dot{Y}_i}{Y_i}\right) - \sum\left(\frac{F_jX_j}{\Sigma F_jX_j} \cdot \frac{\dot{X}_j}{X_j}\right), \qquad \ldots(5)$$

where $F_i = \frac{\partial F}{\partial Y_i}$, $F_j = \frac{\partial F}{\partial X_j}$ and:

$$\frac{1}{G} = \Sigma F_iY_i = -\Sigma F_jX_j.$$

Changes in total factor productivity may be identified with shifts of the production function as opposed to movements along the production function by adding the necessary conditions for producer equilibrium—all marginal rates of transformation between pairs of inputs and outputs are equal to the corresponding price ratios—

$$\frac{\partial Y_i}{\partial X_j} = -\frac{F_j}{F_i} = \frac{p_j}{q_i}; \quad \frac{\partial Y_i}{\partial Y_k} = -\frac{F_k}{F_i} = \frac{q_i}{q_k}; \quad \frac{\partial X_j}{\partial X_l} = -\frac{F_l}{F_j} = \frac{p_l}{p_j}; \quad (i, k = 1\ldots m; \quad j, l = 1\ldots n).$$

Combining these conditions with the definition (5) of shifts in the production function, we obtain the definition (4) of total factor productivity:

$$G\dot{F} = \frac{\dot{P}}{P}.$$

The rate of growth of total factor productivity is zero if and only if the shift in the production function is zero.

The complete theory of production consists of a production function with constant returns to scale together with the necessary conditions for producer equilibrium. This theory of production implies the existence of a factor price frontier relating the prices of output to the prices of input. The dual to the definition (4) of total factor productivity may be identified with shifts in the factor price frontier.[1]

The economic interpretation of the index of total factor productivity is essential in measuring changes in total factor productivity by means of Divisia index numbers. As is well known,[2] the Divisia index of total factor productivity is a line integral so that its value normally depends on the path of integration; even if the path returns to its initial value the index of total factor productivity may increase or decrease. However, if price ratios are identified with marginal rates of transformation of a production function with constant returns to scale, the index will remain constant if the shift in the production function is zero.[3]

From either of the two definitions of the index of total factor productivity we have given it is obvious that the rate of growth of this index is not zero by definition. Even for a production function characterized by constant returns to scale with all factors paid the value of their marginal products, the rate of growth of real product may exceed or fall short of the rate of growth of real factor input; similarly, the rate of growth of the

[1] The notion of a factor price frontier has been discussed by Samuelson [54]; the factor price frontier is employed in defining changes in total factor productivity by Diamond [16] and by Phelps and Phelps [51].

[2] See, for example, Wold [64].

[3] See Richter [52]. We are indebted to W. M. Gorman for bringing this fact to our attention.

price of real factor input may exceed or fall short of the rate of growth of the price of real product.[1]

The economic theory of production on which our interpretation of changes in total factor productivity rests is not the only possible theory of production. From the definition of shifts in the production function (5) it is clear that the production function may be considered in isolation from the necessary conditions for producer equilibrium, provided that alternative operational definitions of the marginal rates of transformation are introduced. Such a production function may incorporate the effects of increasing returns to scale, externalities, and disequilibrium. Changes in total factor productivity in our sense could then be interpreted as movements along the production function in this more general sense.

To provide a basis for assessing the role of errors of measurement in explaining observed changes in total factor productivity, we first set out principles for measuring total output and total input. The measurement of flows of output and labour services is, at least conceptually, straightforward. Beginning with data on the value of transactions in each type of output and each type of labour service, this value is separated into a price and a quantity. A quantity index of total output is constructed from the quantities of each output, using the relative shares of the value of each output in the value of total output as weights. Similarly, a quantity index of total labour input is constructed from the quantities of each labour service, using the relative shares of the value of each labour service in the value of all labour services as weights.

If capital services were bought and sold by distinct economic units in the same way as labour services, there would be no conceptual or empirical difference between the construction of a quantity index of total capital input and the construction of the corresponding index of total labour input. Beginning with data on the value of transactions in each type of capital service, this value could be separated into a price of capital service or rental and a quantity of capital service in, say, machine hours. These data would correspond to the value of transactions in each type of labour service which could be separated into a price of labour service or wage and a quantity of labour service in, say, man hours. A quantity index of total capital input would be constructed from the quantities of each type of capital service, using the relative shares of the rental value of each capital service in the rental value of all capital services as weights.

The measurement of capital services is less straightforward than the measurement of labour services because the consumer of a capital service is usually also the supplier of the

[1] It is essential to distinguish our basic hypothesis from a misinterpretation of it recently advanced by Denison:

> Since advances in knowledge cannot increase national product without raising the marginal product of one or more factors of production, they of course disappear as a source of growth if an increase in a factor's marginal product resulting from the advance of knowledge is counted as an increase in the quantity of factor input [14, p. 76].

In terms of our social accounting framework Denison suggests that we measure factor input as the sum of the increase in both prices and quantities; denoting the index of input implied by Denison's interpretation by X^D, gives:

$$\frac{\dot{X}^D}{X^D} = \Sigma v_j \frac{\dot{p}_j}{p_j} + \Sigma v_j \frac{\dot{X}_j}{X_j};$$

the corresponding index of output, say Y^D, would then be defined as:

$$\frac{\dot{Y}^D}{Y^D} = \Sigma w_i \frac{\dot{q}_i}{q_i} + \Sigma w_i \frac{\dot{Y}_i}{Y_i};$$

The resulting index of total factor productivity, say P^D, is constant by definition:

$$\frac{\dot{P}^D}{P^D} = \frac{\dot{Y}^D}{Y^D} - \frac{\dot{X}^D}{X^D} = 0.$$

By comparing this definition with our definition (4), the error in Denison's interpretation of our hypothesis is easily seen.

service; the whole transaction is recorded only in the internal accounts of individual economic units. The obstacles to extracting this information for purposes of social accounting are almost insuperable; the information must be obtained by a relatively lengthy chain of indirect inference. The data with which the calculation begins are the values of transactions in new investment goods. These values must be separated into a price and quantity of investment goods. Second, the quantity of new investment goods reduced by the quantity of old investment goods replaced must be added to accumulated stocks. Third, the quantity of capital services corresponding to each stock must be calculated.[1]

Paralleling the calculation of quantities of capital services beginning with the quantities of new investment goods, the prices of capital services must be calculated beginning with the prices of new investment goods. Finally, a quantity index of total capital input must be constructed from the quantities of each type of capital service, using the relative shares of the implicit rental value of each capital service in the implicit rental value of all capital services as weights. The implicit rental value of each capital service is obtained by simply multiplying the quantity of that service by the corresponding price. At this final stage the construction of a quantity index of total capital input is formally identical to the construction of a quantity index of total labour input or total output. The chief difference between the construction of price and quantity indexes of total capital input and any other aggregation problem is in the circuitous route by which the necessary data are obtained.

The details of the calculation of a price and quantity of capital services from data on the values of transactions in new investment goods depend on empirical hypotheses about the rate of replacement of old investment goods and the quantity of capital services corresponding to a given stock of capital. In studies of total factor productivity it is conventional to assume that capital services are proportional to capital stock. Where independent data on rates of utilization of capital are available, this assumption can be dispensed with. A number of hypotheses about the rate of replacement of old investment goods have been used in the literature: (1) Accounting depreciation measured by the straight-line method is set equal to replacement, possibly with a correction for changes in prices. (2) Gross investment in some earlier period is set equal to replacement. (3) A weighted average of past investment with weights derived from studies of the " survival curves " of individual pieces of equipment [2] is set equal to replacement. From a formal point of view, the last of these hypotheses includes the first two as special cases.

We assume that the proportion of an investment replaced in a given interval of time declines exponentially over time. A theoretical justification for this assumption is that replacement of investment goods is a recurrent event. An initial investment generates a series of replacement investments over time; each replacement generates a new series of replacements, and so on; this process repeats itself indefinitely. The appropriate model for replacement of investment goods is not the distribution over time of replacements for a given investment, but rather the distribution over time of the infinite stream of replacements generated by a given investment. The distribution of replacements for such an infinite stream approaches a constant fraction of the accumulated stock of investment goods for any " survival curve " of individual pieces of equipment and for any initial age distribution of the accumulated stock, whether the stock is constant or growing. But this is precisely the relationship between replacement and accumulated stock if an exponentially declining proportion of any given investment is replaced in a given interval of time.

The quantity of capital services corresponding to each stock could be measured directly, at least in principle. The stock of equipment would be measured in numbers of

[1] Here we assume that the " quantity " of a particular type of capital as an asset is proportional to its " quantity " as a service, whatever the age of the capital. If this condition is not satisfied, capital of each distinct age must be treated as a distinct asset and service. Output at each point of time consists of the usual output plus " aged " capital stock.

[2] Studies in which these three methods have been employed are (1) Jaszi, Wasson, and Grose [33], Goldsmith [25], and Kuznets [39]; (2) Meyer and Kuh [44] and Denison [15]; (3) Terborgh [63].

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machines while the service flow would be measured in machine hours, just as the stock of labour is measured in numbers of men while the flow of labour services is measured in man hours. While the stock of equipment may be calculated by cumulating the net flow of investment goods, the relative utilization of this equipment must be estimated in order to convert stocks into flows of equipment services. For the purposes of this study we assume that the relative utilization of all capital goods is the same; we estimate the relative utilization of capital from the relative utilization of power sources. An adjustment for the relative utilization of equipment is essential in order to preserve comparability among our measurements of output, labour input, and capital input.

To represent the capital accounts which provide the basis for measuring total capital input, we introduce the following notation:

I_k—quantity of output of the kth investment good,

K_k—quantity of input of the kth capital service.

As before, we use the notation:

q_k—price of the kth investment good,

p_k—price of the kth capital service.

Under the assumption that the proportion of an investment replaced in a given interval of time declines exponentially, the cumulated stock of past investments in the kth capital good, net of replacements, satisfies the well-known relationship:

$$I_k = \dot{K}_k + \delta_k K_k, \qquad \ldots(6)$$

where δ_k is the instantaneous rate of replacement of the kth investment good. Similarly, in the absence of direct taxation the price of the kth capital service satisfies the relationship:

$$p_k = q_k\left[r + \delta_k - \frac{\dot{q}_k}{q_k}\right], \qquad \ldots(7)$$

where r is the rate of return on all capital, δ_k is the rate of replacement of the kth investment good, and $\dot{q}_k/q_k$ is the rate of capital gain on that good. Given these relationships between the price and quantity of investment goods and the price and quantity of the corresponding capital services, the only data beyond values of transactions in new investment goods required for the construction of price and quantity indexes of total capital input are rates of replacement for each distinct investment good and the rate of return on all capital. We turn now to the problem of measuring the rate of return.

First, to measure the values of output and input it is customary to exclude the value of capital gains from the value of input rather than to include the value of such gains in the value of output. This convention has the virtue that the value of output may be calculated directly from the values of transactions. Second, to measure total factor productivity, depreciation is frequently excluded from both input and output; this convention is adopted, for example, by Kendrick [37]. Exclusion of depreciation on capital introduces an entirely arbitrary distinction between labour input and capital input, since the corresponding exclusion of depreciation of the stock of labour services is not carried out.[1] To calculate the rate of return on all capital, our procedure is to subtract from the value of output plus capital gains the value of labour input and of replacement. This results in the rate of return multiplied by the value of accumulated stocks. The rate of return is calculated by dividing this quantity by the value of the stock.[2] The

[1] This point is made by Domar [21].

[2] Domar's procedure [21, p. 717, fn. 3] fails to correct for capital gains. Implicitly, Domar is assuming either no capital gains or that all capital gains are included in the value of output, whether realized or not.

implicit rental value of the kth capital good is:

$$p_k K_k = q_k \left[r + \delta_k - \frac{\dot{q}_k}{q_k} \right] K_k.$$

To calculate price and quantity indexes for total capital input, the prices and quantities of each type of capital service are aggregated, using the relative shares of the implicit rental value of each capital service in the implicit rental value of all capital services as weights.

An almost universal conceptual error in the measurement of capital input is to confuse the aggregation of capital stock with the aggregation of capital service. This error may be exemplified by the following passage from a recent paper by Kendrick [38] devoted to theoretical aspects of capital measurement:

> . . . the prices of the underlying capital goods, as established in markets or imputed by owners, can be appropriately combined (with variable quantity weights) to provide a deflator to convert capital values into physical volumes of the various types of underlying capital goods at base-period prices. Or, the result can be achieved directly by weighting quantities by constant prices.
>
> As I view it, this is the most meaningful way to measure " real capital stock," since the weighted aggregate measures the physical complex of capital goods in terms of its estimated ability to contribute to production as of the base period.[1]

The " ability to contribute to production " is, of course, measured by the price of capital services, not the price of investment goods.[2]

We have already noted that direct observations are usually available only for values of transactions; the separation of these values into prices and quantities is based on much less complete information and usually involves indirect inferences; the presence of systematic errors in this separation is widely recognized. For output of consumption goods or input of labour services an error in separating the value of transactions into price and quantity results in an error in measurement of the price and quantity of total output or total labour input and in the measurement of total factor productivity. For example, suppose that the rate of growth of the price of a particular type of labour service is measured with an error; since all relative value shares remain the same, the resulting error in the price of total labour input has a rate of growth equal to the rate of growth of the error multiplied by the relative share of the labour service. The quantity of total labour input is measured with an error which is equal in magnitude but opposite in sign. The error in measurement of the rate of growth of total factor productivity is equal to the negative of the rate of growth of the error in the quantity of total labour input multiplied by the relative share of labour. The effects of an error in the rate of growth of the price of a particular type of consumption good are entirely analogous; of course, an upward bias in the rate of growth of output increases the measured rate of growth of total factor productivity, while an upward bias in the rate of growth of input decreases the measured rate of growth.

An error in the separation of the value of transactions in new investment goods into the price and quantity of investment goods will result in errors in measurement of the price and quantity of investment goods, of the price and quantity of capital services and of total

[1] Kendrick [38, p. 106]; see the comments by Griliches [27, p. 129]. Kendrick takes a similar position in a more recent paper [36]; see the comments by Jorgenson [35]. The treatment of capital input outlined above is based on our earlier paper [31]. The data have been revised to reflect recent revisions in the U.S. national accounts.

[2] The answer to Mrs. Robinson's [53] rhetorical question, " what units is capital measured in? " is dual to the measurement of the price of capital services. Given either an appropriate measure of the flow of capital services or a measure of its price, the other measure may be obtained from the value of income from capital. Since this procedure is valid only if the necessary conditions for producer equilibrium are satisfied, the resulting quantity of capital may not be employed to *test* the marginal productivity theory of distribution, as Mrs. Robinson and others have pointed out.

factor productivity. To measure the bias in the rate of growth of the quantity of investment goods, we let Q^* be the relative error in the measurement of the price of investment goods, I^* the " quantity " of investment goods output, calculated using the erroneous " price " of investment goods, and I the actual quantity of investment goods output. The bias in the rate of growth of investment goods output is then:

$$\frac{\dot{I}^*}{I^*} - \frac{\dot{I}}{I} = -\frac{\dot{Q}^*}{Q^*}. \qquad ...(8)$$

The rate of growth of this bias is negative if the rate of growth of the error in measurement of the price of investment goods is positive, and vice-versa. If we let K^* be the " quantity " of capital calculated using the erroneous " price " of investment goods and K the actual quantity of capital:

$$K^* = \int_{-\infty}^{t} e^{-\delta(t-s)} I^*(s)ds = \int_{-\infty}^{t} e^{-\delta(t-s)} \frac{I(s)}{Q^*(s)} ds.$$

The bias in the rate of growth of the quantity of capital services is then:

$$\frac{\dot{K}^*}{K^*} - \frac{\dot{K}}{K} = \frac{I}{Q^*K^*} - \frac{I}{K} = \frac{I}{\int_{-\infty}^{t} e^{-\delta(t-s)} \frac{Q^*(t)}{Q^*(s)} I(s)ds} - \frac{I}{\int_{-\infty}^{t} e^{-\delta(t-s)} I(s)ds}, \qquad ...(9)$$

which is negative if the rate of growth of the error in measurement of the price of investment goods is positive, and vice-versa.

To calculate the error of measurement in total factor productivity, we let C represent the quantity of consumption goods and L the quantity of labour input; second, we let w_I represent the relative share of the value of investment goods in the value of total output and w_C the relative share of consumption goods; finally, we let v_K represent the relative share of the value of capital input in the value of total input and v_L the relative share of labour. The rate of growth of total factor productivity may be represented as:

$$\frac{\dot{P}}{P} = w_I \frac{\dot{I}}{I} + w_C \frac{\dot{C}}{C} - v_K \frac{\dot{K}}{K} - v_L \frac{\dot{L}}{L}.$$

If we let P^* represent the measured index of total factor productivity using the erroneous " price " of investment goods:

$$\frac{\dot{P}^*}{P^*} = w_I \frac{\dot{I}^*}{I^*} + w_C \frac{\dot{C}}{C} - v_K \frac{\dot{K}^*}{K^*} - v_L \frac{\dot{L}}{L}.$$

Subtracting the first of these expressions from the second we obtain the bias in the rate of growth of total factor productivity:

$$\frac{\dot{P}^*}{P^*} - \frac{\dot{P}}{P} = w_I \left[\frac{\dot{I}^*}{I^*} - \frac{\dot{I}}{I}\right] - v_K \left[\frac{\dot{K}^*}{K^*} - \frac{\dot{K}}{K}\right].$$

Substituting expressions (9) and (8) for the biases in the measured rates of growth of capital input and the output of investment goods, we have:

$$\frac{\dot{P}^*}{P^*} - \frac{\dot{P}}{P} = -w_I \frac{\dot{Q}^*}{Q^*} - v_K \left(\frac{I}{\int_{-\infty}^{t} e^{-\delta(t-s)} \frac{Q^*(t)}{Q^*(s)} I(s)ds} - \frac{I}{\int_{-\infty}^{t} e^{-\delta(t-s)} I(s)ds} \right). \qquad ...(10)$$

If investment and the error in measurement are growing at constant rates, the biases in the rates of growth of the quantity of investment goods produced and the quantity of capital services are equal, so that the net effect is equal to the rate of growth in the error

in measurement of the price of investment goods multiplied by the difference between the capital share in total input and the investment share in total output.[1]

A second source of errors in measurement arises from limitations on the number of separate inputs that may be distinguished empirically. The choice of commodity groups to serve as distinct " inputs " and " outputs " involves aggregation within each group by simply adding together the quantities of all commodities within the group and aggregation among groups by computation of the usual Divisia quantity index. The resulting price and quantity indexes are Divisia price and quantity indexes of the individual commodities only if the rates of growth either of prices or of quantities within each group are identical.

Errors of aggregation in studies of total factor productivity have not gone unnoticed; however, these errors are frequently mislabelled as "quality change". Quality change in this sense occurs whenever the rates of growth of quantities within each separate group are not identical. For example, if high quality items grow faster than items of low quality, the rate of growth of the group is biased downward relative to an index treating high and low quality items as separate commodities. To eliminate this bias it is necessary to construct the index of input or output for the group as a Divisia index of the individual items within the group. Elimination of " quality change " in the sense of aggregation bias is essential to accurate social accounting and to measurement of changes in total factor productivity. Separate accounts should be maintained for as many product and factor input categories as possible. An attempt should be made to exploit available detail in any empirical measurement of real product, real factor input, and total factor productivity.

In some contexts the choice of an appropriate unit for the measurement of quantities of real product or real factor input is not obvious. For example, fuel may be measured in tons or in B.T.U. equivalents, tractor services may be measured in tractor hours or in horsepower hours, and so on. Measures of real product and real factor input may be adjusted for " quality change " by converting one unit of measurement to another. This procedure conforms to the principles of social accounting we have outlined and their interpretation in terms of the economic theory of production if the adjustment for quality change corrects errors of aggregation. In the examples we have given, if the marginal products of different types of fuel always move in proportion when fuel is measured in B.T.U. equivalents but fail to do so when fuel is measured in tons, the appropriate unit for the measurement of fuel is the B.T.U. Similarly, if the marginal products of tractor services measured in horsepower hours always move in proportion, but when measured in tractor hours fail to do so, tractor services should be measured in horsepower hours.

The appropriateness of any proposed adjustment for quality change may be confronted with empirical evidence on the marginal products of individual items within a commodity group. Under the assumption that these products are equal to the corresponding price ratios this evidence takes the form of data on relative price movements for the individual items. Under a more general set of assumptions the marginal products might be calculated from an econometric production function. The latter treatment would be especially useful for " linking in " new factors and products since the relevant prices cannot be observed until the new factors and products appear in the market. Any change in measured total factor productivity resulting from adjustments for quality change is explained by evidence on the movement of marginal products and is not the result of an arbitrary choice of definitions. The choice of appropriate units for measurement of

[1] Domar [22, p. 587, formula (5)] considers a special case of this problem in which capital " is imported from the outside". This specialization is unnecessary, as suggested in the text. A more detailed discussion of this issue is presented by Jorgenson [35].

For constant rates of growth of the relative error in the investment goods price index and the level of investment, formula (10) may be expressed in closed form:

$$\frac{\dot{P}^*}{P^*} - \frac{\dot{P}}{P} = -w_I \frac{\dot{Q}^*}{Q^*} + v_K \frac{\dot{Q}^*}{Q^*},$$

$$= (v_K - w_I) \frac{\dot{Q}^*}{Q^*}.$$

real product and real factor input may go beyond selection among alternative scalar measured such as B.T.U. equivalents or tons; a commodity may be regarded as multi-dimensional and an appropriate unit of measurement may be defined implicitly by taking prices as given by so-called " hedonic " price indexes. The critical property of such price indexes is that when prices are given by a " hedonic " price index for the commodities within a group, all such commodities have marginal rates of transformation vis-*à*-vis commodities outside the group that move in proportion to each other. Insofar as this property is substantiated by empirical evidence, adjustment of the commodity group for "quality change" by means of such a price index is entirely legitimate and amounts to correcting an error of aggregation.[1] This is not to say that any proposed adjustment for quality change is legitimate. The appropriateness of each adjustment must be judged on the basis of the evidence. If no fresh evidence is employed, the choice of appropriate units is entirely arbitrary and any change in measured total factor productivity resulting from adjustment for "quality change" is simply definitional.

" Quality change " is sometimes used to describe a special type of aggregation error, namely, the error that arises in aggregating investment goods of different vintages by simply adding together quantities of investment goods of each vintage. If the quality of investment goods, as measured by the marginal productivity of capital, is not constant over all vintages, this procedure results in aggregation errors. An appropriate index of capital services may be constructed by treating each vintage of investment goods as a separate commodity. To construct such an index empirically, data on the marginal productivity of capital of each vintage at each point of time are required. If independent data on relative prices of capital services of different vintages are used in the construction of such a capital services index, any resulting reduction in measured productivity growth is not tautological. Only where the change in quality is measured indirectly from the resulting increase in total factor productivity, as suggested by Solow [60], does such a procedure result in the elimination of productivity change by definition.[2]

3. MEASUREMENT

3.1. *Initial estimates*

We can now investigate the extent to which measured changes in total factor productivity are due to errors of measurement. We begin by constructing indexes of total output and total input for the United States for the twenty-year period following World War II, 1945-65, without correcting for errors of measurement. As an initial index of total output we take U.S. private domestic product in constant prices as measured in the U.S. national product accounts [48]. As an index of total input we take the sum of labour and capital services in constant prices. Labour and capital services are assumed to be proportional to stocks of labour and capital, respectively. The stock of labour is taken to be the number of persons engaged in the private domestic sector of the U.S. economy. The stock of capital is the sum of land, plant, equipment, and inventories employed in this sector.[3] The rate of growth of total factor productivity is equal to the difference in the rates of growth of total output and total input.

Indexes of total output, total input, and total factor productivity are given in Table I. The average annual rate of growth of total output over the period 1945-65 is 3·49 per cent. The average rate of growth of total input is 1·83 per cent. The average rate of growth of total factor productivity is 1·60 per cent. The rate of growth of total input explains 52·4

1 See Griliches [28] and the references given there.
2 Jorgenson [35].
3 To make stocks of labour and capital precisely analogous, it would be necessary to go even further. Unemployed workers should be included in the stock of labour since unemployed machines are included in the stock of capital. Workers should be aggregated by means of discounted lifetime incomes since capital goods are aggregated by means of asset prices.

TABLE I

Total output, input, and factor productivity, U.S. private domestic economy, 1945-65, initial estimates

	1	2	3
1945	0·699	0·786	0·891
1946	0·680	0·817	0·836
1947	0·695	0·854	0·818
1948	0·729	0·876	0·836
1949	0·726	0·867	0·841
1950	0·801	0·891	0·901
1951	0·852	0·928	0·919
1952	0·873	0·947	0·924
1953	0·917	0·966	0·951
1954	0·904	0·954	0·949
1955	0·981	0·976	1·005
1956	0·999	1·001	0·998
1957	1·013	1·012	1·000
1958	1·000	1·000	1·000
1959	1·069	1·019	1·048
1960	1·096	1·036	1·057
1961	1·115	1·039	1·072
1962	1·189	1·057	1·123
1963	1·240	1·074	1·152
1964	1·307	1·097	1·188
1965	1·387	1·129	1·224

1. Output. 2. Input. 3. Productivity.

per cent of the growth in output; the remainder is explained by changes in total factor productivity.

3.2. *Errors of aggregation*

The first error of measurement to be eliminated is an error of aggregation. This error results from aggregating labour and capital services by summing quantities in constant prices. To eliminate the error, we replace our initial index of total input by a Divisia index of labour and capital input, as suggested by Solow [61]. A similar error results from aggregating consumption and investment goods output by adding together quantities in constant prices. This error may be eliminated by replacing our initial index of total output by a Divisia index of consumption and investment goods output. Indexes of total output, total input, and total factor productivity with these errors of aggregation eliminated are presented in Table II.

The average annual rate of growth of total output over the period 1945-65 with the error in aggregation of consumption and investment goods output eliminated is 3·39 per cent. The average rate of growth of total input with the error in aggregation of labour and capital services eliminated is 1·84 per cent. The resulting rate of growth of total factor productivity is 1·49 per cent. We conclude that these errors in aggregation result in an overstatement of the initial rate of growth of total factor productivity. With these errors eliminated total input explains 54·3 per cent of the growth in total output. This result may be compared with the 52·4 per cent of the growth in total output explained initially.

3.3. *Investment goods prices*

We have demonstrated that an error in the measurement of investment goods prices results in errors in the measurement of total output, total input, and total factor productivity.

Roughly speaking, a positive bias in the rate of growth of the investment goods price index results in a positive bias in the rate of growth of total factor productivity, provided that the share of capital in the value of input exceeds the share of investment in the value of output. This condition is fulfilled for the U.S. private domestic sector throughout the period, 1945-65. Hence, we must examine the indexes of investment goods prices that underlie our measurement for possible sources of bias.

Except for the price index for road construction the price indexes for structures that underlie the U.S. national accounts are indexes of the cost of input rather than the price of output. In the absence of changes in total factor productivity properly constructed

TABLE II

Total output, input, and factor productivity, U.S. private domestic economy, 1945-65, errors of aggregation eliminated

	1	2	3
1945	0·713	0·783	0·912
1946	0·679	0·810	0·841
1947	0·694	0·847	0·824
1948	0·727	0·870	0·840
1949	0·727	0·864	0·845
1950	0·800	0·888	0·903
1951	0·851	0·925	0·921
1952	0·873	0·945	0·926
1953	0·918	0·964	0·953
1954	0·905	0·954	0·950
1955	0·981	0·976	1·005
1956	0·999	1·001	0·998
1957	1·013	1·012	1·000
1958	1·000	1·000	1·000
1959	1·070	1·019	1·049
1960	1·096	1·036	1·057
1961	1·115	1·038	1·073
1962	1·189	1·057	1·124
1963	1·240	1·073	1·153
1964	1·307	1·096	1·189
1965	1·387	1·128	1·225

1. Output. 2. Input. 3. Productivity.

price indexes for construction input would parallel the movements of price indexes for output. This is assured by the dual to the usual definition of total factor productivity (3). Dacy [12] has shown that the rate of growth of the price of inputs in highway construction is considerably greater than that of the price of construction output. Dacy's output price index grows from 0·805 to 0·982 from 1947 through 1959, while the input price index grows from 0·615 to 1·024 in the same period, both on a base 1·000 in 1958.[1] This empirical finding is simply another way of looking at the positive residual between rates of growth of total output and total input where total factor productivity is measured with error. Input price indexes are subject to the same errors of aggregation as the corresponding quantity indexes. Since input quantity indexes grow too slowly, input price indexes grow too rapidly.

[1] The growth of the output price index may be compared with that for personal consumption expenditures, which grows from 76·5 to 108·6 from 1947 through 1959. The close parallel between the output price index for construction and the price of consumption goods suggests an explanation for the difference in rates of growth of prices of consumption and investment goods described by Gordon [26]. This difference results from the error of measurement in using an input price index in place of an output price index for investment goods. If this error is corrected, the difference vanishes.

The use of input prices in place of output prices for structures results in an important error of measurement. To eliminate this error it is necessary to use an output price index in measuring prices of both investment goods output and capital services input. An index of this type has been constructed for the OBE 1966 Capital Stock Study [49]. Components of this index include the Bureau of Public Roads price index for highway structures, the Bell System price index for telephone buildings, and the Bureau of Reclamation price indexes for pumping plants and power plants. The resulting composite index may be compared with the implicit deflator for new construction from the U.S. national accounts [48]. The implicit deflator grows from 0·686 to 1·029 during the period 1947 through 1959 while the OBE Capital Goods Study price index for new construction output grows

TABLE III

Alternative investment deflators

	1	2	3	4	5	6
1945	0·544	0·510	0·759	0·517	0·633	0·357
1946	0·594	0·570	0·768	0·575	0·705	0·638
1947	0·721	0·686	0·827	0·646	0·786	2·310
1948	0·749	0·770	0·863	0·703	0·827	1·023
1949	0·743	0·755	0·868	0·736	0·818	0·788
1950	0·763	0·791	0·878	0·752	0·823	0·818
1951	0·836	0·847	0·942	0·809	0·879	0·945
1952	0·881	0·876	0·954	0·822	0·896	0·949
1953	0·895	0·889	0·943	0·835	0·903	0·497
1954	0·897	0·886	0·929	0·840	0·914	0·772
1955	0·902	0·910	0·919	0·859	0·921	0·931
1956	0·959	0·956	0·949	0·918	0·945	0·978
1957	1·001	0·992	0·984	0·975	0·978	1·113
1958	1·000	1·000	1·000	1·000	1·000	0·994
1959	1·006	1·029	1·014	1·020	1·012	0·991
1960	1·005	1·042	1·009	1·022	1·026	1·020
1961	1·008	1·053	1·006	1·021	1·037	1·011
1962	1·024	1·069	1·008	1·023	1·048	1·001
1963	1·038	1·089	1·004	1·023	1·059	1·011
1964	1·059	1·119	1·004	1·031	1·071	1·014
1965	1·089	1·149	0·995	1·038	1·089	1·032

1. Structures II.
2. Structures I.
3. Equipment II.
4. Equipment I.
5. Inventories II.
6. Inventories I.

from 0·762 to 0·958 during the same period. Thus the relative bias in the input price index for all new construction as a measure of the price of construction output is roughly comparable to the relative bias in Dacy's input price index for highway construction as a measure of the price of highway construction output. The input price index, labelled Structures I, and the output price index, labelled Structures II, are given in Table III.

The price indexes for equipment that underlie the U.S. national accounts are based primarily on data from the wholesale price index of the Bureau of Labour Statistics [6]. Since expenditures on the wholesale price index are less than those on the consumers' price index [4], adjustments for quality change are less frequent and less detailed. A direct comparison of the durables components of the wholesale and consumers' price indexes gives some notion of the relative bias. The wholesale price index increases from 0·646 to 1·023 and the consumers' price index increases from 0·858 to 1·022 over the period 1947 to 1959, both on a base of 1·000 in 1958. A direct comparison of components common to both indexes reveals essentially the same relationship. To correct for bias

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in the implicit deflator for producers' durables, we substitute for this deflator the implicit deflator for consumers' durables. The deflator for producers' durables increased from 0·646 in 1947 to 1·020 in 1959. Over this same period the deflator for consumers' durables increased from 0·827 to 1·014, both on a base of 1·000 in 1958. Thus the relative bias in the producers' durables price index as revealed by a comparison with components common to the wholesale and consumers' price indexes may be corrected by simply substituting the implicit deflator for consumers' durables for the producers' durables deflator. Both indexes are given in Table III; the producers' durables index is labelled Equipment I while the consumers' durables index is labelled Equipment II.

The durables component of the consumers' price index was itself subject to considerable upward bias in recent years. The consumers' price index for new automobiles increased 62 per cent from 1947 to 1959. It has been estimated that correcting this index for quality change would reduce this increase to only 31 per cent in the same period.[1] In view of the upward bias in the consumers' price index our adjustment for bias in the producers' durables price index is conservative. In order to reduce the error of measurement further, detailed research like that already carried out for automobiles is required for each class of producers' durable equipment.

The price indexes for change in business inventories from the U.S. national accounts contain year-to-year fluctuations that result from changes in the composition of investment in inventories; these changes are much more substantial than the corresponding changes in the composition of inventory stocks. The implicit deflator for change in inventories is not published; however, it may be computed from data on change in inventories in current and constant dollars. Changes that amount to nearly doubling or halving the index occur from 1946 to 1947, 1947 to 1948, and 1951 to 1952. The value of the index is 0·357 in 1945, 0·638 in 1946 and 2·310 in 1947, all on a base of 1·000 (or, to be exact, 0·994) in 1958. The index drops to 1·023 in 1948 and 0·788 in 1949. A less extreme but equally substantial movement in the index occurs from 1952 through 1957. Changes in the implicit deflator of this magnitude cannot represent movements in the price of all stocks of inventories considered as investment goods. To represent these movements more accurately, we replace the implicit deflator for change in inventories by the deflator for private domestic consumption expenditures. The level of this index generally coincides with that of the implicit deflator for change in business inventories; however, the fluctuations are much less. Both indexes are given in Table III; the implicit deflator for change in business inventories is labelled Inventories I while the implicit deflator for private domestic consumption expenditures is labelled Inventories II.

Indexes of total input, total output, and total factor productivity with errors in the measurement of prices of investment goods eliminated are presented in Table IV. The average rate of growth of total output over the period 1945-65 with these errors of measurement removed is 3·59 per cent. This rate of growth may be compared with the original rate of growth of total output of 3·49 per cent or with the rate of growth of 3·39 per cent for total output with errors of aggregation removed. The average rate of growth of total input over this period is 2·19 per cent. The original rate of growth of total input is 1·83 per cent; with errors of aggregation removed the rate of growth of total input is 1·84 per cent. The rate of growth of total factor productivity is 1·41 per cent. With errors in measurement of the prices of investment goods eliminated the rate of growth of total input explains 61·0 per cent of the rate of growth of total output.

3.4. *Measurement of services*

Up to this point we have assumed that labour and capital services are proportional to stocks of labour and capital. This assumption is obviously incorrect. In principle flows of capital and labour services could be measured directly. In fact it is necessary to

[1] Griliches [28, Table 8, last column, p. 397].

infer the relative utilization of stocks of capital and labour from somewhat fragmentary data. Okun [50] has attempted to circumvent the problem of direct observation of labour and capital services by assuming that the relative utilization of both labour and capital is a function of the unemployment rate for labour so that the gap between actual and " potential " output, that is, output at full utilization of both factors, may be expressed in terms of the unemployment rate. A similar notion has been used by Solow [62] to adjust stocks of labour and capital for relative utilization. Most of the available capacity utilization measures are based on the relationship of actual output to output at full utilization of both labour and capital, so that these measures also attempt to adjust both labour and capital simultaneously.

TABLE IV

Total output, input, and factor productivity, U.S. private domestic economy, 1945-65, errors in investment goods prices eliminated

	1	2	3
1945	0·692	0·759	0·913
1946	0·662	0·786	0·846
1947	0·679	0·822	0·829
1948	0·718	0·845	0·853
1949	0·717	0·842	0·854
1950	0·798	0·867	0·922
1951	0·839	0·908	0·925
1952	0·858	0·930	0·925
1953	0·905	0·950	0·954
1954	0·900	0·942	0·957
1955	0·982	0·966	1·016
1956	0·995	0·996	0·999
1957	1·009	1·010	1·000
1958	1·000	1·000	1·000
1959	1·076	1·022	1·052
1960	1·107	1·042	1·061
1961	1·127	1·049	1·073
1962	1·199	1·071	1·117
1963	1·249	1·091	1·142
1964	1·319	1·117	1·177
1965	1·400	1·153	1·209

1. Output. 2. Input. 3. Productivity.

Our approach to the problem of relative utilization is somewhat more direct in that we attempt to adjust capital and labour for relative utilization separately. Of course, this adjustment gives rise to a new concept of " potential " or capacity output, but we do not pursue this notion further in this paper. Our first assumption is that the relative utilization of capital is the same for all capital goods; while this is a very strong assumption it is weaker than the assumption underlying the Okun-Solow approach in which the relative utilization of capital and labour depends on that of labour. We estimate the relative utilization of capital from the relative utilization of power sources.[1] Data on the relative utilization of electric motors provides an indicator of the relative utilization of capital in manufacturing, since electric motors are the predominant source of power there. We assume that relative utilization of capital goods in the manufacturing and non-manufacturing sectors is the same. When more complete data become available, this assumption can be replaced by less restrictive assumptions. Unfortunately, this adjustment

[1] Foss [24]. See the Statistical Appendix for further details.

allows only for the trend in the relative utilization of capital; it does not adjust for short-term cyclical variations in capacity utilization. Thus we are unable to attain the objective of complete comparability between measures of labour and capital input.

The assumption that labour services are proportional to the stock of labour is obviously incorrect. On the other hand, the assumption that labour services can be measured directly from data on man-hours is equally incorrect, as Denison [14] has pointed out. The intensity of effort varies with the number of hours worked per week, so that labour input can be measured accurately only if data on man-hours are corrected for the effects of variations in the number of hours per man on labour intensity. Denison [15] suggests that the stock of labour provides an upper bound for labour services while the number of man-hours provides a lower bound. He estimates labour input by correcting man-hours for variations in labour intensity. We employ Denison's correction for intensity,

TABLE V

Total input and factor productivity, U.S. private domestic economy, 1945-65, errors in relative utilization eliminated

	1	2
1945	0·716	0·968
1946	0·742	0·895
1947	0·777	0·877
1948	0·801	0·899
1949	0·802	0·897
1950	0·830	0·963
1951	0·873	0·963
1952	0·899	0·956
1953	0·924	0·980
1954	0·923	0·976
1955	0·959	1·023
1956	0·994	1·001
1957	1·009	1·000
1958	1·000	1·000
1959	1·035	1·038
1960	1·057	1·046
1961	1·067	1·054
1962	1·089	1·098
1963	1·114	1·118
1964	1·146	1·147
1965	1·189	1·172

1. Input. 2. Productivity.

but we apply this correction to actual hours per man rather than potential hours per man. Thus, our measure of labour input reflects short-run variations in labour intensity.

The assumption that labour and capital services are proportional to stocks of labour and capital results in an error in separating a given value of transactions into a price and a quantity. To correct this error we multiply the number of persons engaged by hours per man. The resulting index of man-hours is then corrected for variations in labour intensity. The corresponding error for capital is corrected by multiplying the stock of capital by the relative utilization of capital. Indexes of total input and total factor productivity after these errors have been eliminated are presented for the period 1945-65 in Table V. The average annual rate of growth of total output is the same as before these corrections, 3·59 per cent per year. The average rate of growth of total input is 2·57 per cent. The resulting average rate of growth of total factor productivity is 0·96 per cent. Total input now explains 71·6 per cent of the rate of growth in total output.

3.5. *Capital services*

In converting estimates of capital stock into estimates of capital services we have disregarded an important conceptual error in the aggregation of capital services. While investment goods output must be aggregated by means of investment goods or asset prices, capital services must be aggregated by means of service prices.

The prices of capital services are related to the prices of the corresponding investment goods; in fact, the asset price is simply the discounted value of all future capital services. Asset prices for different investment goods are not proportional to service prices because of differences in rates of replacement and rates of capital gain or loss among capital goods. Implicitly, we have assumed that these prices are proportional; to eliminate the resulting error in measurement, it is necessary to compute service prices and to use these prices in aggregating capital services.

We have already outlined a method for computing the price of capital services in the absence of direct taxation of business income. In the presence of direct taxes we may distinguish between the price of capital services before and after taxes. The expression (7) given above for the price of capital services is the price after taxes. The price of capital services before taxes is:

$$p_k = q_k\left[\frac{1-uv}{1-u}\,r+\frac{1-uw}{1-u}\,\delta_k-\frac{1-ux}{1-u}\,\frac{\dot{q}_k}{q_k}\right] \qquad ...(11)$$

where u is the rate of direct taxation, v the proportion of return to capital allowable as a charge against income for tax purposes, w the proportion of replacement allowable for tax purposes, and x the proportion of capital gains included in income for tax purposes

We estimate the variables describing the tax structure as follows: The rate of direct taxation is the ratio of profits tax liability to profits before taxes. The proportion of the return to capital allowable for tax purposes is the ratio of net interest to the total return to capital. Total return to capital is the after tax rate of return, r, multiplied by the current value of capital stock. The proportion of replacement allowable for tax purposes is the ratio of capital consumption allowances to the current value of replacement. The proportion of capital gains included in income is zero by the conventions of the U.S. national accounts. Given the value of direct taxes we estimate the after tax rate of return by subtracting from the value of output plus capital gains the value of labour input, replacement, and direct taxes. This results in the total return to capital. The rate of return is calculated by dividing this quantity by the current value of the stock of capital. Given data on the rate of return and the variables describing the tax structure, we calculate the price of capital services before taxes for each investment good.[1] These prices of capital services are used in the calculation of indexes of capital input, total input, and total factor productivity.

For the U.S. private domestic economy it is possible to distinguish five classes of investment goods—land, residential and non-residential structures, equipment, and inventories. Although it is also possible to distinguish a number of sub-classes within each of these groupings, we will employ only the five major groups in calculating an index of total capital input. For each group we first compute a before tax service price analogous to (11). We then compute an index of capital input as a Divisia index of the services of land, structures, equipment and inventories. In constructing this index we eliminate the conceptual error that arises from the implicit assumption that service prices are proportional to asset prices for different investment goods. In eliminating this conceptual error we also eliminate the error of aggregation that results from adding together capital services in constant prices to obtain an index of total capital input. To eliminate the corresponding error in our index of investment goods output we replace our initial index by a Divisia index of investment in structures, equipment, and inventories. Indexes of total output, total input and total factor productivity resulting from the elimination of these errors are

[1] Further details are given in the Statistical Appendix.

presented in Table VI. The after tax rate of return implicit in the new index of capital input is also given in Table VI.

The average rate of growth of total output over the period 1945-65 with the error in aggregation of investment goods eliminated is 3·59. This rate of growth is essentially the same as for total output with errors in the aggregation of consumption and investment goods and errors in the measurement of investment goods prices eliminated. The average rate of growth of total input with errors in aggregation of capital services eliminated is 2·97 per cent. This rate of growth may be compared with the initial rate of growth of 1·83 per cent.

TABLE VI

Total input and factor productivity, U.S. private domestic economy, 1945-65, errors in aggregation of capital input eliminated; implicit rate of return after taxes

	1	2	3	4
1945	0·692	0·671	1·030	0·158
1946	0·661	0·698	0·950	0·198
1947	0·678	0·735	0·926	0·237
1948	0·717	0·765	0·940	0·223
1949	0·716	0·773	0·930	0·126
1950	0·797	0·804	0·992	0·095
1951	0·837	0·850	0·986	0·242
1952	0·857	0·880	0·976	0·143
1953	0·905	0·908	0·997	0·091
1954	0·900	0·911	0·988	0·078
1955	0·982	0·951	1·032	0·113
1956	0·995	0·987	1·008	0·175
1957	1·009	1·005	1·004	0·138
1958	1·000	1·000	1·000	0·107
1959	1·077	1·039	1·035	0·097
1960	1·107	1·063	1·040	0·105
1961	1·127	1·076	1·046	0·118
1962	1·199	1·099	1·089	0·138
1963	1·250	1·126	1·107	0·131
1964	1·320	1·160	1·134	0·127
1965	1·401	1·206	1·157	0·141

1. Output. 2. Input. 3. Productivity. 4. Rate of return.

The resulting rate of growth of total factor productivity is 0·58 per cent. The index of total factor productivity with these errors eliminated is presented in Table VI. With these errors eliminated total input explains 82·7 per cent of the growth in total output. The original index of total input explains 52·4 per cent of this growth.

3.6. *Labour services*

We have eliminated errors of aggregation that arise in combining capital services into an index of total capital input. Similar errors arise in combining different categories of labour services into an index of total labour input. Implicitly, we have assumed that the price per man-hour for each category of labour services is the same; to eliminate the resulting error of measurement it is necessary to use prices per man-hour for each category in computing an index of total labour input. Second, to eliminate the error of aggregation that results from adding together labour services in constant prices, we replace our initial index of labour input by a Divisia index of the individual categories of labour services.

The Divisia index of total labour input is based on a weighted average of the rates

of growth of different categories of labour, using the relative shares in total labour compensation as weights. To represent our index of total labour input, we let L_l represent the quantity of input of the lth labour service, measured in man-hours. The rate of growth of the index of total labour input, say L, is:

$$\frac{\dot{L}}{L} = \Sigma v_l \frac{\dot{L}_l}{L_l}$$

where v_l is the relative share of the lth category of labour in the total value of labour input. The number of man-hours for each labour service is the product of the number of men, say n_l, and hours per man, say h_l; using this notation the index of total labour input may be rewritten:

$$\frac{\dot{L}}{L} = \Sigma v_l \frac{\dot{n}_l}{n_l} + \Sigma v_l \frac{\dot{h}_l}{h_l}.$$

For comparison with our initial indexes of labour input we separate the rate of growth of the index of labour input into three components—change in the total number of men, change in hours per man, and change in labour input per man-hour. We have assumed that the number of hours per man is the same for all categories of labour services, say H. Letting N represent the total number of men and e_l the proportion of the workers in the lth category of labour serivces, we may write the index of total labour input in the form:

$$\frac{\dot{L}}{L} = \frac{\dot{H}}{H} + \frac{\dot{N}}{N} + \Sigma v_l \frac{\dot{e}_l}{e_l}. \qquad \ldots(12)$$

Our initial index of labour input was simply N, the number of persons engaged; we corrected this index by taking into account the number of hours per man, H. To eliminate the remaining errors of aggregation we must correct the rate of growth of man-hours by adding to it an index of labour input per man-hour. The third term in the expression (12) for total labour input given above provides such an index. We will let E represent this index, so that:

$$\frac{\dot{E}}{E} = \Sigma v_l \frac{\dot{e}_l}{e_l}. \qquad \ldots(13)$$

For computational purposes it is convenient to note that the index may be rewitten in the form:

$$\frac{\dot{E}}{E} = \Sigma \frac{p_l}{\Sigma p_l e_l} \dot{e}_l = \Sigma p_l' \dot{e}_l,$$

where p_l is the price of the lth category of labour services and p_l' is the relative price. The relative price is the ratio of the price of the lth category of labour services to the average price of labour services, $\Sigma p_l e_l$.

In principle it would be desirable to distinguish among categories of labour services classified by age, sex, occupation, number of years schooling completed, industry of employment, and so on. An index of labour input per man-hour based on such a breakdown requires detailed research far beyond the scope of this study. We will compute such an index only for males and only for categories of labour broken down by the number of school years completed. The basic computation is presented in Table VII. Data on relative prices for labour services are available for the years 1939, 1949, 1956, 1958, 1959 and 1963.[1] Combining these prices with changes in the distribution of the labour force provides a measure of the change in labour input per man-hour.[2]

[1] Additional details on relative prices for labour services are presented in the Statistical Appendix, Table XII.

[2] Additional details on the distribution of the labour force are presented in the Statistical Appendix, Table XI.

TABLE VII

Relative prices, changes in distribution of the labour force, and indexes of labour-input per man-hour, U.S. males, the civilian labour force,* 1940-64

School year completed	p_i'	Δe_i	p_i'	Δe_i	p_i'	Δe_i	p_i'	Δe_i	p_i'	Δe_i	p_i'	Δe_i
	1939	1940-48	1949	1948-52	1956	1952-57	1958	1957-59	1959	1959-62	1963	1962-65
Elementary 0-4	0·497	−2·3	0·521	−0·3	0·452	−1·3	0·409	−0·8	0·498	−0·8	0·407	−0·8
5-6 or 5-7	0·672	−3·1	0·685	−0·5	0·624	−0·2	0·565	−1·0	0·688	−0·9	0·562	−1·5
7-8 or 8	0·887	−6·8	0·813	−1·8	0·796	−3·3	0·753	−1·2	0·801	−1·9	0·731	−1·2
High School 1-3	1·030	2·4	0·974	−1·3	0·955	0·7	0·923	0·6	0·912	−0·6	0·886	−0·3
4	1·241	7·0	1·143	1·0	1·159	2·6	1·113	0·9	1·039	1·6	1·087	3·2
College 1-3	1·442	1·4	1·336	1·2	1·356	0·2	1·392	0·7	1·255	1·3	1·269	0·0
4+ or 4	1·947	1·3	1·866	1·6	1·810	1·3	1·840	0·9	1·569	1·0	1·571	0·2
5+	...	...	...	...	...	...	...	...	1·888	0·3	1·730	0·4
Percentage change in labour input per man-hour		6·45		2·50		2·97		2·39		2·36		2·13
Annual percentage change		0·78		0·62		0·59		1·20		0·79		0·72

SOURCE: Derived from Tables 11 and 12, Statistical Appendix.

* The relative prices are computed using the appropriate beginning period distribution of the labour force as weights.

Indexes of total input and total factor productivity with errors in the aggregation of labour services eliminated are presented in Table VIII. The average rate of growth of total input over the period 1945-65 with the error in aggregation of labour services eliminated is 3·47. This rate of growth may be compared with the initial rate of growth of total input of 1·83 per cent. The resulting rate of growth of total factor productivity is 0·10 per cent. With these errors eliminated total input explains 96·7 per cent of the growth in total output.

TABLE VIII

Total input and factor productivity, U.S. private domestic economy 1945-65, *errors in aggregation of labour input eliminated*

	1	2
1945	0·634	1·090
1946	0·661	1·001
1947	0·700	0·971
1948	0·732	0·981
1949	0·743	0·966
1950	0·776	1·026
1951	0·823	1·017
1952	0·857	1·002
1953	0·887	1·020
1954	0·894	1·007
1955	0·936	1·048
1956	0·976	1·019
1957	0·997	1·012
1958	1·000	1·000
1959	1·047	1·027
1960	1·077	1·027
1961	1·096	1·027
1962	1·125	1·064
1963	1·158	1·076
1964	1·200	1·096
1965	1·255	1·112

1. Input. 2. Productivity.

4. SUMMARY AND CONCLUSION

4.1. *Summary*

The purpose of this paper has been to examine the hypothesis that if quantities of output and input are measured accurately, growth in total output may be largely explained by growth in total input. The results are given in Table IX and Charts 1, 2 and 3. We first present our initial estimates of rates of growth of output, input, and total factor productivity. These estimates include many of the errors made in attempts to measure total factor productivity without fully exploiting the economic theory underlying the social accounting concepts of real product and real factor input. We begin by eliminating errors of aggregation in combining investment and consumption goods and labour and capital services. We then eliminate errors of measurement in the prices of investment goods arising from the use of prices for inputs into the investment goods sector rather than outputs from this sector. We remove errors arising from the assumption that the flow of services is proportional to stocks of labour and capital by introducing direct observations on the rates of utilization of labour and capital stock. We present rates of growth that result from correct aggregation of investment goods and capital services. Finally, we give rates of growth that result from correcting the aggregation of labour services.

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The rate of growth of input initially explains 52·4 per cent of the rate of growth of output. After elimination of aggregation errors and correction for changes in rates of utilization of labour and capital stock the rate of growth of input explains 96·7 per cent of the rate of growth of output; change in total factor productivity explains the rest. In the terminology of the theory of production, movements along a given production function explain 96·7 per cent of the observed changes in the pattern of productivity activity; shifts in the production function explain what remains.

This computation is based on the 1945-65 period, measuring total factor productivity peak to peak. If one were to choose a different set of years, the numerical results would be slightly different, but their main thrust would be the same. For example, starting with the Post-Korean peak year of 1953, the rate of growth of input initially explains only 37·3 per cent of the rate of growth of output. After all the corrections the rate of growth of input explains 79·2 per cent of the growth in output between 1953 and 1965, reducing the estimated rate of change in total factor productivity from 2·12 per cent per year to

TABLE IX

Total output, input, and factor productivity, U.S. private domestic economy, 1945-65, *average annual rates of growth*

	Output	Input	Productivity
1. Initial estimates	3·49	1·83	1·60
Estimates after correction for:			
2. Errors of aggregation	3·39	1·84	1·49
3. Errors in investment goods prices	3·59	2·12	1·41
4. Errors in relative utilization	3·59	2·57	0·96
5. Errors in aggregation of capital services	3·59	2·97	0·58
6. Errors in aggregation of labour services	3·59	3·47	0·10

0·72. We conclude that our hypothesis is consistent with the facts. If the economic theory underlying the measurement of real product and real factor input is properly exploited, the role to be assigned to growth in total factor productivity is small.

4.2. *Evaluation of past research*

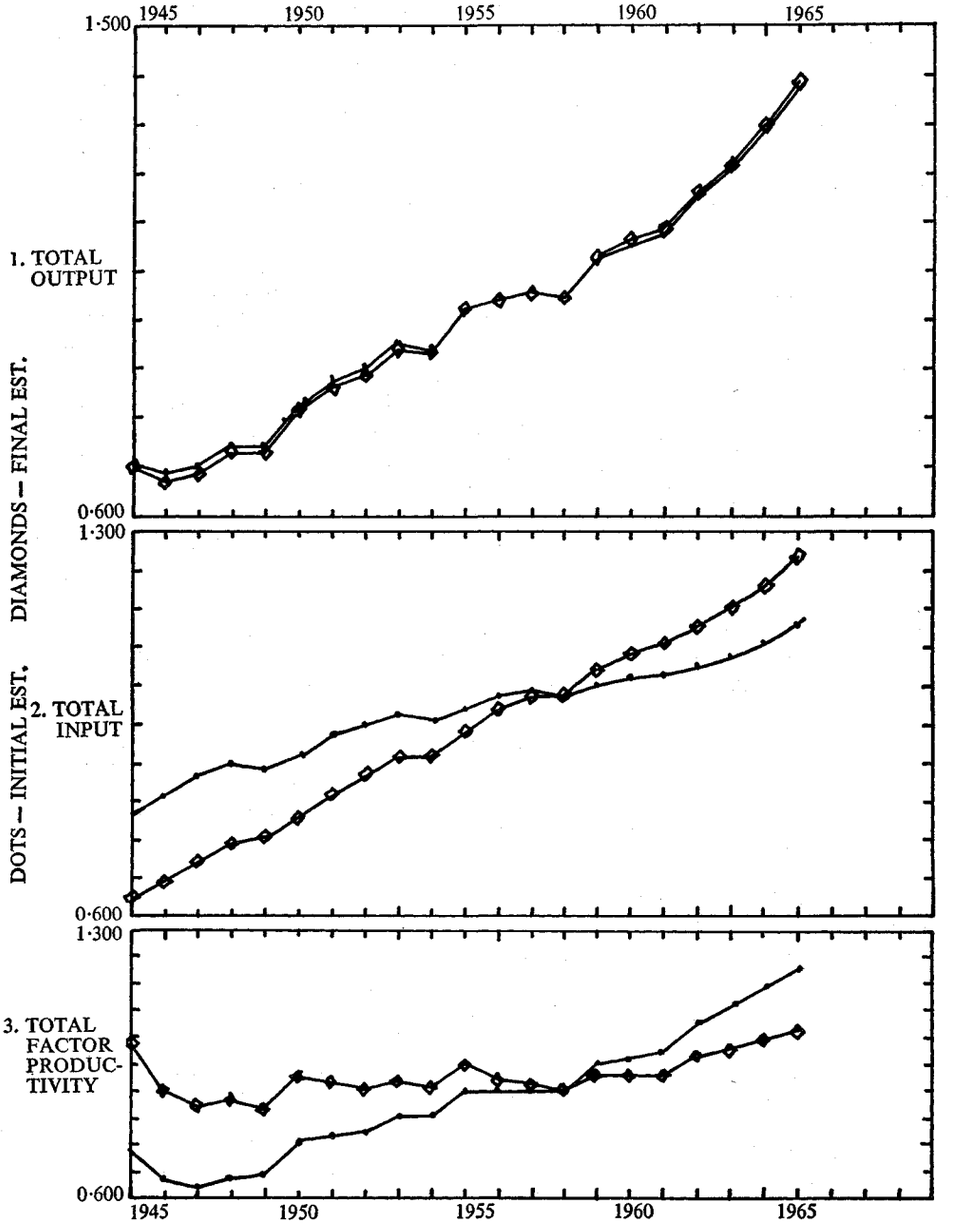
Our conclusion that most of the growth in total output may be explained by growth in total input is just the reverse of the conclusion drawn from the great body of past research on total factor productivity, the research of Schmookler [55], Mills [46], Fabricant [23], Abramovitz [2], Solow [61], and Kendrick [37]. These conclusions, stated by Abramovitz, are " . . . that to explain a very large part of the growth of total output and the great bulk of output *per capita*, we must explain the increase in output per unit of conventionally measured inputs. . . " [1]. This conclusion results from inadequacies in the basic economic theory underlying the social accounts employed in productivity measurements. The increase in output per unit of conventionally measured inputs is characterized by very substantial errors of measurement, equal in magnitude to the alleged increase in productivity. We have given a concrete and detailed list of errors of this type.

Our results differ from those of Denison [15] in that we correct changes in total factor productivity for errors in the measurement of output, capital services, and labour services, while Denison corrects only for errors in the measurement of labour services.

[1] Abramovitz [1, p. 776].

To get some idea of the relative importance of errors in the measurement of labour and errors in the measurement of output and capital, we may observe that the rate of growth of total factor productivity is reduced from 1·60 per cent per year to 0·10 per cent per year. Of the total reduction of 1·50 per cent per year errors in the measurement of output and capital account for 1·17 per cent per year while errors in the measurement of labour

INDEXES OF TOTAL OUTPUT, TOTAL INPUT AND TOTAL FACTOR PRODUCTIVITY (1958 = 1·0), U.S. PRIVATE DOMESTIC ECONOMY, 1945-1965



account for 0·33 per cent per year. We conclude that errors of measurement of the type left uncorrected by Denison are far more important than the type of errors he corrects.[1]

Our results suggest that the residual change in total factor productivity, which Denison attributes to Advance in Knowledge, is small. Our conclusion is not that advances in knowledge are negligible, but that the accumulation of knowledge is governed by the same economic laws as any other process of capital accumulation. Costs must be incurred if benefits are to be achieved. Although we have made no attempt to isolate the effects of expenditures on research and development from expenditures on other types of current inputs or investment goods, our results suggest that social rates of return to this type of investment are comparable to rates of return on other types of investment. Of course, our inference is indirect and a better test of this proposition could be provided by direct observation of private and social rates of return to investment in scientific research and development activities. Unfortunately, many of the direct observations on these rates of return available in the literature attribute all or part of the measured increase in total factor productivity to investment in research and development; [2] since these measured increases are subject to all the errors of measurement we have enumerated, satisfactory direct tests of the hypothesis that private and social rates of return to research and development investment are equal to private rates of return to other types of investment are not yet available.

Another implication of our results is that discrepancies between private and social returns to investment in physical capital may play a relatively minor role in explaining economic growth. Under the operational definitions of total factor productivity we have adopted, a positive discrepancy between social and private rates of return would appear as a downward bias in the rate of growth of input, hence an upward bias in the rate of growth of total factor productivity. The effects of such discrepancies are lumped together with the effects of other sources of growth in total factor productivity we have measured. The fact that the growth of the resulting index is small indicates that the contribution of investment to economic growth is largely compensated by the private returns to investment. This implication of our findings is inconsistent with explanations of economic growth such as Arrow's model of learning by doing [3], which are based on a higher social than private rate of return to physical capital.[3]

Of course, ours is not the first explanation of productivity change that does not rely primarily on discrepancies between private and social rates of return. An explanation of this type has been proposed by Solow [60], namely, embodied technical change. As Solow [59] points out, explanation of measured changes in total factor productivity as embodied technical change does not require discrepancies between private and social rates of return: "... the fact of expectable obsolescence reduces the private rate of return on saving below the marginal product of capital as one might ordinarily calculate it. But this discrepancy is fully reflected in a parallel difference between the marginal product of

[1] Errors in the aggregation of labour services account for 0·48 per cent per year, but this is offset by errors of measurement in the relative utilization of labour of −0·15 per cent per year so that the net correction for errors of measurement of labour is 0·33 per cent per year.

An alternative interpretation of our results may be provided by analogy with the conceptual framework for technical change discussed by Diamond [16]. Errors of measurement in the growth of labour services may be denoted labour-diminishing errors of measurement; capital-diminishing errors of measurement may be separated into embodied and disembodied errors. Errors in capital due to errors in the measurement of prices of investment goods are analogous to embodied technical change. Finally, some of the errors in measurement affect levels of output; these errors may be denoted output-diminishing errors of measurement.

A decomposition of total errors of measurement into labour-diminishing, capital-diminishing, embodied and disembodied, and output-diminishing is as follows: Labour-diminishing errors of measurement contribute 0·33 per cent per year to the initial measured rate of growth of total factor productivity. Embodied capital-diminishing errors contribute 0·28 per cent per year and disembodied capital-diminishing errors contribute 0·99 per cent per year. Finally, output-diminishing errors of measurement of 0·10 per cent per year must be set off against the input-diminishing errors totalling 1·60 per cent per year.

[2] See, for example, the studies of Minasian [47] and Mansfield [42].

[3] See Levhari [40, 41] for an elaboration of this point.

capital and the social rate of return on saving. So . . . the private and social rates of return coincide"[1]. In referring to " capital as one might ordinarily calculate it ", Solow explicitly does not identify quality-corrected or " surrogate " capital with capital input and " surrogate " investment with investment goods output. In Solow's framework the marginal product of " surrogate " capital is precisely equal to the private and social rate of return on saving. The difference between Solow's point of view and ours is that the private and social rates of return are equal by definition in his framework, where the equality between private and social rates of return is a testable hypothesis within our framework.[2]

4.3. *Implications for future research*

The problem of measuring total factor productivity is, at bottom, the same as the estimation of national product and national factor input in constant prices. The implication of our findings is that the predominant part of economic growth may be explained within a conventional social accounting framework. Of course, precise measurement of productivity change requires attention to reliability as well as accuracy. Our catalogue of errors of measurement could serve as an agenda for correction of errors in the measurement of output and for incorporation of the measurement of input into a unified social accounting framework. Given time and resources we could attempt to raise all of our measurements to the high standards of the U.S. National Product Accounts in current prices. This could be done with some difficulty for rates of relative utilization of labour and capital stock and the prices of investment goods, which require the introduction of new data into the social accounts. The elimination of aggregation errors in measuring capital services and investment goods requires a conceptual change to bring these concepts into closer correspondence with the economic theory of production. The measurement of appropriate indexes of labour input, corrected for errors of aggregation, necessitates fuller exploitation of existing data on wage differentials by education, occupation, sex, and so on.

The most serious weakness of the present study is in the use of long-term trends in the relative utilization of capital and labour to adjust capital input and labour input to concepts appropriate to the underlying theory of production. As a result of discrepancies between these trends and year-to-year variations in relative utilization of capital and labour, substantial errors of measurement have remained in the resulting index of total factor productivity. Examination of any of the alternative indexes we have presented reveals substantial unexplained cyclical variation in total factor productivity. An item of highest priority in future research is to incorporate more accurate data on annual variations in relative utilization. Hopefully, elimination of these remaining errors will make it possible to explain cyclical changes in total factor productivity along the same lines as our present explanation of secular changes. Cyclical changes are very substantial so that even our secular measurements could be improved with better data. For example, the use of the period 1945-58, a peak in total factor productivity to a trough, reveals a drop in total factor productivity of nine per cent; the use of the period 1949-65, a trough to a peak, yields an increase in total factor productivity of eleven and a half per cent.

In compiling data on labour input we have relied upon observed prices of different types of labour services. Given a broader accounting framework it would be possible to treat human capital in a manner that is symmetric with our measurement of physical capital. Investment in human capital could be cumulated into stocks along the lines suggested by Schultz [56]. The flow of investment could be treated as part of total output. The rate of return to this investment could then be measured and compared with the rate of return to physical capital. Similarly, investment in scientific research and development could be separated from expenditures on current account and cumulated into stocks.

[1] Solow [59, p. 58-59].
[2] For further discussion of this point, see Jorgenson [35].

The rate of return to research activity could then be computed. In both of these calculations it would be important not to rely on erroneously measured residual growth in total output for measurement of the social return to investment.

It is obvious that further disaggregation of our measurements would be valuable in order to provide a more stringent test of the basic hypothesis that growth in output may be explained by growth in input. The most important disaggregation of this type is to estimate levels of output and input by individual industries. The statistical raw material for disaggregation by industry is already available for stocks of labour and capital and levels of output. However, data for relative utilization of labour and capital and for disaggregation of different types of labour and capital within industry groups would have to be developed. Once these data are available, it will be possible to estimate rates of return to capital for individual industries and to study the effects of the distribution of productive factors among industries along the lines suggested by Massell [43]. The fact that past observations do not reveal significant changes in productivity does not imply that the existing allocation of productive resources is efficient relative to allocations that could be brought about by policy changes. In such a study it might be useful to extend the scope of productivity measurements to include the government sector. This would be particularly desirable if educational investment, which is largely produced in that sector, is to be incorporated into total output.

Finally, our results suggest a new point of departure for econometric studies of production function at every level of aggregation. While some existing studies [29, 30] employ data on output, labour, and capital corrected for errors of measurement along the lines we have suggested, most estimates of production functions are based on substantial errors of measurement. Econometric production functions are not an alternative to our methods for measuring total factor productivity, but rather supplement these methods in a number of important respects. Such production functions provide one means of testing the assumptions of constant returns to scale and equality between price ratios and marginal rates of transformation that underlie our measurement. A complete test of the hypothesis that growth in total output may be explained by growth in total input requires the measurement of input within a unified social accounting framework, the measurement of rates of return to both human and physical capital, further disaggregation, and new econometric studies of production functions. A start has been made on this task, but much interesting and potentially fruitful research remains to be done.

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STATISTICAL APPENDIX

1. As our initial estimate of output we employ gross private domestic product which is defined as gross national product less gross product, general government, and gross product, rest of the world, all in constant prices of 1958. These data are obtained from the U.S. national accounts. Our second estimate of output requires data on gross private domestic investment and gross private domestic consumption, defined as gross private domestic product less gross private domestic investment, in both current and constant prices of 1958. These data are also obtained from the U.S. national accounts.

As our initial estimate of labour input we employ private domestic persons engaged, defined as persons engaged for the national economy less persons engaged, general government, and persons engaged, rest of the world. These data are obtained from the U.S. national accounts [48]. Our initial estimate of capital input is obtained by the perpetual inventory method based on double declining balance estimates of replacement. For structures and equipment the lifetimes of individual assets are based on the " Bulletin F lives " employed by Jaszi, Wasson and Grose [33]. Data for gross private domestic

investment prior to 1929 are unpublished estimates that underlie the capital stock estimates of Jaszi, Wasson and Grose [33]. For inventories and land, the initial values of capital stock in constant prices of 1958 are derived from Goldsmith [25]. The stock of land in constant prices is assumed to be unchanged throughout the period we consider. Estimates of the value of land in current prices are obtained from Goldsmith [25].

The estimates of gross private domestic investment are subsequently revised by introducing alternative deflators to those employed in the U.S. national accounts. These deflators are given in Table III of the text. Gross private domestic consumption is left unchanged in this calculation. We compute stocks of land, structures, residential and non-residential, equipment, and inventories separately for each set of deflators. The basic formula is:

$$K_{t+1} = I_t + (1-\delta)K_t, \qquad \ldots(14)$$

where I_t is the value of gross private domestic investment for each category in constant prices. The initial (1929) value of capital stock in constant prices of 1958 and the depreciation rates are as follows:

	National accounts deflators		Alternative deflators	
	K_{1929}	δ	K_{1929}	δ
Land	254,700	0	254,700	0
Structures				
Residential	183,234	0·0386	162,708	0·0384
Non-residential	163,205	0·0513	142,670	0·0509
Equipment	74,851	0·1325	51,701	0·1226
Inventories	48,504	0	48,504	0

2. In dropping the assumption that services are proportional to stock for both labour and capital, we require data on hours/man and hours/machine. The data on hours/man are derived from Kendrick's data on man-hours in the U.S. private domestic economy, extended through 1965.

To estimate hours/machine we first estimate the relative utilization of electric motors in manufacturing. Estimates have been given by Foss [24] for 1929, 1939 and 1954. We have updated these estimates to 1962. The basic computation is given in Table X. The 1954 data and the basic method of computation are taken from Foss [24, Table II, p. 11]. The 1954 data differ from the figures given by Foss due to a revision of the 1954 horsepower data by the Bureau of the Census and omission of the " fractional horsepower motors " adjustment. The latter, applied to both 1954 and 1962, would not have affected the estimated change in relative utilization. The horsepower data for 1962 and 1954 are from the 1963 *Census of Manufactures* [7], " Power Equipment in Manufacturing Industries," MC63(1)-6. Consumption of electric energy is taken from the 1962 *Survey of Manufactures* [11], Chapter 6. The 1962 total (388·2) is reduced by the consumption of electric power for nuclear energy (51.5) as shown in Series S81-93 of Bureau of the Census, *Continuation to* 1962 *of Historical Statistics of the U.S.* [9].

3. To estimate service prices for capital from the formula (11) given in the text we require data on the tax structure and on the rate of return. The variable u, the rate of direct taxation, is the ratio of corporate profits tax liability to total net private property income. These data are from the U.S. national accounts. The variable v, the proportion of return to capital allowable as a charge against income for tax purposes, is the ratio of

private domestic net interest to the after tax rate of return, r, multiplied by the current value of capital stock. Private domestic net interest is net interest less net interest for the rest of the world sector. These data are taken from the U.S. national accounts. We discuss estimation of the after tax rate of return below. The current value of capital stock is the sum of stock in land, structures, equipment, and inventories. Each of the four components is the product of the corresponding stock in constant prices of 1958, multiplied by the investment deflator for the component. Finally, the variable w, the proportion of replacement allowable for tax purposes, is the ratio of capital consumption allowances to the current value of replacement. Capital consumption allowances are taken from the U.S. national accounts. The current value of replacement is the sum of replacement in

TABLE X

Relative utilization of electric motors, manufacturing, 1954 and 1962

	Unit	1954	1962
1. Horsepower of electric motors, total	Thousand horsepower	91,505	126,783
2. Available kilowatt-hours of motors (line 1 × 7261)	Billions of kilowatt-hours	664·4	920·6
3. Electric power actually consumed, all purposes	Billions of kilowatt-hours	222·1	336·7
4. Per cent power used for electric motors	...	64·6	65·6
5. Power consumed by motors (line 3 × line 4)	Billions of killowatt-hours	143·5	220·9
6. Per cent utilization (line 5/line 2 × 100)	...	21·6	24·0
7. Number of equivalent 40 hour weeks (line 6 × 4·2/100	...	0·907	1·008
8. Index	1954 = 100	100·0	111·1

Line 2: The adjustment is derived as follows: It is assumed " that each electric motor could work continuously throughout the year . . ., 8760 . . . . Horsepower hours are converted to kilowatt-hours; . . . 1 horsepower-hour = 0·746 kilowatt hours. The result [is] . . . adjusted upward by dividing through 0·9, since modern electric motors have an efficiency of approximately 90 per cent. . . . " Foss [23, p. 11]. 8760 × 0·746/0·9 = 7261.

Line 4: Per cent power used for electric motors in 1962 computed using the industry distribution in 1945 given by Foss [24] in his Table I, and the 1962 consumption of total electric power by industries from the 1962 *Survey of Manufacturers* [11, Chapter 6].

Line 7: There are 4·2 forty-hour shifts in a full week of 168 hours.

current prices for structures and equipment. Replacement in current prices is the product of replacement in constant prices of 1958 and the investment deflator for the corresponding component. Replacement in constant prices is a by-product of the calculation of capital stock by formula (14) given above. Replacement is simply δK_t, where K_t is capital stock in constant prices.

To estimate the rate of return we define the value of capital services for land, structures, equipment and inventories as the product of the service price (11) and the corresponding stock in constant prices. Setting this equal to total income from property, we solve for the rate of return. Total income from property is gross private domestic product in current prices less private domestic labour income. Private domestic labour income is private domestic compensation of employees from the U.S. national accounts multiplied by the ratio of private domestic persons engaged in production to private domestic full-time equivalent employees, both from *The National Income and Product Accounts of the United States*, 1929-1965 [49]. This amounts to assuming that self-employed individuals have the same average labour income as employees.

The final formula for the rate of return is then the ratio of total income from property less profits tax liability less the current value of replacement plus the current value of capital gain to the current value of capital stock. The current value of capital gain is the

sum of capital gains for all assets; the capital gain for each asset is the product of the rate of growth of the corresponding investment deflator and the value of the asset in constant prices of 1958.

4. The basic sources of data underlying Table VII of the text are summarized in Tables XI and XII. Table XI presents estimates of the distribution of the male labour force by school years completed for 1940, 1948, 1952, 1957, 1959, 1962 and 1964. These data are taken from various issues of the *Special Labor Force Reports* [5] and *Current*

TABLE XI

Civilian labour force, males 18 to 64 years old, by educational attainment per cent distribution by years of school completed

School year completed	1940	1948	1952	1957	1959	1959†	1962†	1965†
Elementary 0-4	10·2	7.9	7·6	6·3	5·5	5·9	5·1	4·3
5-6 or 5-7*	10·2	7·1	6·6 11·6	11·4	10·4	10·7	9·8	8·3
7-8 or 8*	33·7	26·9	25·1 20·1	16·8	15·6	15·8	13·9	12·7
High School 1-3	18·3	20·7	19·4	20·1	20·7	19·8	19·2	18·9
4	16·6	23·6	24·6	27·2	28·1	27·5	29·1	32·3
College 1-3	5·7	7·1	8·3	8·5	9·2	9·4	10·6	10·6
4+ or 4	5·4	6·7	8·3	9·6	10·5	6·3	7·3	7·5
5+	...	...	...	...	...	4·7	5·0	5·4

SOURCE: The basic data for columns 1, 3, 4, 5 and 6 are taken from U.S. Department of Labor, *Special Labor Force Report* [5], No. 1, " Educational Attainment of Workers, 1959 ". The 5-8 years class is broken down into the 5-7 and 8 (5-6 and 7-8 for 1940, 1948, and 1952) on the basis of data provided in *Current Population Report* [10], Series P-50, Nos. 14, 49 and 78. The 1940 data were broken down using the 1940 *Census of Population* [8], Vol. III, Part 1, Table 13. The 1952 breakdown for translating the 5-7 class into 5-6 and 7-8 was done using the information on the educational attainment of all males by single years of school completed from the 1950 *Census of Population* [8], Detailed Characteristics, U.S. Summary. The 1962 data are from *Special Labor Force Report* [5], No. 30, and the 1965 figures are from *Special Labor Force Report* [11], No. 65, " Educational Attainment of Workers, March 1965 ".

* 5-6 and 7-8 for 1940, 1948 and the first part of 1952, 5-7 and 8 thereafter.

† Employed, 18 years and over.

TABLE XII

Mean annual earnings of males, 25 years and over by school years completed, selected years

School year completed	1939	1949	1956	1958	1959	1963
Elementary 0-4	665	1724	2127	2046	2935	2465
5-6 or 5-7	900	2268	2927	2829	4058	3409
7-8 or 8	1188	2693 2829	3732	3769	4725	4432
High School 1-3	1379	3226	4480	4618	5379	5370
4	1661	3784	5439	5567	6132	6588
College 1-3	1931	4423	6363	6966	7401	7693
4+ or 4	2607	6179	8490	9206	9255	9523
5+	...	...	...	...	11,136	10,487

SOURCE: Columns 1, 2, 3, 4, H. P. Miller [45, Table 1, p. 966]. Column 5 from 1960 *Census of Population* [8], PC(2)-7B, " Occupation by Earnings and Education ". Column 6 computed from *Current Population Reports* [10], Series P-60, No. 43, Table 22, using midpoints of class intervals and $44,000 for the over $25,000 class. The total elementary figure in 1940 broken down on the basis of data from the 1940 *Census of Population* [8]. The " less than 8 years " figure in 1949 split on the basis of data given in H. S. Houthakker [32]. In 1956, 1958, 1959 and 1963, split on the basis of data on earnings of males 25-64 from the 1959 1-in-a-1000 Census sample. We are indebted to G. Hanoch for providing us with this tabulation.

Earnings in 1939 and 1959; total income in 1949, 1958 and 1963.

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Population Reports [10], with some additional data from the 1940, 1950 and 1960 *Census of Population* [8] used to break down several classes into sub-classes. We could have used data from the 1950 and 1960 Censuses on educational attainment. The increase in the number of links did not seem to offset the decrease in comparability that would be introduced by the use of different sources of data. Table II presents estimates of the mean incomes of males (25 years and over) for these classes. These data are largely taken from Miller [45], supplemented by Census and *Current Population Reports* [10] data. Table VI of the text presents the relative incomes, the first differences of the educational distribution, and the computation of an appropriate index of the change in the average education per man.

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By EDWARD F. DENISON

Some Major Issues in Productivity Analysis: An Examination of Estimates by Jorgenson and Griliches

The Office of Business Economics has been asked by several of the principal users of its data to supplement its established series on national output and its composition (GNP) by consistent measures of factor inputs, so as to facilitate the analysis of economic growth. The OBE is responsive to these requests and considers the preparation of measures of factor inputs an appropriate extension of its work on the national economic accounts. The estimates of business capital stocks and some other studies that have been published in the SURVEY OF CURRENT BUSINESS are important steps leading to the preparation of factor input measures.

The conceptual and statistical problems that are involved in the measurement of factor inputs are unusually difficult, however, and OBE believes that some discussion of these problems is called for before it engages itself to prepare the measures. To elicit such a discussion is a major purpose of publishing this article.

In this study, Edward F. Denison, one of the outstanding experts in the analysis of economic growth, provides a searching comparison of the concepts and statistical procedures that he considers appropriate for input measurement with those recently proposed by the eminent econometricians, Dale W. Jorgenson and Zvi Griliches. The Jorgenson-Griliches proposals differ sharply from those set forth by Denison, and also by many others who have done research in this field. For the convenience of the reader, the *Review of Economic Studies* article in which the Jorgenson-Griliches proposals appeared is reprinted—with some corrections by the authors—in this issue of the SURVEY.

These differences in concepts and procedures yield strikingly different conclusions. According to Denison, a substantial part of the postwar growth of national output has been due to an increase in productivity; according to Jorgenson-Griliches almost all of the increase has been due to an increase in factor inputs.

The issues raised by these opposing conclusions are not only important from the standpoint of basic research but are also likely to have far-reaching implications for the formulation of private and public policies directed at the promotion of economic growth. We believe that the publication of the Denison article and of a reply to it by Jorgenson and Griliches in a later issue of the SURVEY will be of substantial interest to all those concerned with economic growth.

IN a recent article, "The Explanation of Productivity Change," Professors Dale W. Jorgenson and Zvi Griliches found that increases in labor and capital input were responsible for almost all postwar growth in the United States [1]. They concluded that output per unit of input contributed little to the growth rate of output—only 0.10 percentage points, to be exact. This estimate contrasts with much larger amounts obtained in virtually all other studies. I arrived at 1.37 percentage points in *Why Growth Rates Differ: Postwar Experience in Nine Western Countries* (written with the assistance of Jean-Pierre Poullier) [2].

This review is a response to repeated requests to comment upon the article by Jorgenson and Griliches.[1] Do their estimates differ so much from mine because of differences in the time period analyzed, in the definition of output, or in the sector of the economy covered? Does the discrepancy reflect a mere difference in classifying growth sources into those regarded as increasing input and those regarded as raising output per unit of input? Or is it due to differences in statistical procedures? What are the differences in our procedures, what are their quantitative effects, and whose, in my opinion, are preferable? In this article, all of these questions are discussed.

To decompose the discrepancy in results, it is necessary to examine many aspects of the estimates. Section I of this review measures the effects of differences in time period, definition of output, and scope of the economy analyzed, and section II examines a minor difference in procedure. After allowance for these differences, most of the large discrepancy between our measures of output per unit of input remains. Our statistical measures of total output diverge because different price indexes are used for deflation; the effect is examined in section VI. Differences between our total input series for the sector of the economy analyzed by Jorgenson and Griliches are much larger. The input series differ because of (a) differences in the weights we use to combine individual inputs and (b) differences in the way we measure each individual input. In sections III and IV, I consider the change that would be introduced in my series, given my individual input measures, if the Jorgenson-Griliches weights were used. In sections V, VII, and VIII, I measure the effects upon their series, given their weights, of using their measure for each input in place of mine. The two preceding sentences must be qualified

NOTE.—Dr. Denison is Senior Fellow, The Brookings Institution, Washington, D.C. The views expressed in this article are those of the author and do not purport to represent the views of the other staff members, officers, or trustees of The Brookings Institution.

1. Its preparation was the occasion of rather extended communication among us, in the course of which Professors Jorgenson and Griliches clarified certain of their procedures, provided some unpublished data needed for comparison of our estimates, and offered suggestions on presentation. This assistance helped me to isolate the differences between our procedures and focus my discussion on these differences. It is acknowledged with gratitude.

I also benefited greatly from discussions of a draft of this review with George Jaszi, and of certain sections with Murray F. Foss, Guy V. G. Stevens, and Allan H. Young.

by noting, as I shall at the appropriate points, that lack of data necessitated some departures from this plan. In section IX, I provide a table that summarizes the results of the preceding sections and thus reconciles our output per unit of input series.

An equally important purpose of this article is to examine the merits of alternative procedures. In most sections I therefore discuss differences in procedure that happen not to be important sources of discrepancy in our series during the particular time period discussed as well as those that are, and in sections IX and X offer some general observations.

The section of most general interest may well be section VII, in which I examine the Jorgenson-Griliches capital utilization adjustment. I try there to nudge the theory of growth analysis forward a little. In addition, their capital utilization adjustment is the largest single reason that our output per unit series diverge.

I. Time Period, Definition of Output, and Scope of Economy Covered

THE Jorgenson-Griliches summary result, that output per unit of input contributed only 0.10 percentage points to a 3.59 percent a year increase in output, refers to the 1945–65 period. Use of 1945 as a starting point minimizes their figure. From 1948 to 1965 Jorgenson and Griliches obtain a growth rate of output per unit of input of 0.74.[2] Almost all of this increase came before 1950 and after 1961; the growth rate of their output per unit of input series was 0.01 from 1950 to 1961 and 2.01 from 1961 to 1965 [calculated from 1, table VIII]. Cyclical movements contribute to the difference between these periods, but even so the contrast is remarkable.

My summary estimate, that the increase in output per unit of input contributed 1.37 points to the growth rate, refers to the period from 1950 to 1962. For this timespan, Jorgenson and Griliches obtain 0.30, as against 0.10 for 1945–65. Thus, the difference in time period is responsible for 0.20 points of the difference between our summary estimates. Our estimates for 1950–62 and two subperiods are contrasted in the first two rows of the following table. The third row [from 2, table 21–1] shows my estimates after adjustment to eliminate, as best I could, the effects of differences among terminal years in the intensity of demand (i.e., short-term changes in intensity of utilization of employed resources).

	1950–62	1950–55	1955–62
Unadjusted:			
Jorgenson-Griliches	0.30	0.42	0.22
Denison	1.37	1.93	.97
Adjusted:			
Denison	1.41	1.54	1.31

The Jorgenson-Griliches series refers to real gross national product per unit of input in the private domestic economy; mine, to real national income (also called net national product valued at factor cost) per unit of input in the economy as a whole.

The reason I chose to analyze the growth of net rather than gross product is both fundamental and conventional.

> "Insofar as a large output is a proper goal of society and objective of policy, it is net product that measures the degree of success in achieving this goal. Gross product is larger by the value of capital consumption. There is no more reason to wish to maximize capital consumption—the quantity of capital goods used up in production—than there is to maximize the quantity of any other intermediate product used up in production, such as, say, the metal used in making television sets. It is the television sets, not the metal or machine tools used up in production, that is the objective of the production process" [2, pp. 14–15].

Jorgenson and Griliches confine discussion of their choice of gross product to a single sentence. "Exclusion of depreciation on capital introduces an entirely arbitrary distinction between labour input and capital input, since the corresponding exclusion of depreciation of the stock of labour services is not carried out" [1, p. 256]. (They also cite an article by Domar, but it contains no reference to depreciation of labor.) Their statement is too brief to allow much discussion, particularly since Jorgenson and Griliches do not specify how they would depreciate labor. I am not aware of a definable labor counterpart to capital depreciation as a component of GNP that there is no advantage in increasing because it is not wanted—feeding, clothing, and housing children surely do not fall into this category—but if there be such, the appropriate remedy would be to change the measures of output and labor earnings.

I do not wish to pursue this subject further in this article, but must provide a statistical reconciliation of our estimates. This is facilitated by the fact that, sheerly by chance, conversion of my estimate of output per unit of input in the 1950–62 period to their concepts would scarcely change it because the difference in definition of output happens to be offset by the difference in the scope of the economy covered. The explanation is as follows:

(a) My output series refers to national income, or net national product (NNP) valued at factor cost, measured in 1958 prices. The Jorgenson-Griliches output series refers to gross national product valued at market prices, measured in 1958 prices. The choice between factor cost and market price weights to combine the components of product does not affect comparability of our results, but that between gross and net

2. National accountants would not draw inferences about postwar growth trends from an analysis beginning before 1948, at the earliest, because elimination of price controls distorted the real output measure in 1945–48, and because—in the case of 1945—of the great difference from later years in the composition of output. In addition, special aspects of postwar reconversion greatly affected the 1945–48 period.

product does. The *absolute* increase in the value of gross product at 1958 factor cost is equal to the increase in net product at 1958 factor cost plus the increase in depreciation valued in 1958 prices. Each year, the change in output per unit of input (and every other growth source except depreciable capital) contributes the same absolute amount to the increase in real GNP at factor cost as to real NNP at factor cost. (Depreciable capital contributes to the increase in real GNP an amount equal to its contribution to the increase in real NNP plus the absolute increase in depreciation at constant prices.) But the same absolute amount contributed by output per unit of input yields a smaller percentage increase in GNP at factor cost than in NNP because the value of GNP is bigger than that of NNP—in 1950 by 11.6 percent, according to my estimates. Hence, output per unit of input contributed less to the growth rate of GNP when measured in percentage points. For 1950–62, my estimates yield a contribution of output per unit of input to the growth rate of GNP of 1.24 percentage points as against 1.37 to the growth rate of NNP.[3]

(b) My output estimates refer to the economy as a whole; the Jorgenson-Griliches estimates, to the private domestic economy. Thus, the latter exclude the net inflow of property income from abroad and GNP originating in general government. However, my estimates imply *no* increase in output per unit of input in the sectors they exclude.[4] The *absolute* contribution of the increase in output per unit of input to the increase in output is therefore the same in the sector covered by the Jorgenson-Griliches estimates as in the whole economy. Because the level of private domestic GNP was smaller than that of total GNP, the contribution of output per unit of input to its growth rate is proportionately larger; it is 1.38.[5]

This is practically the same as my original figure of 1.37; adjustments (a) and (b) are almost exactly offsetting.[6] Thus, differences in definition and scope of output together account for none of the difference between our 1950–62 estimates of the contribution of output per unit of input.[7]

II. Divisia Indexes

JORGENSON and Griliches devote considerable attention in their article to their use of Divisia indexes (which are averages of growth rates, with frequent changes in weights) in their measurement of input and output. I shall not discuss the alleged theoretical superiority of Divisia indexes, but simply note that their substitution has no effect upon the comparisons. When Jorgenson and Griliches introduce them in moving from their table I to table II, the movement from 1950 to 1962 of their series for output, input, and factor productivity is almost unaffected. Indeed, introduction of Divisia indexes has no appreciable effect at other dates except at the very beginning of their period, when price and output patterns were distorted. Moreover, my own procedures for combining inputs are substantially equivalent to the use of Divisia indexes.

III. The Input Weights: Total Labor vs. Total Capital and Land

TO calculate changes in total input, weights to combine the various types of input are required. Our weights, though different, share two characteristics that distinguish them from those of some other investigators. First, we each set the sum of our input weights equal to 100 percent (or 1). This has the effect of classifying gains from economies of scale as a contribution of output per unit of input to the growth of output.[8] Second, we each use the shares of labor, and of capital and land, in total earnings from production as weights to combine these broad types of input, and rely upon data from the national accounts to estimate these shares.[9]

Our actual weights differ as a result of differences in the scope and definition of our output measures and of differences in our estimating procedures. The latter contribute to the discrepancy between our results for growth of GNP per unit of input. During the postwar periods analyzed, capital-land input increased more than labor input so that the greater the weight attached to capital-land, the more a measure of

3. For consistency with OECD estimates, my GNP figures include a small amount for government capital consumption. This comes out again when I move to the private domestic economy in adjustment (b).

4. The entire increase in net property income from abroad is counted as a contribution of capital. Real GNP in general government is measured on the assumption that output per person employed does not change (this statement is only approximately accurate), and for this reason I used procedures that have the effect of measuring inputs in general government by employment [2, pp. 187–188]. Hence, no change in output per unit of input occurs in general government.

5. As indicated in section IV, my estimates imply that the contribution to the growth rate of *net* product at factor cost in the *private domestic* sector was 1.51.

6. This implies, of course, that the levels of total national income and private domestic GNP (both measured in 1958 prices at factor cost) happened to be almost the same at the start of the period (1950).

7. In measuring the effects of differences between us in concepts, scope, or procedures for this review, I often shortcut the calculations by using average weights or rates for the period examined even though we each subdivide the periods in our calculations. The results are accurate enough for the purpose at hand.

8. Throughout this review, I ignore as of no quantitative importance the fact that, in presenting the contributions of the sources to the growth rate, I allocated to output per unit of input 0.01 percentage points of an interaction term. Jorgenson and Griliches do not present contributions as such and hence omit this term, but with their estimates nothing would be allocated to productivity in any case. I also ignore rounding discrepancies that cause their growth rate of output to exceed the sum of the growth rates of input and output per unit of input at intermediate points in their analysis by small amounts varying up to 0.06 (as presented in their table IX).

9. My reasons for using income shares are stated in 2, chapter 4.

total input increases and the less output per unit of input increases.

Differences related to scope and definition

The weights used in my study refer to the shares of labor and capital-land in total national income. I measure labor earnings as the sum of (1) the compensation of employees and (2) a portion (about three-fifths) of proprietors' income; this portion is derived on the assumption that the labor share of national income originating in proprietorships and partnerships is the same as the labor share of national income originating in nonfinancial corporations [2, p. 37]. My estimate of the total earnings of capital and land is equal to the sum of the following items: the remainder (about two-fifths) of proprietors' net income; corporate profits (before tax) and inventory valuation adjustment; the rental income of persons; and net interest. The labor share plus the capital-land share equals national income. (Whatever is not earned by labor is counted as earnings of capital and land despite the fact that "pure" profit—whether a return to entrepreneurship or monopoly profit—is included.)[10] Depreciation is revalued at replacement cost in the computation of corporate and noncorporate earnings and rental income, and of total national income.[11] On the average in the 1950–62 period, labor earnings represented 78.6 percent and capital and land earnings 21.4 percent of total national income.[12] These percentages are shown in line 1 of the following table. The remainder of the table will help the reader follow the rest of this discussion.

The Jorgenson-Griliches analysis is confined to the private domestic sector. My results imply that labor earnings averaged 74.7 percent and capital and land earnings 25.3 percent of national income in this sector. Jorgenson and Griliches analyze the growth of gross rather than net output; this obviously calls for a difference in procedure somewhere in the calculations. One acceptable possibility is to include depreciation with the earnings of capital and land in the derivation of weights, and this is what Jorgenson and Griliches do.[13] If depreciation is added to national income and to the capital-land share, and the percentages are recomputed, my estimates indicate that labor earnings averaged 67.2 percent of gross domestic product at factor cost in 1950–62 and that capital-land earnings together with depreciation averaged 32.8 percent. (These figures are unaffected by the method of measuring depreciation.) These shares, shown in line 3 of the table, differ from those in line 1 for conceptual reasons. Their use by Jorgenson and Griliches to analyze gross private product would have introduced little or no discrepancy between their estimate of output per unit of input and that which I derived in section I after allowance for differences in the definition and scope of our output measures.

	Labor share	Property share
Denison labor estimates:		
1. Whole economy, national income	78.6	21.4
2. Private domestic economy, national income	74.7	25.3
3. Private domestic economy, GNP at factor cost	67.2	32.8
Jorgenson-Griliches labor estimates:		
4. Private domestic economy, GNP at factor cost	70.8	29.2
5. Private domestic economy, GNP at market prices	63.8	36.2

Differences due to estimating procedures

The Jorgenson-Griliches weights differ from these for two reasons. First, although their estimate of labor earnings, like mine, equals compensation of employees plus a portion of proprietors' income, they obtain the latter by a different procedure. They assume that labor earnings of proprietors are equal to the number of proprietors (exclusive of unpaid family workers) times compensation per fulltime equivalent employee in the private domestic economy [1, p. 278]. This procedure allocates approximately all of proprietors' income to labor and none to capital and land. The labor share obtained by this procedure averages 70.8 percent, and the capital-land share 29.2 percent, of private domestic GNP at factor cost instead of 67.2 and 32.8, the percentages at which I arrive. My allocation of proprietors' income seems to me the more reasonable, but admittedly both procedures have substantial precedent. In the nature of the case, there is no way to check the results directly. Their use of a larger estimate of labor earnings would, in itself, lead Jorgenson and Griliches to a *higher* estimate of the contribution of output per unit of input to growth than I obtain. However, it is much more than offset by what I regard as an error in their derivation of capital-land earnings.

Jorgenson and Griliches state in their statistical appendix [1, p. 278] that "total income from property is gross private domestic product in current prices less private domestic labour income." Gross private domestic product was valued at market prices in their calculation. This means that Jorgenson and Griliches count indirect business tax liability minus "subsidies less current surplus of government enterprises" and plus business transfer payments and the "statistical discrepancy" in the national accounts as earnings of capital and land. Jorgenson and Griliches inform me that this inclusion was intentional, not an oversight. Inclusion of these items in the earnings of capital and land raises their capital-land share from 29.2 percent to 36.2 percent, or by almost one-fourth, and lowers their labor share from 70.8 to 63.8.[14] (These shares, shown in row 5 of the preceding text table, were computed from annual

10. Since Jorgenson and Griliches do the same, this does not cause our estimates to diverge.

11. The estimates are based on use of Bulletin F lives and straight-line depreciation. They were prepared before the results of the latest OBE capital stock study for nonresidential structures and equipment became available.

12. I do not actually use weights for the period as a whole in calculations, nor do Jorgenson and Griliches. I use weights for three subperiods, and they change weights annually. The averages provide a convenient summary.

13. This procedure is not necessarily exactly equivalent to that which I used in section I above to adjust my estimates to a gross product basis, but any difference in the end result for output per unit of input is probably trivial.

14. It also has the effect of including indirect taxes, and the other reconciliation items mentioned, in profits *after tax* in the numerator of the "implicit rate of return after taxes" that Jorgenson and Griliches show in table VI, column 4, of their article. Their article gives no hint of this peculiar definition of an after tax rate of return. I doubt that many readers of their article can be aware of it.

figures given me by Jorgenson and Griliches.)

The principal item at issue, quantitatively, is indirect business tax liability. Jorgenson and Griliches do not explain why they include indirect business taxes in their weights or why, if they are to be included, there is more reason to add them to capital-land earnings than to labor earnings. Possible reasons for their procedures are hard to visualize, and I can only speculate as to what they may have had in mind.

The fact that Jorgenson and Griliches are analyzing the growth of gross product valued at market prices (which, viewed from the "income side," includes indirect taxes), rather than gross product valued at factor cost, surely necessitates no difference in weights. Share weights are used as estimates of the relative response (elasticity) of output to changes in labor input and to capital-land input; for example, use of weights of 30 percent for capital and land and 70 percent for labor to analyze gross product growth would imply that a given percentage increase in every type of capital-land input raises gross product by three-sevenths as large a percentage as does the same percentage increase in every type of labor input. There is no systematic reason for the percentage response of gross product valued at market prices to differ from the percentage response of gross product at factor cost.[15]

Possibly Jorgenson and Griliches mean to challenge the classification of indirect taxes as indirect. The income division that is appropriate for use as weights is the distribution of earnings that would prevail in the absence of taxes, *taking as given* the existing quantities of each input in the sector and period analyzed. To approximate this distribution, analysis is required of what is often called "shortrun" tax incidence (to distinguish it from analysis of incidence when any impact of taxes on the quantities of factors is taken into account). My use of the classification of taxes followed in the national accounts thus implies the following assumptions. First, that personal income and inheritance taxes (and various licenses, minor taxes, and nontax recipts of governments that are classified as personal) do not alter the distribution of earnings before taxes; hence, they need not be deducted from before-tax shares to achieve the desired distribution. Second, that the "shortrun" incidence of payroll taxes is on labor earnings; hence, labor earnings should be measured inclusive of payroll taxes. Third, that the "shortrun" incidence of corporate profit tax accruals is on corporate profits; hence, corporate profits should be measured inclusive of corporate profits taxes. Fourth, that the incidence of taxes classified as indirect is on no particular type of income and their presence does not alter relative shares measured exclusive of such taxes. Taxes classified as indirect, and the average percentage of total "indirect business tax and nontax accruals" represented by each type in 1950–62, are: sales and excise taxes and customs duties, 55 percent; property taxes, 33 percent; business motor vehicle licenses, 2 percent; other business taxes, 7 percent; business nontaxes, 3 percent.

No one supposes this classification of taxes to be precise. For example, I have myself suggested that at least the portion of the corporate income tax that is levied on regulated utilities probably is passed on in higher prices, causing my capital-land share to be overstated relative to labor. But, with some allowance for offsets, I have regarded the national accounts classification as acceptable.

If Jorgenson and Griliches count indirect taxes as earnings of capital and land because of incidence considerations, this implies that they accept the first three assumptions listed above and reject the fourth in favor of an assumption that the shortrun incidence of indirect taxes rests on capital and land.

For one tax classified as indirect, that on real property, this assumption may be preferable.[16] Indeed, in the context of considering the effect of taxes on the allocation of resources among sectors of the economy, I have myself suggested that one should not consider the impact of the corporate income tax, which bears only on the corporate sector, without simultaneously considering the property tax, which bears most heavily on the principal noncorporate sectors of the private economy: housing and farming [3, pp. 186–187]. It is plausible to argue that neither tax is shifted in the short run. But I see no possible reason to suppose that the short-term incidence of the other components of indirect tax and nontax liability rests on capital and land. These represent the bulk of the category, so I regard addition of indirect taxes to capital-land earnings as mainly an error.[17]

Although counting the difference between factor-cost and market prices as property income raises the Jorgenson-Griliches capital-land share of private domestic GNP by 7.0 percentage points in 1950–62, their actual weight averages only 3.4 percentage points higher than the weight implied by my estimates (with depreciation added) because of their smaller allocation of proprietors' income to property income.

My own estimate of output per unit of input is only moderately sensitive to differences in weights of this magnitude. If I were to substitute their weights for mine, my estimate of the contribution of output per unit of input would be lowered by about 0.08 percentage points.[18] I shall use this number to measure the difference in our results that is due to differences in our division of the weights between labor and capital-land as a whole. However, it should be noted that the Jorgenson-Griliches estimates are much more sensitive than mine to differences in weights because they estimate the

15. The movement over time of gross product at 1958 market prices differs from that of gross product at 1958 factor cost only if the composition of output shifts toward or away from products that were taxed (or subsidized) at above- or below-average rates in 1958. Any difference in movement is not related to share weights in the economy as a whole. (In 2, pp. 15–16, I suggest that if, in the output measure whose growth is analyzed, the components of output are weighted by market prices, such shifts should themselves be treated as a statistical "source" of growth.)

16. Even if this is so, it is an open question whether addition of property taxes to capital-land earnings would, on balance, improve the weights in view of the probable overstatement of the capital-land weight in both our estimates that results from counting "pure profit" and all of the corporate income tax in this share.

17. Inclusion of other, smaller reconciliation items between GNP at market prices and GNP at factor cost in property income seems tenable for only one minor subcomponent: corporate contributions to non-profit organizations.

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differential between the increase in capital-land input and labor input to have been far larger than I do. Substitution of my weights for theirs would raise their estimate of output per unit of input much more than 0.08. In the reconciliation I attempt, this extra amount will be reflected in the difference I identify with differences in our measures of changes in inputs.

IV. Allocation of the Total Capital-Land Weight Among Components

THE procedures that Jorgenson and Griliches and I adopt to estimate the contribution of capital and land to growth are similar at the most general level.

The total weight of capital and land is first divided among types of capital and land in proportion to the estimated earnings of each type. In my estimates five types are distinguished. One of these, international assets, does not appear in the portion of the economy analyzed by Jorgenson and Griliches. The others are: residential structures and residential land, nonresidential structures and equipment, nonresidential land, and inventories. Jorgenson and Griliches use a different classification. They distinguish among residential structures, nonresidential structures, equipment, residential and nonresidential land, and inventories.

Once the weights are assigned, each component of capital-land is treated as a separate input. An index measuring the quantity of each input must be developed. The weight is then multiplied by the growth rate of the index to arrive at the contribution of each component to growth.[19] (In my case contributions of international assets and, as explained in section V, residential property are calculated by a different procedure that does not require an input index.) The total capital-land contribution is the sum of the contributions of the components. In this section, I consider the weights. Later sections will examine the input indexes.

Because I analyze net product and my total capital-land weight includes only net (after-depreciation) earnings, my total capital-land weight is allocated among types of assets in proportion to their estimated net earnings. Jorgenson and Griliches allocate earnings in two parts. The portion of their capital-land weight corresponding to net (after-depreciation) earnings is allocated by estimates of net earnings, as in my procedure. To net earnings of each type of *depreciable* asset, they add depreciation (replacement in their terminology) in order to obtain gross earnings. This corresponds to their measurement of gross product and inclusion of depreciation in their total capital-land weight. This difference in our weighting procedure is legitimate because we are analyzing the growth of different output measures.

The preceding description of the Jorgenson-Griliches methodology pertains to their final estimates, which incorporate the adjustments introduced in moving from their table V to table VI. The weighting structure they initially use—in their tables I through V—is a mixture in that the total capital-land weight includes depreciation but is allocated among components by net earnings alone.

Use of asset values to allocate net earnings

The total weight of capital and land (excluding depreciation in the Jorgenson-Griliches estimates) is, as I have indicated, divided among components in proportion to their net earnings. But first the earnings of each component must be estimated, and this requires some assumptions.

The earnings of an enterprise can be measured, but most enterprises use more than one type of capital and land and there is no way to observe directly the earnings of each type. The analyst has no alternative but to assume that the individual enterprise earns the same rate of return on each.[20] Given this assumption, the total net earnings of capital and land in each enterprise can be distributed among different types of assets in proportion to their value to obtain the earnings of each type.

Jorgenson and Griliches introduce a second assumption: that the rate of return is the same in all enterprises. The two assumptions together permit them to allocate the net earnings of capital-land among types of assets by current asset values in the private economy as a whole. Except for a modification for capital gains and taxes, which I shall discuss shortly, this is their procedure.

The second assumption is not required by the nature of the economy.

18. Substitution of their higher estimates of the labor content of proprietors' income for mine, and addition of all the reconciliation items between GNP at factor cost and GNP at market prices to my estimates of capital-land earnings, would lower my labor share of total national income in 1950–62 from 78.6 to 74.1. By my procedures, the difference of 4.5 percentage points would be allocated among nonresidential structures and equipment, nonresidential land, and inventories in proportion to their present weight. (The weight of other capital-land components is independently derived.) Such a shift in weights would lower my estimate of the contribution of labor input by 0.06 percentage points, raise the contribution of capital by 0.14, and hence lower my estimate of the contribution of output per unit of input to the growth rate of national income in the whole economy in 1950–62 by 0.08. The effect on the growth rate of GNP at factor cost per unit of input in the private domestic sector would be the same, for reasons explained in section I.

19. The actual arithmetic of the Jorgenson-Griliches calculation differs from this description, but it is arithmetically equivalent. Suppose, in a year 1, that in current prices total income and output are $100 and earnings of inventories are $5 (equal to 5 percent of the total weight). Suppose that inventory input is measured by its value in 1958 prices, and this value is $100 in year 1 and $110 (10 percent more) in year 2. The more usual procedure would multiply the 10 percent increase in inventory input by its 5 percent weight, and conclude that the increase in inventories had raised output by 0.5 percent. The Jorgenson-Griliches procedure is to divide the $5 of inventory earnings in year 1 by the $100 of constant-price value in year 1 to obtain a "service price" of 5 cents per unit ($1 of value in 1958 prices) of inventories. The 100 units of inventory input in year 1 and the 110 units in year 2 are then multiplied by 5 cents, yielding $5 in year 1 and $5.50 in year 2. The difference of 50 cents is the contribution of the increase in inventories, and is again equal to 0.5 percent of the year-1 value of output.

20. Jorgenson and Griliches and I each assume statistically, subject to some later qualifications about capital gains and taxes, that, if the rate of return is the same for all types of assets, the ratio of net earnings to net value at current prices is also the same. This is not a wholly satisfactory assumption [2, p. 143, and 3, pp. 28, 112–113, 289–294], but it introduces no discrepancy between our results because we both use it.

If data were available, one could allocate earnings separately for each enterprise and add up the results. If it turned out, for example, that enterprises having a high proportion of their assets in inventories had a higher rate of return, on the average, than enterprises having a high proportion of their assets in fixed capital, this procedure would (I believe appropriately) yield a higher weight for inventories and a lower weight for fixed capital than would a summary allocation of total capital-land earnings in the economy as a whole by the value of different types of assets in the economy as a whole. With the statistics available, this procedure cannot be implemented for individual enterprises. But I have found it possible to introduce what I regard as major improvements in the weighting structure by dealing with groups of enterprises.

(1) The earnings of capital and land used in the provision of housing services—called the "services of dwellings" industry in international compilations—were isolated [2, p. 40].[21] They are almost the same as total earnings in this industry since labor earnings are trivial. Since residential capital and residential land are the only types of capital and land used by this industry, and since (by definition) these assets are not used by any other industry, the earnings of residential capital and land can be unambiguously identified. Actual earnings of residential property are smaller than the estimate that would be obtained if total earnings in the economy as a whole were allocated by asset values, and hence my procedure leaves more weight for the remaining assets.[22]

(2) The net flow of property income from abroad, corresponding to the earnings of international assets, was also isolated; however, once my estimates are adjusted to correspond to the scope of the economy they cover, this procedure does not affect the comparison with Jorgenson and Griliches because income from abroad is outside their sector.

(3) The remaining earnings of capital and land—those arising in the domestic nonhousing sector—were divided between farm and nonfarm components. *Within* each sector, the total was distributed among nonresidential structures and equipment, nonresidential land, and inventories, in proportion to their net value. The estimates for the farm and nonfarm sectors were then added to obtain total earnings for each of these three types of assets. Farming has a lower ratio of earnings to assets than the nonfarm nonresidential sector, and a higher proportion of its assets are in land and a lower proportion in structures and equipment. Hence, the separate attention I give to agriculture results in a lower weight for land and a higher weight for nonresidential structures and equipment than would be obtained if the farm-nonfarm division were not made.

My average weights for the 1950–62 period are shown as percentages of total national income and of total nonlabor income in the first two columns of the following table. The next two columns give similar data for the private domestic sector.

The last column gives a percentage breakdown of the total capital-land weight that corresponds *conceptually* to the percentage distribution of the net (after-depreciation) portion of the Jorgenson-Griliches final weights, except for an adjustment for capital gains and taxes that they introduce. (It also corresponds conceptually to their division of the total gross capital-land weight, including depreciation, used in the construction of their table I.)[23]

Their distributions differ from this statistically, however, because they allocated total net capital-land earnings among components by values in the private domestic economy as a whole, without giving separate attention to the "services of dwellings" and agricultural industries.[24] For this reason, they presumably assigned a much higher proportion than I of the total net capital-land weight to residential structures and to residential and nonresidential land, and a lower proportion to nonresidential structures and equipment and (to a lesser extent) inventories.[25] On balance, the weighting structure for net earnings *within* their capital-land aggregate probably yielded a smaller increase in combined capital-land input, and hence tended to produce a *larger* increase in output per unit of input, than my weights would have done. This is chiefly because land, to which they assign more weight, did not increase.

21. In most Western European countries, the "services of dwellings" is considered a separate industry, for which the necessary data are published. In the United States, this activity is divided between the "real estate" and "farms" industries and not published separately, but it can be approximated from the details of the national accounts worksheets.

22. My precedures avoid the need to further divide the earnings of residential property between structures and sites. If such a breakdown were desired in order to preserve the Jorgenson-Griliches classification of assets, it could be obtained by allocating earnings *within* the housing sector by asset values.

23. Note, however, that Jorgenson and Griliches classify residential land with other land rather than with dwellings. They also subdivide nonresidential structures and equipment.

24. And possibly also because of differences in data used.

25. In their table I, they presumably also assigned a lower proportion of their total weight than I to structures and equipment and a higher proportion to land and inventories because, to arrive at the current value of structures and equipment, they use the double declining balance formula which yields lower values for such assets than the straight-line formula I adopted. In their final gross earnings weights, this difference is more than offset since depreciation is added back to the capital component to which it pertains.

	Whole economy		Private domestic economy	
	Percent of national income	Percent of capital-land earnings*	Percent of national income*	Percent of capital-land earnings*
International assets	0.6	3		
Residential structures and land	3.5	16	4.3	17
Nonresidential structures and equipment	11.2	52	13.6	54
Nonresidential land	2.9	14	3.5	14
Inventories	3.2	15	3.9	15
Total capital and land	21.4	100	25.3	100

*Approximate.

Capital gains

Anticipated capital gains or losses and taxes on income may bias earnings weights derived in the ways I have described if their presence causes the percentage distribution of asset values to diverge from that of earnings within a sector of the economy where the distributions have been assumed to be the same [3, p. 28]. I believe any such bias in my estimates to be trivial, but must devote extended discussion to the topic because Jorgenson and Griliches assign it a central place in their analysis.

I shall consider capital gains first. Jorgenson and Griliches believe the presence of capital gains or losses affects the validity of the assumption that earnings are distributed like asset values. They state: "Asset prices for different investment goods are not proportional to service prices because of differences in . . . rates of capital gain or loss among capital goods" [1, p. 267]. Their idea is that current asset values are proportional to the sum of earnings and capital gains so that allocation of earnings by asset values assigns too much to assets producing large capital gains and too little to assets producing small capital gains or capital losses. They do not discuss the timespan over which capital gains and losses must be cumulated to secure this proportionality, but I presume it is the discounted value of the anticipated stream of earnings and capital gains that would be supposed pertinent.

The relevance of this idea to the actual data we both use must now be explored. It is necessary, I believe, to distinguish sharply between land and reproducible capital. The current value of land is estimated market value; Jorgenson and Griliches and I rely upon Raymond Goldsmith for data. Land prices may and often do reflect not only current earnings related to current marginal products but also the expectation that marginal products will be higher in the future because of increasing land scarcity (relative to other factors). Land is also an inflation hedge and may reflect the expectation of a rise in the general price level as well. Hence, the ratio of current earnings to value may be lower for land than for capital, and allocation of earnings by value may overweight land and underweight capital.

The case of land has no counterpart within the reproducible capital aggregate. The values Jorgenson and Griliches and I use for capital components are their current replacement costs, estimated by use of price indexes for new equipment, structures, and goods held in inventory. These values are firmly anchored to the present price level and present production costs of capital goods and are not affected by capital gains. (Actually, I doubt that it would matter if the values were true market values, since there is no general reason for these to depart from reproduction costs.) Therefore I see no reason to suppose the allocation of weights among structures, equipment, and inventories is biased by capital gains.

As indicated, land may be overweighted and all the capital components correspondingly underweighted because of capital gains. But if this is true of my weights, the bias must be slight. My weight for dwellings and dwelling sites (including vacant lots, which yield no current income) is completely unaffected because it is based directly on earnings, excluding capital gains, and my procedure does not require a division of this weight between dwellings and their sites. Division of total earnings between farm and nonfarm industries greatly reduces any possible overweighting of private *nonresidential* land. In addition, I used conservative estimates of the value of land (Goldsmith's earlier, rather than later and higher, estimates). Finally, the weight I assigned nonresidential land is so small that it could be reduced even radically with no great effect. If it were cut 40 percent, for example, and this weight reassigned to nonresidential structures, equipment, and inventories, my estimate of the contribution of output per unit of input would fall by only 0.04 percentage points in 1950–62.

If capital gains bias weights obtained from a distribution by asset values, the Jorgenson-Griliches weights, prior to their attempted correction, are subject to larger error than mine because they do not isolate earnings in the "services of dwellings" and agricultural industries in which land is very important.

Jorgenson and Griliches attempt to eliminate the bias that they presume would otherwise enter their weights by introducing a formula that is based on the assumption that, each year, values of types of capital and land are proportional to the sum of the earnings and capital gains derived from them in that year.

The formula can best be understood with the aid of an arithmetic example. Assume for some year the arbitrarily selected data for the private domestic economy shown in the following table. (The table will be used again, and includes some numbers not needed as yet.) For simplicity, I let the data refer to the base year for deflation so that asset values are the same in current and constant prices. The first column gives data based on "true" depreciation (replacement) as estimated by Jorgenson and Griliches; the second, on capital consumption as shown in the national income estimates. Only two types of capital—equipment and inventories—are present, and each has a value of $50,000. (Residential and nonresidential structures are handled like equipment in the formula, and land, like inventories.) During the year, there is a capital gain (realized and unrealized) of $1,500 on the stock of equipment and $500 on inventories. The problem is to divide the total

	Jorgenson-Griliches basis	National accounts basis
Income and product account:		
Sales (equal GNP at market prices)	$60,000	$60,000
Labor earnings	45,000	45,000
Gross capital earnings [a]	15,000	15,000
Depreciation on equipment	7,000	5,000
Interest and profit [a]	8,000	10,000
Interest	1,000	1,000
Profit before tax [a]	7,000	9,000
Corporate income tax [b]	3,333	3,333
Profit less corporate income tax [a]	3,667	5,667
Addenda:		
Value of capital	100,000	----------
Equipment	50,000	----------
Inventories	50,000	----------
Capital gains	2,000	----------
Equipment	1,500	----------
Inventories	500	----------

[a] Includes indirect business taxes and other reconciliation items between factor cost and market price valuation for consistency with the Jorgenson-Griliches classification.
[b] Includes tax on capital gains.

Jorgenson-Griliches gross capital earnings weight of $15,000 (or 25 percent of the total input weight of $60,000) between equipment and inventories when the Jorgenson-Griliches estimate of "true" depreciation is accepted.

The usual procedure would assign to equipment the $7,000 of depreciation on equipment, and divide the $8,000 of net earnings between equipment and inventories in proportion to their values—in the example, $4,000 each.[26] The total weight of equipment is then $11,000 and of inventories $4,000.

In the absence of a corporation income tax, Jorgenson and Griliches would compute the weight (they call it the "service price") for the $50,000 value of each of the two assets by the following formula [1, p. 256]:

$$p_k = q_k\left[r+\delta_k-\frac{\dot{q}_k}{q_k}\right]$$

where p_k is the price of the k^{th} capital service, q_k is the price of the k^{th} investment good, r is the rate of return, net of "true" depreciation but inclusive of capital gains, on all capital, δ_k is the "instantaneous rate of replacement of the k^{th} investment good" (i.e., the ratio of depreciation to net value), and $\frac{\dot{q}_k}{q_k}$ is the ratio of the capital gain on the k^{th} investment good to the value of that good.

If there were no capital gains in my example ($\dot{q}_k$ would then be zero for both equipment and inventories), this formula would yield the same weights as the simple procedure: $11,000 for equipment and $4,000 for inventories. The price of $50,000 of equipment would be calculated as

$$\$50{,}000\left[\frac{8{,}000}{100{,}000}+\frac{7{,}000}{50{,}000}-\frac{0}{50{,}000}\right]$$

or $11,000.

The price of $50,000 of inventories would be calculated as

$$\$50{,}000\left[\frac{8{,}000}{100{,}000}+\frac{0}{50{,}000}-\frac{0}{50{,}000}\right]$$

or $4,000.

The example actually assumes capital gains of $2,000, of which $1,500 is on equipment holdings and $500 on inventory holdings. When these are introduced, the weights (service prices) shift toward inventories, which have a lower rate of capital gain. The estimated price (earnings) of $50,000 of equipment becomes

$$\$50{,}000\left[\frac{8{,}000+2{,}000}{100{,}000}+\frac{7{,}000}{50{,}000}-\frac{1{,}500}{50{,}000}\right]$$

or $10,500.

The price of $50,000 of inventories becomes

$$\$50{,}000\left[\frac{8{,}000+2{,}000}{100{,}000}+\frac{0}{50{,}000}-\frac{500}{50{,}000}\right]$$

or $4,500.

The assumption of the calculation is that asset values each year are proportional to the sum of net (after-depreciation) earnings and capital gains in that year.[27] Jorgenson and Griliches base their weights (service prices) for each year on such a calculation (or rather a more complicated one to which I shall come shortly) for that year.

I find it impossible to believe that the procedure adopted by Jorgenson and Griliches actually improves the weights. It might be appropriate to apply the Jorgenson-Griliches assumption that values are proportional to the sum of net earnings and capital gains—but only with the use of average capital gains over long periods of time to adjust earlier years—if (1) asset values used in the calculations were independently obtained sales values and (2) substantially different rates of capital gain on different types of capital were forecast by firms and (3) their forecasts were accurate. But the second condition is unlikely and the third so restrictive that I doubt the procedure would be an improvement even if the first condition were met. Actually, the first condition is not met; as already noted, the capital stock values used are not market values but current reproduction costs that are not affected (except very indirectly and irrelevantly) by prospective capital gains. Consequently, the bias that Jorgenson and Griliches seek to eliminate is not present in the original data.[28] Their capital gains adjustment thus introduces a bias in the opposite direction—that is, it overweights capital assets on which capital gains are small.

Even if all three conditions were met, the relevance of an annual calculation would elude me. Since capital gains are highly erratic from year to year, the weights must also change erratically from year to year. It could hardly be argued that market prices of capital goods and land fluctuate annually so as to maintain proportionality between capital values and the sum of earnings and capital gains each year, nor could firms adjust the composition of their real assets annually even if they could foresee the pattern of each year's capital gains and losses. The supposed error in the use of asset values to derive weights for a year could have no relationship at all to the size of capital gains in that year.

Tax on corporate profits

I turn now from capital gains to taxes on income. Jorgenson and Griliches consider only the tax on corporate profits. It is sometimes argued that the presence of this tax leads to allocation of resources in such a way as to cause the after-tax rate of return in the corporate sector to be the same as, and hence the before-tax rate of return higher than, that in the noncorporate sector.

Because earnings from all types of capital and land used by corporations are taxed alike, it is easy to avoid any bias from this source in the distribution of capital-land earnings (which include this tax) among types of assets if asset values are available separately for corporations. One need only allocate earnings of capital and land in the taxed corporate sector in proportion to asset values in corporations, to allocate earnings in the untaxed noncorporate sector in proportion to noncorporate asset values, and then to add the two

26. I follow here the Jorgenson-Griliches procedure of counting indirect taxes, etc., as part of the net earnings component.

27. The calculation implies net earnings of $3,500 and capital gain of $1,500 for equipment, and net earnings of $4,500 and capital gain of $500 for inventories.

28. Except perhaps for the division of the weight between land, on the one hand, and the four capital components as a group, on the other.

distributions to secure the final earnings estimates for use as weights. This procedure avoids any bias from the tax whether the tax diverts resources from the corporate to the noncorporate sector or does not.

My estimates do treat separately two sectors that are overwhelmingly noncorporate: housing and agriculture. However, the combined earnings of corporate and noncorporate firms within the nonfarm nonhousing sector were allocated by their combined asset values. This introduces an error into my weights for nonresidential structures and equipment, inventories, and nonresidential land if both (1) the rate of return after tax (rather than before tax) was the same for corporate and noncorporate firms, and (2) the percentage distribution of assets among the three types was different in corporate and noncorporate firms. The first condition would mean that before-tax earnings per dollar of value of each type of capital and land are higher in corporations than in noncorporate firms. If this is so, and if the second condition is also met, failure to allocate capital-land earnings of corporate and noncorporate firms (within the nonfarm nonhousing sector) separately would yield too large an estimate for earnings of types of assets used most by noncorporate firms and too small an estimate for types used most by corporations. However, the distribution of assets in noncorporate nonfarm firms could scarcely differ enough from that in nonfarm corporations to introduce an error of appreciable size.

Because Jorgenson and Griliches make a single allocation for the whole private domestic economy, without isolating housing and agriculture, the potential bias in their estimates is much larger and extends to residential as well as nonresidential capital and land. The direct way for them to remove the potential bias would be to make separate allocations of earnings in corporate and noncorporate sectors. An indirect way, having no advantage because it requires the same information, would be to increase the weight attached to corporate assets by (1) raising the value of corporate holdings of each type of asset by the ratio of after-tax earnings to before-tax earnings in corporations; (2) adding the resulting adjusted value of corporate holdings to the unadjusted value of noncorporate holdings of each type of asset; and (3) allocating combined corporate and noncorporate before-tax capital-land earnings among types of capital and land in proportion to the adjusted asset values so obtained. I surmise that Jorgenson and Griliches may have had this in mind when they introduced their formula for the determination of service prices in the presence of a direct tax on income.

This formula, which is used in their actual calculations in place of the simpler formula already discussed, is quite complex because it tries to deal simultaneously with capital gains and the corporate income tax, including the effects of differential taxation of capital gains. I believe the formula is intended to allocate earnings among types of capital and land on the assumption that asset values each year are proportional to the sum of net (after depreciation) earnings and capital gains in that year when earnings and capital gains from each type of asset are each measured after deduction of the corporate income tax applicable to them.

The formula, which I shall now describe, does not actually do this. In fact, it does nothing at all to remove the bias, just discussed, that allocative effects of the corporate income tax may be presumed to introduce. The reason is that Jorgenson and Griliches apply the *same* ratio of before-tax earnings to after-tax earnings (the average ratio for the whole private economy) to both corporate and noncorporate assets instead of using the corporate ratio for corporate assets and a ratio of one for noncorporate assets.

Introduction of new terms does not improve the results obtained by the simpler no-tax formula already described but instead compounds the errors. In particular, it accentuates the erroneous shift of the weights from capital-land components on which capital gain is high to those on which capital gain is small. In addition, it shifts weight from depreciable assets to land and inventories if (as is the case) "true" depreciation as measured by Jorgenson and Griliches exceeds capital consumption allowances as measured in the national accounts (which they use as a proxy for depreciation allowable for tax purposes). I presume their purpose in doing this is to allow for supposed effects of taxing depreciable assets on amounts that represent recovery of capital rather than true earnings, but defects in their formula and measurements make the amounts shifted haphazard.

The formula [1, p. 267, formula 11] is:

$$p_k = q_k\left[\frac{1-uv}{1-u}r + \frac{1-uw}{1-u}\delta_k - \frac{1-ux}{1-u}\frac{\dot{q}_k}{q_k}\right].$$

The definitions of the terms [as given in 1, pp. 256, 267, and 277–279 and in correspondence from the authors] and their values for equipment and for inventories in my example above are as follows:

p_k is the price of the k^{th} capital service. In using the example, I let it refer for convenience to the price of the service of $50,000 worth of equipment, and of $50,000 worth of inventories.

q_k is the price of the k^{th} investment good. In the example, it is $50,000 for equipment and $50,000 for inventories.

u is the ratio of corporate profits tax liability to profits before taxes in the private domestic sector of the economy.

Corporate profits tax liability is taken from the national accounts. It includes tax liability incurred because of inventory profits and other capital gains.

"Profits before taxes" in the private domestic sector are measured as property income (Jorgenson-Griliches definition) less capital consumption allowances and private domestic net interest, both taken from the national accounts. Profits before taxes are therefore equal to the sum of

"corporate profits and inventory valuation adjustment" in the domestic sector, the proportion of "proprietors' income" not allocated to labor, the "rental income of persons," "indirect business tax and nontax liability," "business transfer payments," and "statistical discrepancy," minus "subsidies less current surplus of government enterprises." [29]

If the reason that Jorgenson and Griliches count indirect taxes as capital-land earnings is a belief that their shortrun incidence is on this share, one would also expect indirect taxes to be counted as taxes on these earnings. This is not done; indirect taxes are not counted as taxes on income but as part of income after tax.

This variable is the same for each type of asset, regardless of its distribution between the corporate and noncorporate sectors. In the example,

$$u=\frac{3,333}{9,000}=.3704.$$

r is the ratio of (a) total income from property less profits tax liability less the current value of replacement plus the current value of capital gain to (b) the current value of capital stock. It is the same for all types of capital and land. In the example,

$$r=\frac{15,000-3,333-7,000+2,000}{100,000}=.06667.$$

v is the ratio of private domestic net interest to the after-tax rate of return, r, multiplied by the current value of the capital stock. It is the same for all types of capital and land. In the example,

$$v=\frac{1,000}{.06667\times 100,000}=.15.$$

w is the proportion of "true" replacement (depreciation) that is allowable for tax purposes. Jorgenson and Griliches obtain this proportion as the ratio of capital consumption allowances, as measured in the national accounts, to their estimates of depreciation (replacement). They use the same ratio for all types of depreciable assets (residential structures, nonresidential structures, and equipment). For equipment in the example,

$$w=\frac{5,000}{7,000}=.7143.$$

No value is needed for inventories (or land).

δ_k is the rate of replacement (depreciation) of the k^{th} investment good. For equipment in the example,

$$\delta_k=\frac{7,000}{50,000}=.14.$$

No value is needed for inventories.

x is defined as the proportion of capital gains included in income for tax purposes. However, Jorgenson and Griliches inform me that, in their calculations, x actually was assumed to be zero for all types of assets.[30]

$\frac{\dot{q}_k}{q_k}$ is the rate of capital gain on the k^{th} investment good. I defer a description of the derivation of $\dot{q}_k$. In the example, the ratio is

$$\frac{1,500}{50,000}=.03 \text{ for equipment,}$$

and

$$\frac{500}{50,000}=.01 \text{ for inventories.}$$

When the values derived from the example are inserted, weights of \$10,794 for equipment and \$4,206 for inventories are obtained. For equipment p_k equals:

$$\$50,000\left[\frac{1-(.3704\times.15)}{1-.3704}\times.06667+\frac{1-(.3704\times.7143)}{1-.3704}\times.14-\frac{1-(.3704\times 0)}{1-.3704}\times.03\right]=\$10,794.$$

For inventories, p_k equals:

$$\$50,000\left[\frac{1-(.3704\times.15)}{1-.3704}\times.06667+.00-\frac{1-(.3704\times 0)}{1-.3704}\times.01\right]=\$4,206.$$

Effects of the formula

It is informative to recapitulate results from the example, and insert the results of one additional calculation. When no account was taken of capital gains or taxes, weights of \$11,000 for equipment and \$4,000 for inventories were obtained. Use of the no-tax formula to allow for capital gains shifted the weights to \$10,500 and \$4,500. If tax depreciation had been the same as true depreciation in the example, substitution of the formula with taxes present would have further shifted the weights to \$10,046 and \$4,954, this change reflecting the Jorgenson-Griliches assumption that capital gains are tax free.[31] With allowance, in addition, for taxation of part of "true" depreciation on equipment, the weight of equipment is raised to \$10,794 and that of inventories reduced to \$4,206. The particular numbers reflect only the figures assumed in the example, of course, but the direction of the changes at each

29. As originally printed, the Jorgenson-Griliches article stated that "the variable u, the rate of direct taxation, is the ratio of profits tax liability to profits before taxes for the corporate sector. These data are from the U.S. national accounts" [1, p. 277]. This definition, though logical if u were to be used only for corporate assets, would make the equation as it stands wholly inconsistent.

30. In their article this is not really clear. They write only that "the proportion of capital gains included in income is zero by the conventions of the U.S. national accounts" [1, p. 267]. This must be interpreted to mean that "the variable x, the proportion of capital gains included in income for tax purposes (but not the value of capital gains as they appear elsewhere in the formula) is zero." The two statements are unrelated, and while the first is true, the second is not. Some capital gains (the inventory valuation adjustment in particular) are fully, and others partly, taxed. Jorgenson and Griliches include these taxes in the numerator of u, which has the effect of charging them to earnings instead of to capital gains. With x equal to zero, $-ux$ in the numerator of the last term of the formula could be omitted without changing the results.

31. This calculation uses only the column in the example headed "Jorgenson-Griliches." The values of the variables are the same as those just given except that u is .4761 instead of .3704, and w (for equipment) is 1 instead of .7143.

step helps to explain just what the formula does to the weights. I have already pointed out the main consequences.

The Jorgenson-Griliches formula may have theoretical interest.[32] But as they have applied it, it is hardly to be taken seriously as a tool for statistical analysis. The alterations in weights, away from assets with large capital gains, that would be introduced by their simple "tax-absent" formula are untenable. If they were tenable, the additional changes introduced by their "tax-present" formula would not be. The only bias potentially introduced by the corporate income tax (except by differential taxation of earnings and capital gains) is not affected. The overall corporate tax rate, u, as measured, is meaningless. It also is obviously wrong to assume that this tax bears as heavily upon dwellings and land as upon other assets. How indirect taxes can be counted as part of before-tax capital-land earnings but not as a tax on these earnings defies my understanding. Capital gains are not actually taxed at zero, as is assumed; they are taxed at a wide range of effective rates, ranging up to full taxation of the nonfarm inventory valuation adjustment. The fraction of depreciation (replacement) as measured by Jorgenson and Griliches that is taxable is not the same for all types of depreciable assets, as is assumed; the ratio of reproduction cost to original cost varies greatly between long-lived structures and short-lived equipment, and the proportions of these assets on which fast depreciation is allowed also varies greatly in the later years of their period.[33] Furthermore, much of the depreciation in the national accounts (particularly that on most dwellings) has no tax relevance at all (and farm depreciation is already on a replacement-cost basis). But these objections are, of course, largely superfluous if I am correct in asserting that the capital gains adjustment is itself a mistake.

32. However, if the formula is viewed as a theoretical construct rather than a description of their procedures, u, v, w, and x should all carry the subscript k since they differ for each asset type.

33. Tax depreciation differs from the Jorgenson-Griliches estimate of true depreciation chiefly because original cost is not the same as reproduction cost and because double declining balance depreciation is not allowed or, if allowed, is not used by taxpayers because they do not think it to be to their advantage.

Estimates of capital gains

The estimates of capital gains used by Jorgenson and Griliches that underlie the whole analysis are themselves subject to considerable criticism. The capital gain on any type of asset in a year is properly the difference between (a) the change in the value of holdings of the asset from the beginning to the end of the year, and (b) the value of the change in the quantity of the asset, measured in current prices. This figure can be approximated within an acceptable error by multiplying the value of the asset at the beginning of the year by the percentage change during the year in a price index for the stock of the asset.

Jorgenson and Griliches inform me that they used the former of these methods to secure capital gains on land, utilizing data from Raymond W. Goldsmith. For the capital items, however, they use neither of these measures. They write: "The capital gain for each asset is the product of the rate of growth of the corresponding *investment* deflator and the value of the asset in constant prices of 1958" [1, p. 279, italics added]. This differs from proper procedure in two respects. First, they measure changes in prices from the average of one year to the average of the next, instead of from the beginning to the end of the year. This is important for their annual series, but probably washes out over a period of years. Second, and more important, they use the implicit deflator for investment instead of the implicit deflator for the capital stock. This procedure yields an accurate approximation of the capital gain only if the two deflators are the same. They are the same if, but only if, the composition of the stock of an asset is the same as the composition of investment in it during each of the years compared—gross investment in the case of depreciable assets, net investment in the case of inventories. Only in this case are the weights appropriate for a capital stock price index the same as those that underlie the investment price index.

In the national accounts framework, this condition is met only for residential structures, which are treated as a single commodity both in deflation of investment and in building up a capital stock series. It is not met for nonresidential structures or for producers' durables, for each of which deflation is performed in considerable detail.[34] It is wildly not met for inventories; the composition of inventory change is usually very different from that of the stock of inventories. Moreover, the composition of inventory change varies greatly from year to year. As a consequence of this (together with the fact that, on a 1958 base, the levels of price indexes for different inventory components diverge greatly as one moves away from 1958), the implicit deflator for the change in inventories properly moves very erratically, especially in years far removed from 1958, even though the deflator for the stock of inventories moves smoothly. Jorgenson and Griliches note and dislike these wild movements. But instead of correcting their method to use the deflator for the stock of inventories instead of inventory change, they arbitrarily alter the deflator for inventory change by substituting the consumption deflator.

Depreciation

When an investment yielding a positive gross return is made, gross output is increased, depreciation is increased, and net output is increased by the difference between the two, which is the net product of the investment. If one were interested in analyzing the growth of both gross and net product, he could proceed in any of three ways. (1) He could analyze the growth of net product using net earnings weights (as I did in *Why Growth Rates Differ*), and add constant-price depreciation to output and to the contribution of capital in order to analyze gross product (as I did in section I of this paper). When I apply this method to the private domestic sector covered by Jorgenson and Griliches, my estimates yield the following results:

	Growth rate of output	Contribution of inputs	Contribution of output per unit of input
Net product	3.23	1.72	1.51
Gross product	3.35	1.97	1.38

34. The fact that Jorgenson and Griliches treat each of these as a single commodity, with a single service life, in constructing capital stock series does not suffice to remove the objection.

(2) He could analyze the growth of gross product using gross earnings weights (as Jorgenson and Griliches do), and subtract constant-price depreciation from output and from the contribution of capital in order to analyze net product. (3) He could analyze the growth of net product using net earnings weights and the growth of gross product using gross earnings weights. The three procedures are exactly equivalent only in special circumstances, but their results are not likely, in practice, to diverge very much. To explore the considerations involved in the choice would take me far afield, and I content myself with the assertion that, to measure net product, it is better to use net product weights than to follow the second alternative.

Jorgenson and Griliches [1, p. 257] criticize John W. Kendrick for not using service prices as his weights. They are wrong. Kendrick analyzed growth of net product and appropriately used net earnings weights. To include depreciation in the weights in an analysis of the growth of net product, as Jorgenson and Griliches insist he should do, would be a plain error that would lead to overstatement of the contribution of capital to growth.[35] That the other aspect of their service prices—their capital gains and tax adjustment—would have improved his estimates is just not credible on the basis of my preceding discussion.

Effect of differences in weights

When Jorgenson and Griliches adjust their initial estimates to use what they call "prices of capital services" in their calculations, they raise their 1950–62 growth rate of total input, and lower that of output per unit of input, by 0.35 percentage points [computed from 1, tables V and VI]. This number combines the effects of two changes from their initial estimates. First, Jorgenson and Griliches remove an error present in their initial weights. Whereas they initially allocate the depreciation component of their gross capital-land earnings weight like net earnings, they now allocate it correctly by depreciation. Second, they introduce the adjustment for capital gains and corporate income tax that I have described. The portion of the 0.35 percentage points that results from the reallocation of depreciation does not represent a discrepancy between their estimates and mine of the contribution of output per unit of input to GNP growth in the private domestic sector. I cannot isolate this portion but it is clearly substantial and, like the combined adjustment, positive. The portion that results from the adjustment for capital gains and taxes does cause a discrepancy, but I cannot isolate the amount nor even be sure whether it is positive or negative.[36] Neither can I calculate the discrepancy between our results (not necessarily included in the 0.35) that is introduced by my according separate treatment to housing and agriculture. Hence, I cannot measure the difference in our output per unit of input series that resulted from the difference in our allocation of the total capital-land weight among components, and this introduces a gap into the reconciliation table I provide in section IX.[37]

Consideration of the bearing of the Jorgenson-Griliches discussion of service prices upon my own estimates suggests only one qualification of my procedures. This is the possibility, already examined, that I may slightly bias my results by overweighting nonresidential land.

V. The Measurement of Capital-Land Inputs (Excluding the "Utilization" Adjustment)

I turn now to input series for the various types of capital and land. This section compares my estimates with those of Jorgenson and Griliches after their adjustment for what they call "errors" in investment goods prices, but not for changes in "utilization." Their "utilization" adjustment will be discussed separately in section VII.

Nonresidential land

Jorgenson and Griliches and I each estimate the input of nonresidential land to have been constant over the period.[38] Its contribution to growth is therefore zero in both series.[39]

Inventories

To measure inventory input, I use the OBE series for the value of farm and nonfarm inventories in 1958 prices; this is the series that is consistent with the annual changes published in the national accounts. The growth rate of this series times the inventory share of national income equals the contribution of inventories to growth.

Jorgenson and Griliches initially use a conceptually similar, but statistically different, series obtained by starting with a base-year value and cumulating annual changes published in the national accounts. They then introduce a certainly erroneous change in the price deflator; they substitute for the inventory deflator the deflator for personal consumption expenditures. This error is apparently a byproduct of their faulty procedure for measuring capital

35. Unless the second alternative listed above were to be adopted, which Jorgenson and Griliches do not suggest.
There have been some studies of gross product that have included depreciation in the weight of capital and land as a whole but have allocated it among components by value of the stock. The Jorgenson-Griliches criticism of this procedure (which corresponds to theirs in construction of their table 1) is correct.

36. The percentage division of the Jorgenson-Griliches gross capital-land earnings weight between net earnings and depreciation also affects the results. It may or may not differ appreciably from mine. Their depreciation is presumably larger because they use the double declining balance instead of the straight-line formula. But their net earnings are also larger because they include indirect taxes.

37. The combined effect of this and certain other differences is estimated in section IX to be 0.33 percentage points.

38. Their estimates combine residential with nonresidential land. Perhaps they would assume some slight decrease in nonresidential land and an increase in residential land if they were to make the distinction.

39. Because of differences in the *weight* assigned to this nongrowing factor, already discussed, this does *not* mean that land does not affect our results.

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gains, which I have already discussed.

Growth rates of the stock of inventories from 1950 to 1962 are 3.00 for my series [2, p. 190], 4.06 for their initial series, and 4.14 for their series after the price substitution (both computed from 1950 and 1962 values in 1958 prices provided by Jorgenson and Griliches). The initial Jorgenson-Griliches inventory series increases by about the same *absolute* number of 1958 dollars as mine. Its much larger *percentage* change and growth rate reflect a much lower figure for the base-year value of the stock; their series for total inventories runs at a bit lower level than the OBE series for nonfarm inventories alone. The data they use for level and change are evidently inconsistent.

The difference of 1.14 points between their final inventory growth rate and mine accounts for 0.04 percentage points of the difference between our estimates of output per unit of input growth, based on my share weights; the amount based on their share weights would probably be about the same. Of the divergence, 0.03 is due to the low level of their inventory series; this is raised to 0.04 by their price adjustment.

Nonresidential structures and equipment: Denison series

One's choice of a capital stock series to measure input of nonresidential structures and equipment necessarily depends on his judgment as to whether or not the ability of a capital good to contribute to production declines during its actual service life because it performs less well, requires more maintenance, or is installed in a less optimal use than it was initially as a result of demand shifts and the like; and, if it does decline, by how much and in what time pattern. Gross stock (the value of the stock without deduction for accumulated depreciation) provides an appropriate measure if there is no decline. Use of a net stock series is always inappropriate on theoretical grounds; net value drops as the length of the remaining service life declines, and this has no relevance to ability to contribute to production currently. In *Why Growth Rates Differ*, I assumed that the ability of capital goods to contribute to production typically does decline during their service lives but not very much. I suggested [2, pp. 140–141] that if one weighted the growth rate of gross stock about 3, and that of net stock based on straight-line depreciation about 1, he would obtain a series that might reasonably approximate the decline in the ability of capital goods to contribute to production as they grow older. To give some weight to net stock in this way is merely a convenient method of introducing a declining pattern.

In my actual estimates, I gave *equal* weight to gross stock, based on Bulletin F lives, and to net stock, based on Bulletin F lives and straight-line depreciation. (For the 1950–62 period, but not the subperiods, estimates of the contribution of capital to growth with the capital stock data I had were actually the same whether gross stock or net stock was used, so that the weights actually did not matter for the whole period.) I did so partly because I feared the gross stock series then available to me was unduly sensitive to possible errors in estimated service lives as a result of its construction with but little detail and without a distribution of retirements, and I wished to reduce this sensitivity; and partly because of the needs of international comparisons [2, pp. 140–141].

My estimates were made before the latest OBE capital stock study was completed. Before I continue this section, the change that use of the new OBE data would introduce into my estimates needs examination. Had the OBE study been completed, I would have used OBE capital stock series based on Bulletin F lives, on use of the Winfrey distribution for retirements, and on use of the OBE "price deflation II."

Growth rates of the stock of nonresidential structures and equipment from 1950 to 1962 computed from five measures, and my estimates of the contribution of structures and equipment to the growth rate based on each, are as follows:[40]

Nonresidential structures and equipment capital stock series	Growth rate (percent)	Contribution to growth rate of national income (percentage points)
Average of gross and net stock series, equal weights:		
1. Used in *Why Growth Rates Differ*	3.74	0.43
2. OBE revised—Deflation I	3.24	.37
3. OBE revised—Deflation II	3.51	.40
Average of gross stock (weighted 3) and net stock (weighted 1):		
4. OBE revised—Deflation II	3.40	.39

Row 1 shows the estimates I actually used. Row 2 shows that the incorporation of revised OBE data, based on Bulletin F lives, straight line depreciation, and the Winfrey distribution, but retaining the same deflators (OBE Deflation I) as the estimates I actually used, would lower my estimate of the contribution of capital to growth by 0.06 percentage points. The change is due mainly to the use of much more detail in the calculation of stocks. Row 3 shows that substitution of OBE's series based on their Deflation II for nonresidential structures would yield a contribution of capital 0.03 percentage points higher than does use of their Deflation I series. (I shall comment on the difference shortly.) After this substitution, the contribution of nonresidential structures and equipment based on revised data remains 0.03 points lower than the estimate I actually used.

Given estimates incorporating the Winfrey distribution and the use of considerable commodity detail, and in the absence of international comparisons, I would weight gross stock about three and net stock (based on straight line depreciation) one, instead of assigning equal weights. This would yield a contribution of 0.39 points (row 4) and would lower the estimates I actually used for the contribution of capital by 0.04. My estimate for the contribution of output per unit of input is thus 0.04 points too low by reference to the estimate I would now secure by use of the data presently available.

40. The revised OBE data were provided by letter on December 19, 1967. My average 1950–62 weight for nonresidential structures and equipment is 11.2 percent of total input.

Nonresidential structures and equipment: Jorgenson-Griliches series

Jorgenson and Griliches treat nonresidential structures and producers' durables as separate inputs in their estimates. For each, they use the double declining balance formula to obtain a capital stock series. No detail is used for either calculation.

Capital stock series obtained by the double declining balance formula have always heretofore been described as "net stock" series. Estimates of the value of net stock obtained by this formula assume that net value declines rapidly—much more rapidly than the straight line formula assumes. Justification of so rapid a decline in net value has relied on the argument that obsolescence is rapid; this justification seems to require that obsolescence not only shortens service lives (this is reflected in all capital stock series) but also *greatly* accelerates the loss of value during the shortened service life.

Although their method is the same, Jorgenson and Griliches sometimes appear to regard the series they obtain by the double declining balance formula not as a net stock series but as a gross stock series. Thus, in describing the derivation of a capital series, they state [1, p. 255]: "The quantity of new investment goods reduced by the quantity of old investment goods *replaced* must be added to accumulated stocks." And, again: "We assume that the proportion of an investment *replaced* in a given interval of time declines exponentially over time." [Both italics mine.] And they usually (though not on page 277) refer to the value eliminated from the stock each year as "replacement" rather than as depreciation. *If* they mean "replacement" to be construed as equal to discards, they are indeed trying to construct a gross stock series. But if this *is* their intent, their method is certainly odd. I do not know what evidence they would muster to support the assumption (which is also applied, even more improbably, to dwellings) that discards decline exponentially (i.e., are greatest in the first year after purchase or installation and thereafter decline each year). But even if it were true that discards decline exponentially, their exponents (because they use *double* declining balance) apparently are about twice too big to retain the (Bulletin F) average service lives that they initially accept and from which they begin the calculation [1, p. 277]; that is, they greatly cut their own average service lives. Starting with a 15.1-year average service life for equipment, for example, they estimate half the stock has vanished after 5 years, and seven-eighths after 15 years.

Whatever the intent, changing the name does not change the data, and I shall regard the series constructed by Jorgenson and Griliches as measuring what such series have always been regarded as measuring—the net stock based on the double declining balance formula—and what they call "replacement" as an estimate of depreciation. A series based on this formula makes the ability of an individual capital good to contribute to current production drop much faster than seems to me at all plausible. Whatever can be said to justify its use in measuring net value has no relevance to measurement of changes in ability to contribute to current production.

I have puzzled over the Jorgenson-Griliches discussion of why they use their formula [1, p. 255] but have been unable to discern its relevance to the choice of a capital stock series to measure changes in capital input.[41]

It may be necessary to note here that the choice of a particular formula to measure capital depreciation (or "replacement") in the process of computing income share weights, including the net capital values used to allocate total net capital-land earnings among components, in no way dictates that the same formula should be used to construct the capital stock series that is used to indicate changes in capital input over time. Different series not only can be used for the two purposes but, conceptually, must be. For weighting, value must decline as remaining service life diminishes whereas a measure of current services must not do so. Thus, it is entirely consistent to use net stock values to determine weights, and whatever series seems most suitable (including, in particular, gross stock) to measure changes in capital input (or services) over time. Jorgenson and Griliches themselves accept this view when they adjust their capital services for changes in utilization (section VII below) without changing their depreciation.

I wish to stress that the choice of depreciation or replacement formula appropriate for measurement of changes in capital input has nothing to do with "vintages," that is, with the way one wishes to treat quality differences in capital goods that do not reflect a difference in costs and that result in "unmeasured" quality change (or "embodied" technical progress) as time goes on. Use of a fast depreciation formula is not a method of making an allowance for unmeasured quality change. This can be readily seen from the fact that, with any continuous rate of quality improvement in capital goods, net capital stock based on double declining balance depreciation can rise either more or less than gross stock or net stock based on straight line depreciation. From 1950 to 1962, for example, data from the OBE capital stock study show identical percentage changes for net stock when straight line depreciation is used and when the double declining balance method is used.[42]

Jorgenson and Griliches employ series they themselves derive by use of the double declining balance formula. They assign a single service life to all nonresidential structures and to all producers' durables, whereas OBE assigns different lives to each of a large number of components. The growth rate of their value of nonresidential structures and equipment (from the beginning of 1950 to the beginning of 1962) is 0.17 higher than that of the corresponding OBE series. Even so,

41. The Jorgenson-Griliches discussion seems to visualize steady growth of replacement investment, and their rationalization seems to require, in addition, steady growth of new investment. But if gross capital investment grew at a steady rate (and service lives were not changed over time), it would make little or no difference whether an index of gross stock (in the usual sense of the term) or of net stock computed by any of the usual formulas were used to measure capital input. It is only because investment has been irregular—particularly because of depression and war—that the problem of selection has any importance.

42. This is the case whether "constant cost I" or "constant cost II" estimates are compared. Changes are computed from the average of the beginning and end of 1950 to the similar figure for 1962.

in the period examined, their series is not radically different from other measures. The 1950–62 growth rates of the capital stock series they initially obtained (prior to their price substitution) and used in constructing their table I, are 4.11 for equipment, 3.42 for nonresidential structures, and 3.72 for nonresidential structures and equipment combined (computed from data for the value of the stock in 1958 prices provided by Jorgenson and Griliches).

However, in moving from their table II to table IV, Jorgenson and Griliches greatly accelerate the rise in the growth of the equipment stock by deflating past gross investment in producers' durables by the price deflator for consumers' durables instead of that for producers' durables. This substitution raises the 1950–62 growth rate of their equipment stock alone by 1.49 points, to 5.60, and the growth rate of nonresidential structures and equipment combined by 0.62 points, to 4.34 (computed from capital stock data provided by Jorgenson and Griliches).

To justify the substitution, Jorgenson and Griliches state that, for items that appear in both the BLS consumers' price index and the BLS wholesale price index, the retail and wholesale series diverge by roughly the same amount as the composite indexes. They further state that the consumers' price index is better because more money is spent on it.

It is desirable to deflate common components of consumers' expenditures for durable goods and producers' purchases of durable goods by the same deflator, the best available—at least when they are sold by the same outlets on similar terms. But automobiles are the only important common component (as well as the only component of the consumer and wholesale price indexes that is mentioned by Jorgenson and Griliches).[43] And OBE already uses the same (consumers') price series to deflate consumer and business purchases of automobiles. The sharp divergence between the implicit deflators for all consumers' durables and all producers' durables is ascribable to commodities *not* common to the two series. Production processes for the two sets of goods are very different. Consumers' durables, which had the smallest price rise of any sizable product group, are dominated by mass-produced, standardized products. Their exceptional price behavior was due to radio and television receivers, "kitchen and other household appliances," and automobile "tires, tubes, accessories, and parts." Producers' durables, in contrast, are dominated by items produced in small volume, including a large element of individualized, built-to-order items most akin to custom services. I do not see how any inference about changes in prices of producers' durables can be drawn from prices of consumers' durables, or that the latter provide a more relevant comparison with the former than any other prices.

The OBE deflator for producers' durables is, to be sure, subject to substantial error in either direction because the data entering it are incomplete and their reliability low—mainly because so many components are *not* standardized. But there is no a priori presumption that the series is biased upward by reference to the usual price index criteria. I regard this substitution as unwarranted.

It must be stressed that this price substitution cannot be rationalized as an attempt to allow for quality change not involving a difference in costs at a common date ("unmeasured" quality change). Neither the CPI nor the WPI makes any such allowance (nor do any of the GNP deflators).[44]

In contrast to producers' durables, there is a presumption that the deflator for the nonresidential structures portion of GNP is biased upward by reference to usual price index criteria. This is because most components are based on prices of construction materials and labor, rather than on output prices, and hence do not allow for changes in output per man-hour in on-site construction work. This bias has long been recognized, but its size has been hard to appraise.

For use in its capital stock study, OBE developed an alternative nonresidential construction price series that attempts to eliminate this bias, and used it as an alternative to the GNP nonresidential construction price deflator to derive its Deflation II capital stock estimates that I have already mentioned. These estimates differ from OBE's Deflation I estimates only because of the use of a different construction deflator. Jorgenson and Griliches make the same substitution in moving from their table II to table IV. This raises the 1950–62 growth rate of their nonresidential structures series by 0.50 percentage points, from 3.42 to 3.92, and the growth rate of nonresidential structures and equipment combined by 0.28 points, from 3.72 to 4.00 (computed from data provided by Jorgenson and Griliches).[45] The effect on the combined series is almost identical to that (0.27 points) introduced when the similar substitution was made between lines 2 and 3 of the text table above, and the effect upon the growth rate of *total* input when my weights are used is also the same, 0.03 percentage points.[46]

The 4.00 growth rate of the stock of nonresidential structures and equipment obtained by Jorgenson and Griliches when their construction price substitution but not their equipment price substitution is introduced may be compared with the 3.40 growth rate I obtain by use of the revised OBE data with use of Deflation II (text table above). The 0.60 difference reflects both a difference in choice of capital stock series and OBE's greater use of commodity detail. Based on my weights, it accounts for 0.07 percentage points of the difference between us in output per unit of input.

Residential structures and land

My methodology does not require an input series for residential structures

43. Some types of office furniture might be regarded as having a household counterpart, and there are items of trivial importance.

44. In my view, there is no way to do so. But this is a controversial matter that need not be discussed here.

45. With *both* the equipment and construction price substitutions, the 1950–62 growth rate of the Jorgenson-Griliches series for nonresidential structures and equipment is 4.65.

46. Robert J. Gordon has also attempted to construct a series for deflation of nonresidential construction from which the bias has been eliminated. Data he has generously provided me show that substitution of his series for the OBE nonresidential construction deflator would raise the growth rate of a series for the stock of nonresidential structures and equipment (specifically, the gross stock based on Bulletin F lives) by 0.40 percentage points. A change of this size would raise the growth rate of a total input series, based on my weights, by 0.04 percentage points as against the 0.03 indicated by the OBE Deflation II series.

and land. Instead, I isolate the amounts of national income, measured in constant prices, that originated in the "services of dwellings" industry in the same way as the current dollar figures were obtained in deriving share weights. The same procedure can be followed for GNP at factor cost. I find [2, pp. 123–126, 413] that the increase in the stock of dwellings and residential land contributed 0.25 percentage points to the growth rate of national income and 0.32 points to the growth rate of GNP at factor cost from 1950 to 1962.[47] This method of direct measurement, which I first used in [2], is, in my opinion, an important advance in growth analysis. It provides a measure for the contribution of this very large part of the capital-land stock to the growth of output as actually measured that is entirely accurate, except for some slight statistical difficulty in the United States in disentangling the details of the national product estimates. An incidental advantage, it may be noted, is that the figure for the contribution to GNP makes no use of, and consequently cannot be affected by, errors in the price index for residential construction.

Jorgenson and Griliches measure the contribution of residential structures as the growth rate of the dwellings stock times the weight assigned to dwellings—the procedure I used in an earlier study [3]. However, instead of using a gross stock series to measure changes in the services of dwellings, as I did then, they use net stock calculated by the double declining balance formula. It seems to me impossible to suppose that this pattern remotely resembles that of the flow of services of dwellings during their service life. The 1950–62 growth rate of the dwellings stock computed by this formula, as they initially estimate it for use in their table I, is 4.53 (computed from data provided by Jorgenson and Griliches).

The deflator for residential construction may be presumed to have an upward bias for the same reason as the deflator for nonresidential construction. Jorgenson and Griliches attempt to allow for this by deflating residential construction expenditures by the OBE Deflation II series for nonresidential construction in place of the residential construction deflator. This raises the 1950–62 growth rate of their dwellings stock by 0.39 points, from 4.53 to 4.92.[48]

Residential land is combined with other land in the Jorgenson-Griliches procedure. As already indicated, their combined growth rate (and contribution to growth) is zero.

If I had used the Jorgenson-Griliches growth rate for the net stock of dwellings, and multiplied it by *my* share weights, I would have obtained a much lower figure than I did for the contribution of dwellings to growth of total national income: probably around 0.13 percentage points instead of 0.25.[49] My output per unit of input series would then have been raised by about 0.12 points. I am not, unfortunately, able to quantify the effect upon *their* estimates of the difference between us in the measurement of the contribution of housing.

Summary comment

The Jorgenson-Griliches estimates of the contribution of capital and land to GNP growth differ from mine because of (1) differences in weights; (2) differences in the initial method of measuring capital and land inputs, including the difference in method of estimating the contribution of dwellings; (3) their substitutions of price indexes; and (4) a utilization adjustment they introduce. I have already examined the weights (1); discussion of the utilization adjustment (4) is deferred to section VII.

The total effect of all their price substitutions (3) was to raise their 1950–62 growth rate of total input, and lower that of output per unit of input, by 0.23 percentage points [computed from 1, tables II and IV]. This calculation is based on use of their weights. Of this amount, in the neighborhood of 0.07 points derives from adjustment of construction. The remaining 0.16 points are due to substitutions of price series for producers' durables and inventories (almost entirely the former), which I regard as illegitimate. (It is partly offset by an output adjustment described in section VI below.)

The effect of (2), differences in measures of input (*other* than price substitutions for producers' durables and inventories), I can calculate only with the use of my weights—that is, the numbers refer to the change in my series that use of their input indexes would introduce. Of the difference between us in total input and output per unit of input, the difference in our measure of inventory input (excluding their price substitution) accounts for about 0.03 percentage points, and land indexes for none. Their nonresidential structures and equipment series rises enough more than the revised OBE series I would use to account for 0.07 points; both are based on the OBE II construction deflator. The difference in residential structures accounts for *minus* 0.12 points. The difference in capital stock measures (or their equivalent, in the case of dwellings) thus accounts for *minus* 0.02 points of the difference in our output per unit of input measures, based on my weights and apart from the effects of their price substitutions for producers' durables and inventories.

My incorporation of revised OBE data for nonresidential structures and equipment would *add* 0.04 points to the difference between us.

47. The increase in gross product at factor cost, valued in 1958 prices, was put at $15.7 billion.

48. From 1950 to 1962, the Deflation II series rises less than the residential construction deflator, so the substitution implies that the bias in the deflator is *downward* in this period. This accounts for the negative adjustment in the growth rate of output that the following section shows is introduced by this price substitution. Over the longer time span reflected in the capital stock series, the adjustment is in the right direction.

49. This calculation supposes that about one-fourth of the weight I assign to dwellings pertains to sites, as distinguished from structures.

VI. Effect of Price Index Alterations on Output

JORGENSON and Griliches substitute investment price indexes in deflating the investment components of GNP as well as in measuring capital stock. The 1950–62 growth rate of their private domestic GNP is raised by 0.09 percentage points [calculated from 1, tables II and IV] and this partially offsets the deduction from output per unit of input they introduced by substituting prices in capital stock measurement.

To isolate the separate effects of their price substitutions on output, I duplicated their calculations. The breakdown of their adjustment is: producers' durable equipment 0.10; nonresidential structures 0.03; residential structures, −0.03; and inventories, 0.00. (The total, 0.10, presumably differs from their 0.09 because of rounding.) Thus, their entire output adjustment stems, on balance, from the use of consumers' durables prices to deflate producers' durables; none of it results from the legitimate attempt to adjust construction prices.

VII. The Utilization Adjustment for Capital and Land

MORE than half of the difference between our output per unit of input growth rates in 1950–62 results from an adjustment that Jorgenson and Griliches introduce for changes in utilization of capital and land. Their general idea is that the hours per year that capital is used have increased secularly, and that a given percentage increase in capital hours per dollar of capital has the same effect on output as a similar percentage increase in the quantity of capital. Their capital utilization adjustment raises the contribution of their total input series by 0.60 percentage points in their full 1945–65 period and by about 0.58 points in the 1950–62 period.[50] Their method of deriving this adjustment is theoretically unsound, and the statistical procedures they followed to obtain their estimates are altogether untenable. In my view, their capital utilization adjustment should be discarded.

Series for manufacturing equipment powered by electric motors

The starting point for the adjustment was a series contained in a 1963 SURVEY OF CURRENT BUSINESS article by Murray F. Foss [4]. Most production equipment in manufacturing is powered by electric motors. Foss used Census data for electric power consumption and the horsepower of electric motors to estimate the average number of hours per year that electric-power-driven equipment in manufacturing establishments was utilized. He concluded that its utilization increased by an amount on the order of one-third to one-half from the 1920's to the mid-1950's. The dates for which he made actual calculations were the Census years 1929, 1939, and 1954 [4, table 2, line 7]. Growth rates of average equipment hours calculated from his utilization estimates for these years are −0.45 from 1929 to 1939, 2.15 from 1939 to 1954, and 1.10 from 1929 to 1954. Jorgenson and Griliches made a similar comparison of the years 1954 and 1962 [1, table X, line 6]. From 1954 to 1962, the growth rate was 1.33. Jorgenson and Griliches used the 1939–54 rate for all annual changes in the 1945–54 period and the 1954–62 rate for all annual changes after 1954. They thus obtained average rates of increase in utilization of about 1.72 for 1945–65 and 1.60 for 1950–62.

These rates almost certainly are much higher than the trend rate, which is what Jorgenson and Griliches are seeking, or the rate that would be obtained if calculations could be made directly from the terminal years of these periods. The average rate from the depression year 1939 to 1954 must have been greatly raised by the difference in cyclical position; the rate from 1945 or 1950 to 1954 must have been much smaller than the rate over the 1939–54 period as a whole.[51] The rate from 1954, itself a recession year, to 1962 or 1965 probably was also raised by cyclical influences.[52] A minimal downward adjustment of their estimates to eliminate cyclical incomparability in the pre-1954 period could be made by substituting the 1929–54 rate where they use the 1939–54 rate. This would lower the 1945–65 growth rate of utilization from 1.72 to 1.22, and the 1950–62 rate from 1.60 to 1.25. Probably a better procedure would be to use the 1929–62 rate, which is 1.16, as representative of the trend throughout the period, hence for both the 1945–65 and 1950-62 periods; this would cut their 1950–62 rate by more than one-fourth and their

50. The 1945–65 figure of 0.60 points was provided by Jorgenson and Griliches; it can also be approximated from their published data.

The average growth rate of their capital utilization series itself was 1.72 in 1945–65 and 1.60 in 1950–62. (See the following text paragraph.) Multiplication of their 1950–62 growth rate of 1.60 by their average 1950–62 capital-land share of 0.36175 yields an estimated contribution of 0.58 percentage points.

(In this period, the combined contribution of their capital utilization adjustment and the labor hours adjustment was 0.52, thus the contribution of the labor adjustment was apparently about −0.06. I use this figure in section VIII.)

51. Foss himself wrote: "In fact, some of the illustrations in this article suggest that the major change in relative equipment utilization took place during and immediately after World War II, and that changes since then (aside from cyclical movements) have been relatively small" [4, p. 8].

52. Because Jorgenson and Griliches interpolate between far-removed dates rather than use annual estimates, the capital utilization adjustment obviously cannot purport to adjust capital input for shortrun variations in utilization. Jorgenson and Griliches note this and state that it "allows only for the trend in the relative utilization of capital" [1, p. 266]. My objection to their procedure is the same whether one construes their series as representing the trend rate in 1945–65 and 1950–62 or the actual changes from 1945 to 1965 and from 1950 to 1962.

1945–65 rate even more. Overstatement of the increase in this series from the absence of any procedure to deal with the cycle is, however, among the least of my objections to their utilization adjustment, and there is no need to pursue it further.

A second limitation is that the weights used to construct the all-manufacturing utilization series are inappropriate for the use to which Jorgenson and Griliches put it. "Available kilowatt hours of motors" were used as weights to combine utilization ratios for the component industries in obtaining the all-manufacturing utilization series.[53] For use in converting a series for the value of power-driven equipment in manufacturing establishments to a capital input series, the utilization ratios for all manufacturing should be based on the use of the *value* of power-driven equipment in each industry as that industry's weight. This was noted by Foss [4, p. 11] but is not mentioned by Jorgenson and Griliches. A series so constructed is not available for comparison, nor are the value data for power-driven equipment that its construction would require. Perhaps the two sets of weights would yield tolerably similar results; at the 2-digit level, Foss finds, with some exceptions, fair correspondence between distributions of *total fixed* capital and installed horsepower. Nevertheless, the possibility of appreciable error is present in the manufacturing series.

Equipment values are not available for mining either, but similar utilization ratios for the five mineral industries were published separately by Foss. Solely as an illustration that weights *may* matter, I calculated all-mining utilization ratios with alternative proxies for capital values. Use of "available kilowatt hours" as weights yields a 4 percent increase in utilization from 1929 to 1954, whereas use of "electric power consumed by motors" would yield a 16 percent decline. Like the manufacturing series, these calculations used 1929 weights for 1929 and 1954 weights for 1954. I argue subsequently that fixed weight indexes would be more appropriate. I calculated fixed weight indexes using four alternative sets of 1929 weights. Use of "value of machinery and equipment installed during 1929" yields a 14 percent increase in utilization from 1929 to 1954; "available kilowatt hours of motors" a 12 percent increase; "national income originating," a 2 percent increase; and "electric power consumed by motors," a 1 percent decrease. Probably the first two are better proxies than the last two for equipment values, but differences are large and investigation is needed.

In the absence of tests of its effects, the inappropriate weighting of the manufacturing equipment series adds to the reservations about the Jorgenson-Griliches use of this series that is created by their failure to allow for cyclical differences. But there is a fundamental conceptual objection to their use of this series to adjust capital input that would remain if value weights were used and cyclical adjustments were made. To develop this point, I shall proceed as if this had been done.

Conceptual problem of incorporating utilization data

The trend rate of capital utilization provides interesting information. But to integrate this information into the type of classification of growth sources that Jorgenson and Griliches or I employ, one must know the *reasons* that utilization increased and the *amount* due to each reason. Even if one knew exactly how much utilization had changed, in the absence of this additional information he still would not know the amount of the increase in output that (prior to any utilization adjustment) is included in the contribution of input (or any component of input) and the amount that is included in the contribution of output per unit of input. This is a subject that Jorgenson and Griliches do not discuss at all. However, their procedures imply that, prior to the introduction of their capital utilization adjustment, the effects of an increase in capital utilization necessarily appear only in their output per unit of input series.

The average hours "worked" by power-driven equipment in manufacturing establishments (adjusted to eliminate short-term fluctuations) may actually change for quite varied reasons, and these have altogether different implications for the analysis.[54]

1. The effects of some types of change are fully measured by the increase in the capital stock, so that any additional allowance for increased utilization duplicates the change in the capital stock measure. These types can be described as changes in composition of capital, of which three main categories can be distinguished.

(a) At any point in time, producers can select among varieties of equipment with different characteristics that sell at different prices. One characteristic that can be purchased at a higher price is greater reliability: longer use without downtime for regular maintenance or to replace worn-out or defective components or the entire machine. If producers shift to higher priced equipment, average "hours worked" will increase but so will the capital stock series. A priori there is reason to suppose that, as capital has become more abundant relative to labor, the use of more expensive equipment has been one aspect of the rising capital-labor ratio.

(b) At any point in time, different manufacturing industries vary in the hours they use capital. On the assumptions that Jorgenson and Griliches and I accept, the rate of return, as measured by the ratio of net earnings to net value, is, nevertheless, the same in each manufacturing industry. If hours in each industry are unchanged, but the weights of the industries alter, the average hours in manufacturing as a whole will change but capital input should not.

Suppose Industry A and Industry B each have $1 million of equipment, but

53. Foss confirms this statement, which the reader can check by use of Foss's ratios for mineral industries [4, table 5], for which the procedure was similar and for which industry data are shown. For minerals industries, Foss shows a five-industry breakdown. The all-industry utilization ratio in his column 6 is equal to the ratios for the individual industry groups weighted by "available kilowatt hours of motors" as shown in column 2.

54. Not all of these possibilities had occurred to me when I discussed capital utilization in *Why Growth Rates Differ* [2, pp. 154–155]. I would now word that section somewhat differently.

Industry A operates on three labor shifts, or 120 hours a week, and Industry B on one shift of 40 hours, and capital is used during the same time periods. Equilibrium requires the same rate of return in the two industries; otherwise, there would be an incentive for capital to move from one industry to the other. If the rate of return is 10 percent, the product (as indicated by earnings) of the $1 million of equipment in each industry is $100,000. The product of $1 million of equipment per hour it is used in a week must then be three times as high in Industry B as in Industry A ($2,500 against $833.33). This must be the case, or the rates of return would differ. If (because of changes in demand patterns or for other reasons) Industry B gets bigger relative to Industry A, average hours worked by equipment in the two industries combined will decline, whereas if Industry A gets bigger average hours will increase, because Jorgenson and Griliches use a capital utilization series that is constructed with shifting industry weights. They would therefore measure the former development as a decline in equipment input, the latter as an increase. This is a simple "error of aggregation." It results from giving an hour worked by $1 million of equipment in each industry the same weight.

To illustrate, suppose that in a second year the total value of equipment is $2,000,000, as before, but Industry A now has $1,500,000 and Industry B $500,000. Based on the use of capital stock to measure input, without a utilization adjustment, the contribution of equipment to output (in first-year values) remains $200,000; only the division between industries has changed—to $150,000 in Industry A and $50,000 in Industry B. This correct result could also be obtained by correctly weighting hours: The value of equipment (in millions) in each industry is multiplied by average weekly hours, and the contribution to output of an hour worked by $1 million of equipment is counted as $833.33 in Industry A and $2,500 in Industry B. In Industry A, equipment value times hours increased from 120 to 180; multiplication by $833.33 yields an increase in equipment's contribution from $100,000 to $150,000. In Industry B, equipment value times hours dropped from 40 to 20; multiplication by $2,500 yields a drop in the contribution of equipment from $100,000 to $50,000. The total contribution of equipment at first-year values is again $200,000 in both years.

In this example, the Jorgenson-Griliches procedure would erroneously yield an increase in equipment input of 25 percent, instead of no change, because it assigns equal weight to an hour worked in each industry.

Foss has investigated the effects of changes in industry weights in selected periods and concluded that the change in the all-manufacturing utilization ratio he observed chiefly reflected changes in individual industries rather than in industry mix, although he did note that there probably *was* a shift toward continuous process manufacturing industries, particularly aluminum, refined petroleum, and chemicals.

(c) At any point in time, the number of hours that different types of equipment are used varies widely *within* any establishment, firm, or industry. If the composition of assets changes, the average hours worked by all combined will rise or fall even though there is no change for any particular type. The hours for the same type of equipment may also vary among uses, and this distribution may change over time. These cases are identical to that discussed in (b). Greater use does not imply larger earnings per dollar of capital value. Two machines of different types (or of the same type in different uses) must be assumed to contribute equal amounts to production per dollar of value, not per dollar of value mutliplied by hours worked. If this assumption is invalid, rates of return vary and the economic unit is not in equilibrium. The sensitivity of a conglomerate average-hours-worked series to changes in weights of different types of machines, and to changes in weights of different uses of machines, must be high because the range of hours is large. Shifts of this type could well dominate the long-term movement of "average hours" series for individual firms, establishments, and industries.

Unless a capital utilization series can be standardized to eliminate the effects of *all three* types of "mix" changes, it is useless for the purpose to which Jorgenson and Griliches put it. I cannot imagine how such standardization could be achieved. But even if it could, this would surmount only one of the difficulties.

2. The amount of downtime of machines depends in part on the number of workers who operate them (which affects, among other things, the speed of machine operation), their skill, and the care they exercise. It depends also upon the number and skill of the workers who repair machines. The skill of engineers and others employed by equipment suppliers to service customers is often a crucial determinant of the amount of time lost from breakdowns. If machine hours increase because of an increase in the quantity or an improvement in the quality of labor, this is already counted in principle, and one hopes in practice, as a contribution of labor.

3. The amount of downtime depends in part on expenditures for maintenance. A firm presumably attempts to allocate expenditures among maintenance, purchases of new capital goods for replacement, and production labor in such a way as to minimize total cost. Maintenance expenditures may change because the price of maintenance changes relative to prices of capital goods and production workers; in this case, there is no ascertainable contribution to growth. Maintenance expenditures may also change because management devises a better procedure to determine the minimum cost combination. If they increase for this reason, only the *net* benefit remaining after deducting the increase in maintenance costs from the saving in capital and labor costs contributes to an increase in output.[55] Classification of any net benefit is discussed in case 7 below.

4. Downtime depends in part on the inventory of spare parts; any change is already covered as a contribution of

55. Unless output is measured on the Scandinavian "gross-gross-product" basis, which double counts maintenance as well as capital consumption.

inventories. It depends also on the speed with which parts and servicemen can be obtained; this, in turn, depends on capital and labor in the transportation industries, which are already counted as capital and labor input.[56]

5. The hours that machines are used may change because of a change in the average hours worked per worker; in my study I allow, in principle, for this effect in my adjustment of labor input for changes in labor hours of full-time workers [2, p. 61, n. 11]. (I found no significant change in labor hours of full-time workers in the economy as a whole over the period analyzed so this case did not actually affect my estimates.)

6. Machine hours may also change because shift work becomes more or less prevalent *in particular activities*. In my estimates, such a development was regarded as a component source of the change in output per unit of input [2, pp. 152–154, 173–174], and in my international comparisons, I made a specific estimate for this determinant. However, I found no evidence of a significant change in shift work in the United States in 1950–62, and therefore estimated the contribution of changes in shift work to be zero [2, pp. 152–154, 173–174].

7. The hours worked by machines may rise, or in some cases fall, because of advances of knowledge and its dispersion. These may:

(a) Provide more reliable machines without increasing their cost—a development variously described as "unmeasured" quality change in capital goods or "embodied" technical progress. (In practice, "measured" quality change covered in case 1(a) above and "unmeasured" quality change are often intertwined.)

(b) Enable management to make more continuous use of machines. Foss writes:

> "Also of importance over the long run has been the advance in knowledge acquired by management in making more efficient use of machines. One example of this has been the efforts by many firms to smooth out within the year the production peaks which come from seasonal or other short-lived peak loads and which frequently entail the use of standby equipment with relatively low annual utilization. . . . Within particular industries there have undoubtedly been efforts to introduce continuous, automatic operations in which machines tend to be used with a high degree of intensity."

(c) Improve communications and speed transportation of parts and of key personnel needed for repairs, notably by air.

(d) Improve the decisionmaking process generally—notably with respect to determination of the trade-off among costs incurred for maintenance, replacement, downtime, speed of operating machines, waste of materials, and quality of product.

This list of possible reasons for changes in average machine hours may not be exhaustive. But it suffices to make clear that, unless the reasons for changes in capital utilization are known and their effects can be isolated and quantified, data on capital utilization cannot be integrated into a classification of growth sources of the type Jorgenson and Griliches and I use. It is possible that the entire change indicated by the Jorgenson-Griliches series is already reflected in capital and labor input or counterbalanced by higher maintenance costs, and is not a component of the Jorgenson-Griliches output per unit of input series prior to their utilization adjustment, or of my series. Or any or all of it may be a component. Jorgenson and Griliches never mention, and appear unaware of, the range of possibilities.

Among the possible reasons for an increase in capital hours that I have listed, two would or might contribute to a change in output per unit of input as I measure it, and as Jorgenson and Griliches do prior to introduction of their utilization adjustment. The effects of one of these, changes in shift work in particular activities, I estimated [2, pp. 152–154] to be zero in the economy as a whole in 1950–62, though admittedly on the basis of inadequate information; better data may permit more reliable estimation in future years. The other is advances in knowledge and their dispersion. There is no clear presumption that these led to an increase in the hours that capital goods are utilized or that, if they did, the net saving in unit costs bore any systematic relationship to the change in machine hours. But if there was such an effect, it appears in the "advances of knowledge" component of my output per unit of input series. I see scant possibility that it will ever be possible to isolate this effect.

If one could isolate and measure this effect and the shift-work effect, one would have a choice of transferring them to the contribution of capital (evidently the Jorgenson-Griliches preference) or of classifying them as component sources of the growth of output per unit of input. The latter would be my preference because it is not the saving-investment process that governs these income determinants [2, p. 144], and I shall say a little more about this at the end of this article. But it would really make little difference to the sophisticated reader where they were shown because he could move them at will.

The Jorgenson-Griliches estimates

The Jorgenson-Griliches estimates implicitly assume (1) that the utilization series would be unchanged if weighted by value of power-driven machinery and (2) that the entire effect of increased utilization appears in their productivity measure until they make their utilization adjustment, hence that *only* advances in knowledge and changes in shift work *within industries* affected utilization of manufacturing equipment driven by electric motors. Since they do not diminish the growth of their capital stock series by

56. Parts of points 2 to 4 are nicely illustrated by an advertising letter that happened to reach me as I was writing this section. It states:

"Are you aware that the . . . Corporation has for the past fifteen years been providing preventive and corrective maintenance to a growing number of manufacturers and users of electronic and electromechanical devices?

"Our experience in performing both scheduled and emergency service (supported by factory-trained personnel, local stocking of replacement parts, and quick response to emergency calls) aims to improve your operation in terms of lower 'down-time' and higher reliability."

shortening service lives as they increase capital utilization, they also assume (3) that increased utilization does not cause equipment to wear out more rapidly. (If there is such a user cost, the utilization adjustment duplicates their original estimate of the contribution of capital for this reason.)

I know of no reason to accept this set of assumptions. But it is instructive to calculate what the quantitative importance of the change in utilization of power-driven equipment in manufacturing would be if by chance all these assumptions were correct. First, the weight in total input must be calculated. *All* nonresidential structures and equipment represented 13.6 percent of total input in the private domestic economy in 1950–62, according to my net earnings weights. *All* producers' durables in manufacturing establishments represented about 14 percent of the value of the total stock of private nonresidential structures and equipment, hence 1.9 percent of total input. Machinery in manufacturing establishments driven by electric motors represented at the outside 70 percent of the value of the stock of producers' durables in manufacturing establishments in 1950–62, hence at most 1.4 percent of total input. If the utilization of such machinery increased 1.16 percent a year (the figure I suggested earlier as the trend rate of the utilization series), and if an increase in utilization is treated (as Jorgenson and Griliches *do* treat it) as equivalent to the same percentage increase in the quantity of such equipment, this raises the growth rate of total input (net product basis) in the private domestic economy by 0.016 percentage points (1.4 percent of 1.16 percent) and lowers that of output per unit of input by the same amount. This would be my estimate if I were to accept the Jorgenson-Griliches utilization estimates and their three implicit assumptions mentioned in the preceding paragraph (which, of course, I do not). Even with the Jorgenson-Griliches utilization increase of 1.60 percent a year, the contribution is only 0.022 percentage points in 1950–62. If, as in the Jorgenson-Griliches estimates, depreciation is added to the weights, the calculated contribution to gross product growth would probably come up to 0.03.

How do Jorgenson and Griliches get from 0.03 to 0.58? By introducing the "very strong assumption" (their language) that utilization of *all* types of capital and land in *all* activities increased at the same rate as did machinery in manufacturing establishments driven by electric motors! This assumption is not only "very strong"; it is truly magnificent in its implausibility. Utilization of structures, sites, furniture, and office equipment in manufacturing, of office buildings, of physicians' automobiles, of houses and their sites, of railroad stations, of farmland (have the seasons changed?), of inventories (whatever this may mean), of literally everything has increased, and at the same rate as machinery driven by electric motors in manufacturing establishments!

If one is willing to assume that the change in machinery hours in manufacturing was due only to advances in knowledge and changes in shift work within industries, he might perhaps, I suppose, go even further and assume there was some net increase in *machinery* hours outside manufacturing after 1950, and thus raise the figure derived from the manufacturing series a little. Foss found some examples of machinery in nonmanufacturing industries in which utilization increased from the 1920's to the 1950's as well as some where it did not. For example, in two of five mining industries, utilization of power-driven equipment increased from 1929 to 1954 while in three it declined, although it should be noted again that these years are not cyclically comparable.[57] Locomotive use increased while freight car use decreased. Utilization in electric utilities increased from the late 1930's to 1948, but not from 1948 to 1958. And so on. But even doubling the manufacturing figure would yield no more than 0.06 points in their gross product growth rate. Jorgenson and Griliches have applied the increase in utilization not only to all machinery but to all other types of capital and to land. Since all capital and land received 36.2 percent of their total input weight (inclusive of depreciation as well as indirect taxes), this raised the contribution of the utilization adjustment from 0.03 to 0.58 (36.2 percent of 1.60).

The conclusion to be drawn from the preceding discussion—it seems to me inescapable—is that the Jorgenson-Griliches utilization adjustment must be rejected.

After this summation, it may seem superfluous to mention that the Jorgenson-Griliches procedures also contain an important inconsistency. Houses and sites represent a huge part of the stock of capital and land, and much of the capital utilization adjustment reflects the assumption that the hours houses are used have increased. Even if Jorgenson and Griliches were right to assume that people have been spending an increasing amount of time in their houses, per dollar value in constant prices of house, this would not affect their output measure because (fortunately) OBE does not adjust its deflated consumer expenditure series for housing to allow for the supposed increased utilization, and Jorgenson and Griliches do not adjust the OBE series on this account. Hence, Jorgenson and Griliches are arithmetically wrong to subtract the utilization adjustment for residential structures and the residential portion of their land input from the growth of productivity.[58]

57. The Foss series for all mineral industries rises (but its 1929–54 growth rate is only 0.17 as compared with 1.10 for manufacturing) because of a very sharp increase in nonmetal mining, which receives a rather heavy weight (20 percent of the total in 1929 and 27 in 1954) based on available kilowatt hours of motors.

58. Let me stress that my criticisms of the Jorgenson-Griliches utilization adjustment do not extend to the article by Foss, which I have praised in print on several occasions. Nor do I mean to deny the value and relevance to growth studies of series of the type that Foss prepared for power-driven equipment in manufacturing and mining industries and a few other types of fixed capital and that might be prepared for additional types. Indeed, like Jorgenson and Griliches, I should be very glad to see such studies extended. I believe Foss is correct in suggesting [4, p. 10] their importance for analysis of long-term changes in capital-output ratios. Studies of shift work would be immediately useful. More generally, the fact that capital utilization series do not easily fit into the type of classification discussed in this article does not imply that one cannot fruitfully explore the relationship between changes in capital utilization and economic growth. There may be a valid analogy with studies, obviously valuable, of such questions as: "How does transportation affect growth?" or "How did high wages in the United States affect American as compared with European growth in the nineteenth century?" Studies of these questions, too, do not yield results that fit into the type of classification of growth sources that is examined here.

VIII. The Measurement of Labor Input

JORGENSON and Griliches and I measure labor input in ways that are similar in spirit and general approach. Both our input series take into account employment; hours worked, with an allowance for a productivity offset as hours change; and the education of the labor force. My series allows, in addition, for changes in the distribution of total hours worked among age-sex groups whereas theirs does not, but Jorgenson and Griliches agree that this should be done [1, p. 269].[59] Thus a comparison does not raise major conceptual issues.

However, the data and procedures we actually use to measure labor input differ at almost every step, and it is necessary to consider whether this introduces a difference into our estimates of productivity change. My conclusion is that our labor input series are in rather close agreement with respect to the common elements of our estimates, after allowance for my inclusion of government employees.[60] Their omission of an age-sex measure contributes to their higher estimate of the growth of output per unit of input.

Employment, hours, and education

Because of a difference in classification with respect to employment and hours effects, it is desirable to combine the two for comparison. It is also necessary to build up a comparison in several parts.

My employment series is based on household survey data from the *Monthly Report on the Labor Force.* Jorgenson and Griliches rely on the OBE series for persons engaged in production, which is the sum of its full-time equivalent employees and active proprietors of unincorporated enterprises. This series is mainly constructed from establishment reports.

I have attempted to compare data from the two sources at the all-civilian-employment level to try to determine whether movements of the two series are statistically consistent from 1950 to 1962. My series for civilian employment has a 1950–62 growth rate of 1.03.[61] To obtain a conceptually similar series for comparison, I start with OBE series on persons engaged in production, excluding military employment; substitute the OBE series for full-time and part-time employees for full-time equivalent employees; add my estimates for unpaid family workers; and adjust the 1962 figure to exclude Alaska and Hawaii by application of a 1960 overlap ratio. The resulting series has a 1950–62 growth rate of 1.00. For this timespan, the *statistical* difference between MRLF and OBE data would, by this test, make the Jorgenson-Griliches employment series grow 0.03 less than mine. However, Jorgenson and Griliches omit unpaid family workers. The 1950–62 growth rate of their employment series for private industries would be lowered by 0.06 if my estimates for unpaid family workers were added to their estimates. The two differences together would make their series grow 0.03 more than mine.

We each estimate the effect of changes in hours worked by measuring changes in average hours, and allowing for a productivity offset as hours of full-time workers decline. For civilian workers, my resulting series for the effect of changes in hours upon the work done in a year of employment has a growth rate of −0.25 from 1950 to 1962 [2, table 6–6, and an adjustment to exclude military personnel]. This figure includes the effect of a major increase in part-time employment; in fact, it mainly reflects the effect on hours of an increasing part-time component of employment, as distinguished from changes in hours of full-time workers. Two figures from the Jorgenson-Griliches estimates must be combined for comparison. Their series for the effect of hours on the work done in a year of *full-time* employment has a growth rate of about −0.09 from 1950 to 1962.[62] The increase in part-time work is reflected in the employment component of the Jorgenson-Griliches labor input series because their employment series is computed on a full-time equivalent basis. The 1950–62 growth rate of the OBE persons engaged series for private industries is lower by 0.23 than that of an otherwise similar series in which the OBE series for full-time and part-time employees is substituted for full-time equivalent employees. Thus, the combined effect of changes in full-time hours and increased part-time employment on the Jorgenson-Griliches labor input series is −0.32 (−0.09 plus −0.23), which compares with my −0.25. When the difference of −0.07 is added to the 0.03 difference in the employment growth rates, it appears that the difference between our employment and hours series makes their labor input series grow 0.04 points less than mine. Based on their 1950–62 average labor share, this would make their estimate of the contribution of total input 0.03 points lower, and of output per unit of input 0.03 higher, than use of my series.[63]

59. They also say that the labor input series should, in addition, be standardized by occupation and industry. In my view, this is a conceptual error, but since they did not do this, no discrepancy between our estimates is introduced.

60. To adjust for the difference in the scope of our employment estimates, I use OBE data for general government employment. This is appropriate because these data are consistent with the government product data used in Section I above to reconcile productivity estimates. The difference in the scope of our estimates causes little difficulty in comparing other components of our labor input series because, with unimportant exceptions, we each assume that changes are the same for total private employment as for total civilian employment.

61. Computed from 2, tables 5-1A, 5-1C, 5-1D, and C-1. In my estimates, all series are linked at 1960 to eliminate the effect of adding Alaska and Hawaii to coverage of the data.

62. In footnote 50, I calculated that their hours adjustment for labor amounted to −0.06 percentage points in the growth rate of total input. Division of this amount by their average labor share of 0.638 in 1950–62 yields −0.09.

63. I have not isolated the effect of one of their procedures in this reconciliation of our estimates. Although unpaid family workers are excluded from the Jorgenson-Griliches employment series, they do affect total labor input via the hours estimates. Jorgenson and Griliches inform me that they obtained average hours by dividing the BLS establishment-based series for total manhours worked in the private economy (which includes unpaid family workers) by persons engaged in production (which excludes unpaid family workers). Hence, the decline in the ratio of unpaid family workers to total employment presumably intensifies the decline in their average hours series. This reduces the growth in labor input insofar as it was not offset by their efficiency adjustment.

We each estimate the effect of the rise in education upon the quality of labor. The growth rate of my "education quality" series for civilian employment is 0.75 [2, table 8–5]. Despite procedural differences, their rate is also 0.75 [computed from 1, table VII]. No discrepancy in our labor input series is introduced by education.

Age-sex composition

My "quality index" for changes in the age and sex composition of hours worked by civilian employees has a −0.15 growth rate from 1950 to 1962 [2, table 7–7, and an adjustment to exclude military personnel]. Jorgenson and Griliches omit this labor characteristic from their measure. Based on their average 1950–62 labor share, the omission causes their total input series to grow 0.11 points more than mine from 1950 to 1962, and their output per unit of input series 0.11 points less.

IX. Summary of Statistical Review

AN approximate reconciliation of our output per unit of input estimates can now be compiled. It is provided in table 1.

The initial difference between our estimates is 1.27 percentage points (line 3). When my estimates are adjusted to conform to the definition and scope of output used by Jorgenson and Griliches, and their estimates are adjusted to my time period, the difference is reduced to 1.08 (line 6). If my estimates are adjusted to incorporate revised OBE data for the stock of nonresidential structures and equipment, including use of the OBE Deflation II series for nonresidential structures, the difference between us is widened to 1.12 percentage points (line 9).

I found only one significant difference in our classifications of growth sources, as between input and output per unit of input. My input series is broader in that it includes the effect on labor "quality" of shifts in the age-sex composition of hours worked, whereas such shifts affect the Jorgenson-Griliches series for output per unit of input. This source made a negative contribution to growth in 1950–62, so that adjustment of their output per unit of input series to my classification narrows the difference between us from 1.12 to 1.01 percentage points (line 12).

The remaining 1.01 points, which are divided among components in lines 13 to 20, result from differences in statistical procedures. These are of two types: differences in weights and differences in input measures.

Not all of the difference between our weights is relevant here; the portion that is due to inclusion by Jorgenson and Griliches of depreciation and the portion that is due to their exclusion of government and the international sector are related to the difference in output measures, and their effects were previously eliminated in moving from line 3 to line 6. (There is one exception: The effect on the capital utilization adjustment of including depreciation in the weights was not eliminated and is included in the effect of the capital utilization adjustment in line 18.)

The division of the 1.01 points in lines 13 to 20 is, in principle, that which results from first measuring the effect upon my series of substituting their weights for mine and then measuring the effects of substituting their

Table 1.—Reconciliation of Denison and Jorgenson-Griliches Estimates of the Growth Rate (or Contribution to Growth) of Output per Unit of Input (Percentage points)

Reported output per unit of input growth rates:	
1. Denison, total national income, 1950–62 (p. 1)	1.37
2. Jorgenson-Griliches, private domestic GNP, 1945–65 (p. 1)	.10
3. Difference 1–2	1.27
Rates adjusted for definition and scope of output and time period:	
4. Denison, private domestic GNP, 1950–62 (p. 3)	1.38
5. Jorgenson-Griliches, private domestic GNP, 1950–62 (p. 2)	.30
6. Difference 4–5	1.08
Rate adjusted for new data:	
7. Adjustment of Denison series to incorporate new "structures and equipment" data (p. 14)	.04
8. Denison, private domestic GNP, 1950–62, adjusted, 4+7	1.42
9. Difference 8–5	1.12
Rate adjusted for difference in classification:	
10. Adjustment of Jorgenson-Griliches series to eliminate effect of changes in "labor quality" due to shift in age-sex composition of hours worked [a,c] (p. 24)	−.11
11. Jorgenson-Griliches, private domestic GNP, 1950–62, classification adjusted 5–10	.41
12. Difference 8–11	1.01
Breakdown of remaining difference of 1.01:	
13. Difference in division of input weights between labor and capital-land [b,c] (p. 5)	.08
14. Difference in inventory capital stock series [d] (p. 14)	.03
15. Difference in nonresidential structures and equipment capital stock series [d] (p. 16)	.07
16. Difference in residential structures procedure [d] (p. 17)	−.12
17. Jorgenson-Griliches substitutions of price indexes for equipment and inventories, net effect [e]	.07
Effect via output	−0.09 (p. 18)
Effect via input [a]	.16 (p. 17)
18. Jorgenson-Griliches capital-land utilization adjustment [a] (p. 18)	.58
19. Difference in estimates of employment and hours (p. 23)	−.03
20. Other differences [f]	.33

[a] Amount calculated with Jorgenson-Griliches weights.
[b] Reflects the net effect on the Jorgenson-Griliches weights of (1) counting as capital-land earnings all indirect taxes and other reconciliation items between factor cost and market price measures and (2) allocating to capital-land earnings a smaller portion than Denison of proprietors' income.
[c] Calculation based on Denison input series.
[d] Amount calculated with Denison weights.
[e] The construction price substitutions had no effect on output. Their effect on input is already taken into account in lines 7, 15, and 16.
[f] This estimate was obtained as a residual.

To obtain a full reconciliation it would have been necessary after line 9 to measure (1) the changes in my estimates that would have been introduced by my use of the Jorgenson-Griliches weights (except for depreciation) and (2) to measure the effect on their estimates, based on their weights, of the differences between us in measuring inputs. The first could be done for the division of weights between labor and capital-land, but not within the capital-land aggregate. The second could be done for most differences, but lines 14 to 16 were calculated by use of my weights instead of theirs. Line 20 therefore includes:

1. The effects of differences in the allocation of the total capital-land weight among components, including the consequences of the Denison division of the economy among sectors and the Jorgenson-Griliches adjustment for capital gains and taxes.
2. The difference between the amounts shown in lines 14, 15, and 16 and the amounts that would be obtained in these lines if Jorgenson-Griliches weights were used in the calculation instead of the Denison weights.
3. Possible errors in the calculations of amounts shown in several other lines of this table resulting from my use of average 1950–62 weights instead of annual weights (in the case of Jorgenson-Griliches estimates) or 1950–54, 1955–59, and 1960–62 weights (in the case of the Denison estimates) to calculate differences.
4. Rounding discrepancies.

input measures for mine when their weights are used; the breakdown would be different if the order were reversed. Two departures from this principle should be noted. The effect of a different allocation of total net capital-land earnings among components, the principal subject of section IV, was not measured and is included in "other differences" in line 20. Also, the effect of using different capital stock series (or a different method in the case of dwellings) could be measured only with the use of my weights (lines 14, 15, 16), and the difference between these results and those that would be obtained with their weights is also included in "other differences" in line 20.

The difference between us of 1.01 points shown in line 12 would be 1.04 were it not for a small offset (line 19) flowing from a difference in our estimates of employment and hours, which I did not evaluate. I have presented what I regard as compelling reasons to consider each of their procedures that contributes to this discrepancy as inferior. Nothing in their article suggests to me a change in my estimates.

Well over half of the entire statistical difference stems from the Jorgenson-Griliches utilization adjustment for capital and land (line 18). If increased utilization of capital and land resulting from advances in knowledge had really contributed 0.58 percentage points to the growth rate, then this amount would be regarded as due to classification rather than to statistical procedure. I have stressed my reasons for concluding that this is not the case. Although the portion of the total gains from advances in knowledge that is transmitted to higher productivity by the mechanism of lengthening capital hours simply cannot be estimated from available information, an amount larger than, say, 0.02 or 0.03 points in the 1950–62 growth rate seems improbable. I therefore classify the Jorgenson-Griliches utilization adjustment of 0.58 as resulting from differences in statistical procedure rather than in classification.

X. Some General Observations

JORGENSON and Griliches draw certain conclusions from their results that I believe to be unsupported and unsupportable.

To introduce this discussion, let me first recall that, in the framework of my estimates, output per unit of input in the private domestic economy may rise, or fall if changes are adverse, for any of a large number of reasons. Seven are perhaps worth listing. Having concluded that Jorgenson and Griliches do not have a broader classification of inputs than mine, I consider that all apply equally to their estimates.

1. Advances in technical, managerial, and organizational knowledge permit more output to be obtained with a given quantity of inputs. The gains may take the form of making possible production of more efficient capital goods at the same cost (resulting in "embodied" technological progress) or they may take any other form. Advances in knowledge, whether transmitted through improvements in capital goods or not, may result from expensive research at one extreme or from completely cost-free accidental discoveries at the other.

2. Knowledge may become more quickly or widely dispersed.

3. Expansion of markets may permit economies of scale.

4. The allocation of resources may move closer to the allocation that would maximize output. Allocation has a myriad of aspects ranging from the distribution of total resources among industries, products, and firms of different size to the placement of each individual worker in the particular job in which his contribution is greatest.

5. Obstacles deliberately imposed by governments, business, or labor unions against the most efficient utilization of resources in the use to which they are put may weaken.

6. The adequacy of government services (roads, police, courts, etc.) that affect private productivity may change.

7. The intensity of utilization of resources may change cyclically with variations in the pressure of demand [2, pp. 273–277, 441–442]. (I try to eliminate the effects in presenting "adjusted" growth rates of output per unit of input.)

My statistical estimates of output per unit of input may also rise or fall because my measures of input are incomplete (for example, I could not measure how hard people work) or inexact. In presenting my estimates, I have always tried to stress the limitations of information and technique, and the fact that one cannot proceed with growth analysis without introducing some assumptions. He can only try to adopt assumptions that are as realistic as he can make them. In this article, I have considered only differences between the Jorgenson-Griliches techniques, data, and assumptions and my own. I have not considered the limitations of techniques and assumptions that we share.

Interpretation of Jorgenson-Griliches results

Jorgenson and Griliches introduce their article by stating that its purpose is to test the hypothesis that "if real product and real factor input are accurately accounted for, the observed growth in total factor productivity is negligible." [1, p. 249] Their small estimate of the rise in total output per unit of input leads them to "conclude that our hypothesis is consistent with the facts." From this conclusion, they draw sweeping inferences. My conclusion is that they obtain their strikingly low estimate of productivity growth not by eliminating errors made in other research but by introducing new errors of their own. If so, the inferences they draw from this finding are also wrong.

I have stressed that the determinants of changes in output per unit of input are the same for the Jorgenson-Griliches series as for mine.[64] I am unable to find anything in their procedures that would have the effect of reclassifying a growth

64. Except that they also include changes in labor quality due to changes in age-sex composition.

source that I consider to be a component of output per unit of input into a component of input except their wholly unwarranted capital utilization adjustment. Nevertheless, their theoretical discussion suggests that Jorgenson and Griliches would like to reclassify growth sources from productivity to input. Some readers of their article have supposed that they have actually done so; this is understandable because Jorgenson and Griliches are not very clear on this matter.

Their discussion [1, p. 260] of "vintages" of capital goods is likely to mislead the unwary reader. This discussion is concerned with the fact that the design of capital goods improves as time passes. For this reason, an investment of a given sum this year buys a bundle of capital goods that is more productive than the bundle that could have been purchased this year with the same sum of money if capital goods of designs known 10 or 20 years ago were now being produced and were the only types known and available.

Jorgenson and Griliches indicate that, to aggregate capital goods in the capital stock, they would like to treat capital goods of different vintages as different commodities and weight them by their marginal products at a common date, rather than weight them by their costs at a common date as is the general practice in existing capital stock series. This procedure would be equivalent to adjusting existing capital stock series to reflect "unmeasured" quality change; "unmeasured" quality change in the capital stock is defined as the difference in movement between a capital stock series constructed by weighting components by marginal products and a series in which costs are used as weights [2, pp. 134–135, 144–145]. The contribution of "unmeasured" quality change to growth is "embodied technical progress." Thus, the procedure Jorgenson and Griliches recommend would have the effect of transferring "embodied technical progress" from the productivity to the input measure.[65]

It is difficult to read their article without supposing that they actually do make such a transfer.[66] But they stop short of making this claim explicit. In actual fact, I find nothing in their procedures that has the effect of adjusting capital input for the type of quality change that is not reflected in cost differences at a common date, and thus of "embodying" technical progress (nor am I aware of any statistical procedure that could be introduced to do this). I have taken pains to point out that neither their price substitutions nor their use of a fast depreciation (replacement) formula in measuring capital stock has any such effect.

It should also be noted that a distinction they introduce between costly and "costless" advances in "applied technology, managerial efficiency, and industrial organization" [1, p. 250] plays no role in their estimating procedure. They do not capitalize the costs or benefits of research and development, of reallocation of labor, or of any other action that would contribute to an increase in output per unit. Thus, they have transferred none of the gains from costly research or from other expenditures or costly actions out of their estimates of output per unit of input.

Given the characteristics of their productivity estimates that I have described, how is one to interpret the following passage, which appears after their empirical results are presented?

> "Our results suggest that the residual change in total factor productivity, which Denison attributes to Advance in knowledge, is small.[67] Our conclusion is not that advances in knowledge are negligible, but that the accumulation of knowledge is governed by the same economic laws as any other process of capital accumulation. Costs must be incurred if benefits are to be achieved. Although we have made no attempt to isolate the effects of expenditures on research and development from expenditures on other types of current inputs or investment goods, our results suggest that social rates of return to this type of investment are comparable to rates of return on other types of investment. Another implication of our results is that discrepancies between private and social returns to investment in physical capital may play a relatively minor role in explaining economic growth." [1, p. 274]

This quotation seems to contain four statements. Even if the Jorgenson-Griliches statistical results were accurate, they would not, I believe, support all of these statements. Indeed, the interpretation of their residual productivity estimate that is required for it to support the first statement seems directly contrary to the interpretation that would be required for it to lend any support to the other three statements.

The first statement is that the small Jorgenson-Griliches residual does not imply a small contribution to growth from advances in knowledge. This statement could be correct *only* if their procedures *have* the effect of reclassifying much of what I regard as the contribution of output per unit of input to an input contribution. In the absence of such a reclassification, a tiny figure for growth of output per unit of input *would* in fact leave little room for a contribution from advances in knowledge—or from economics of scale, reallocation of resources, or any of the

65. Jorgenson and Griliches would like to allow for "unmeasured quality change" of capital goods in computing the fixed investment components of GNP at constant prices as well as in constructing capital stock series. This would not affect the amount transferred from "GNP per unit of input" to input as "embodied technical progress," but by raising the growth rate of gross product, it would offset to some degree the reduction of the productivity series. However, three points should be noted. (1) The addition to growth of GNP per unit of input would tend to be much smaller, on the average, than the deduction because the ratio of gross fixed investment to GNP is much smaller than the fixed investment share of gross earnings, especially when the latter includes indirect taxes. [See 1, p. 262.] (2) In an analysis of *net* product growth, most of the addition to productivity (but not of the subtraction) would disappear because the increase in the growth rate of gross output in constant prices would be accompanied by a corresponding increase in the growth rate of depreciation in constant prices. (3) The relative size of the positive and negative adjustments to GNP per unit of input would change from time to time unless (a) the rate of "unmeasured quality improvement" were constant over a long period (from the installation date of the oldest capital in the stock when output is first measured to the last date that output is measured) and (b) changes in the share of fixed investment in output synchronized with changes in the share of fixed investment in earnings in some very special way.

66. Their footnote 1 on p. 254, does not contradict this. It merely states that they do not measure embodied technical progress in such a way as to make the change in output per unit of input zero by definition. Their footnote 1, p. 274, refers to errors in capital goods prices, which they try to correct, as "analogous to embodied technical change."

67. Footnote by Denison: Actually, I have attributed to advances in knowledge only part of my estimate of the contribution of output per unit of input.

other sources I have listed as contributing to changes in output per unit of input.

The second statement is that, to obtain important advances in knowledge, commensurate costs must be incurred; costs must be incurred if benefits are to be achieved. This implies that a comparison of costs and gains has been made. Actually, Jorgenson and Griliches provide no estimates at all of the *costs* of obtaining knowledge—e.g., costs of research or exploration. The fact that their residual productivity estimate is small can indicate that *gains* from advances in knowledge—whether costly or costless—are small *only* if Jorgenson and Griliches *have not* transferred gains from advances in knowledge from productivity to input. I would regard as implausible a finding that advances in knowledge have contributed to growth an amount as small as their residual.[68] I have tried to show that their estimate actually results from procedural and statistical errors. But, although I have argued that Jorgenson and Griliches have made no *valid* transfers of growth sources from productivity to input, the actual reason their residual is so very small is their introduction of the capital utilization adjustment. If this adjustment were really accurate and appropriate, they would have counted gains (their estimate implies *most* of the gains) resulting from advances in knowledge as a contribution of capital. If they had succeeded in adjusting capital stock series for unmeasured quality change by their "vintage" approach, this too would have counted gains resulting from advances in knowledge as a contribution of capital.[69]

The third statement is that social rates of return on research and development are comparable to those on other types of investment. This statement, too, does not follow from their results. As just indicated, they provide neither measures of the costs of research and development for comparison with costs of tangible investment, nor measures of the benefits of research and development and of tangible investment.

As to their fourth point, I do not understand how their results could possibly show that discrepancies between private and social returns to investment in physical capital are small. Jorgenson and Griliches must somehow have drawn this inference from the size of their residual. But their introduction of a capital utilization adjustment renders use of their residual for inferences about social rates of return conceptually invalid, just as it does for inferences about returns to research. And even their small residual would be big enough to add greatly to the private rate of return on investment if (improbably) it arose entirely from the discrepancy between public and private returns to investment.

Part of the difficulty with the quotation I have just analyzed stems from the preference of Jorgenson and Griliches for what I regard as an inconvenient classification of growth sources, and this leads me to a final comment on this topic. I believe there is an advantage in matching growth sources with the reasons that income changes, and I have tried to adhere to this principle in my own work. In particular, confusion and misinterpretation are avoided if the contribution of capital is identified with changes in income that result from investment, and that can be altered by changing the amount of investment, and the contribution of advances in knowledge is identified with changes in income that result from advances in technical and managerial knowledge, and that can be altered by changing the state of knowledge. Confusion is hard to avoid if the consequences of advances in knowledge are classified as contributions of capital. This is why I believe it would be unwise, even if they could be isolated, to count as contributions of capital the gains made possible because someone has devised improved designs of capital goods, or found ways to make possible more continuous use of capital goods. Such a classification is an invitation to misinterpretation.

68. It may be noted that Jorgenson and Griliches have estimated that the increase in output per unit of input was negligible over the whole 1929–64 period as well as during the postwar period [5, p. 61]. They clearly believe this to be the typical situation.

69. If the superiority of later "vintages" of capital goods was that they could be used longer hours, the same gains would actually be transferred twice—once by the capital utilization adjustment, and once by the adjustment of the quality of capital.

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By DALE W. JORGENSON and ZVI GRILICHES

Issues in Growth Accounting: A Reply to Edward F. Denison

1. Introduction

In our paper, "The Explanation of Productivity Change" [60], we examine the measurement of total factor productivity from the perspective provided by the economic theory of production. From the accounting point of view the major innovation in our approach is in the integration of productivity measurement with national accounts for income, saving, and wealth. Our main substantive conclusion is that growth in real factor input rather than growth in total factor productivity is the predominant source of growth in real product.

Both our approach to productivity measurement and our substantive conclusions require much further analysis and testing. Edward F. Denison has made an important contribution to this further analysis and testing in his paper, "Some Major Issues in Productivity Analysis: An Examination of Estimates by Jorgenson and Griliches" [25]. In this paper Denison examines our approach from the vantage point of methods developed in his study, *Why Growth Rates Differ* [28]. Denison's contribution is especially valuable since his objectives are similar to ours and his approach is carefully articulated with national income and expenditure accounts.

Although Denison's objectives and our objectives are similar, any attempt to integrate his approach to productivity measurement into national accounts for saving and wealth gives rise to serious difficulties. The first important difficulty arises from a basic confusion between depreciation and replacement that underlies all of Denison's work. Denison measures net national product as gross product less replacement; the correct definition is gross product less depreciation. The error in measurement of total product carries over to Denison's measure of total factor input, since the value of total product is equal to the value of total factor input as an accounting identity.

A second important difficulty in Denison's approach arises from an inconsistency between his treatment of depreciation in the measurement of total product and his treatment of replacement in the measurement of capital input. This inconsistency results in a contradiction between the income accounts that underlie productivity measurement and the wealth accounts that underlie the measurement of capital input. Although Denison's measure of total factor productivity is consistent with national income and ex-

NOTE.—Professors Jorgenson and Griliches are both members of the Department of Economics, Harvard University. A version of this paper was presented at the 12th Conference of the International Association for Research in Income and Wealth in Ronneby, Sweden, August 30–September 4, 1971.

penditure accounts, it is impossible to integrate his measure into national saving and wealth accounts.

Further difficulties arise in Denison's allocation of property income among assets. First, Denison employs nominal rates of return rather than real rates of return in measuring income from the supply of capital services. As a consequence his allocation of property income among assets is inconsistent with the integration of property income into accounts for saving and wealth. Second, Denison's classification of assets ignores important differences in direct taxation of property income by legal form of organization. His allocation of property income fails to reflect the impact of the tax structure on rates of return of different types of assets.

The purpose of this paper is to compare our approach to productivity measurement with Denison's. For this purpose we present a new set of estimates of total factor productivity for the period 1950–1962 covered in Denison's study, *Why Growth Rates Differ* [28]. These estimates, prepared by Christensen and Jorgenson,[1] implement our approach in much greater detail than the estimates given in our earlier study. The new estimates and the methods employed in obtaining them are presented in Sections 2–6 below. In Section 7 we compare these results with Denison's and our own earlier ones and assess the quantitative importance of the differences.

The first step in productivity measurement is to define measures of product and factor input in current prices. Product is divided between consumption and investment; factor input is divided between labor and capital input. Investment and capital input are linked through national accounts for saving and wealth. Investment in reproducible tangible capital assets is part of the national product and also part of saving. Investment less depreciation plus capital gains is equal to the change in the value of the corresponding capital asset from period to period.

Capital assets underlie capital services. The treatment of capital assets as part of wealth must be consistent with the treatment of capital services as part of factor input. An important objective of our approach to productivity measurement is the integration of capital input into national accounts for income, saving, and wealth. Our estimates of product and factor input, consumption and investment, and labor and capital services are presented in Section 2 below.

In Section 3 we present estimates of capital input implementing our approach in much greater detail than in our original study. The new estimates permit us to distinguish among components of property income corresponding to sectors of the economy that differ in legal form of organization. These estimates provide for a much more staisfactory integration of direct taxation of property income into factor input accounts.

We have attempted to validate our original measures by checking our data against a more comprehensive body of supplementary evidence—especially evidence on investment goods prices in Section 3 and data on changes in the relative utilization of capital in Section 4. In constructing a new set of estimates Christensen and Jorgenson have been able to incorporate new data. In the most difficult area of empirical research, the measurement of relative utilization, they incorporate cyclical as well as secular changes in relative utilization into their measure of capital input.[2] In reviewing their work in Section 4 and in response to Denison's comments we have reached the conclusion that the scope of our original adjustments for changes in relative utilization should be reduced.

In the measurement of real factor input, rates of growth of labor and capital input are averaged to obtain the rate of growth of total factor input, using relative factor shares as weights. The measurement of aggregate labor input as developed by Denison, Griliches, and others,[3] amounts to applying the same principle of aggregation to the individual components of labor input. Rates of growth of the components are averaged to obtain the rate of growth of total labor input, using relative shares in the value of labor input as weights. Our measure of labor input does not differ conceptually from the measure employed by Denison. Even though the details of the measurement procedure are quite different for the two estimates, the empirical results are very similar. Both measures of labor input differ substantially from measures based on unweighted man-hours, such as those of Abramovitz [1], Kendrick [61, 62] and Solow [70]. In Section 5 we compare our measure of labor input with alternatives incorporating additional detail.

In Section 6 we present revised estimates of total factor productivity. Revised estimates of capital input require data on property income by legal form of organization, an analysis of the tax structure for property income, and the incorporation of measures of relative utilization of capital stock. Estimates of capital stock already incorporated into productivity studies provide an important part of the empirical basis for revised estimates of capital input. Ultimately, satisfactory estimates will require the integration of productivity measurement with accounts for income, saving, and wealth. Productivity measures of this type are available for the United States for the period 1929–67,[4] but much further work remains to be done in refining and extending these estimates.

Section 7 summarizes the results of these revisions, compares them with our original estimates, reviews Denison's objections to them, and explores some of the remaining unresolved issues. Our original conclusions are changed somewhat, primarily as the result of the reduction in the magnitude and scope of the relative utilization adjustment. The resulting estimates of growth in total factor productivity are closer to Denison's estimates than our original ones, but still significantly lower. Our revised estimates meet, we believe, all of Denison's valid objections to our original procedures. We have preserved, however, the major conclusion of our original paper: Growth in total input is a major rather than a minor source in the growth of national output. The estimated residual change in total factor productivity is smaller than asserted by other investigators but not so small as was implied by our original estimates. This requires a

revision of the implication of our original paper that all of output growth could be accounted for by a corrected version of total input within the conventions of national income measurement. This does not seem to be the case.

Further progress in explaining productivity change will require allowing the rates of return to differ among different types of investment and among industries and not only among legal forms of organization. Returns to labor of comparable quality may also differ by age, race, sex, or occupation and these differences should be reflected in the measurement of labor input. Finally, a more detailed investigation of possible contributions to growth associated with externalities in the process of research and educational activities would be worthwhile. It is still our belief that the correct research strategy in this area is to refine and extend the accounts so as to minimize the contribution of the unexplained residual.

2. Measurement of Output

2.1 Introduction

We define the value of output and factor input from the point of view of the producer. For each sector of the economy we measure revenue as proceeds to the sector and outlay as expenditures of the sector. The value of output is net of taxes on output while the value of input is gross of taxes on input. The resulting concept of gross value added is intermediate between gross product at market prices, which is the concept of output employed in our earlier study, and gross product at factor cost.

For any concept of gross product the fundamental accounting identity for productivity measurement is that the value of output is equal to the value of input. Denoting the price of aggregate output by q, the quantity by Y, and the price and quantity of aggregate input input p and X, we may represent this identity in the form:

$$qY=pX.$$

In measuring total factor productivity we confine our attention to the private domestic economy. In the U.S. national income and product accounts the value of government services is equal to the value of labor services by definition.[5] The services of capital input in the government sector are ignored, so that product accounts for private and government sectors are not comparable. For the rest of the world sector investment is not included in investment goods output, as defined below, so that factor input accounts for domestic and foreign sectors are not comparable.

In the U.S. national income and product accounts the services of owner-occupied housing and structures utilized by nonprofit institutions are included in the product of the private sector. The value of the flow of services is imputed from data on rental values of comparable structures. Capital services from consumers' durables and producers' durables used by nonprofit institutions are not treated symmetrically with services from owner-occupied housing and institutional structures. Purchases of consumers' durables are included in personal consumption expenditures and purchases of producers' durables by nonprofit institutions are included in private investment, but the flow of capital services from this equipment is not included in the value of private product.

We treat the services of owner-utilized consumers' durables symmetrically with the services of owner-occupied housing and the services of producers' durables utilized by nonprofit institutions symmetrically with those of structures occupied by these institutions. Purchases of new consumers' durables and purchases of producers' durables by nonprofit institutions are transferred from personal consumption expenditures to private investment, leaving the value of total

Table 1.—Production Account, Gross Private Domestic Product and Factor Outlay, United States, 1958 (Current Prices) [a]

[Billions of dollars]

Line	Product	Total
1	**Private gross national product (table 1.7)**	$405.2
2	− Income originating in government enterprises (table 1.13)	4.8
3	− Rest of the world gross national product (table 1.7)	2.0
4	+ Services of consumers' durables (our imputation)	39.6
5	+ Services of durables held by institutions (our imputation)	.3
6	− Federal indirect business tax and nontax accruals (table 3.1)	11.5
7	+ Capital stock tax (table 3.1, footnote 2)	-------
8	− State and local indirect business tax and nontax accruals (table 3.3)	27.0
9	+ Motor vehicle licenses (table 3.3)	.8
10	+ Property taxes (table 3.3)	13.8
11	+ Other taxes (table 3.3)	2.9
12	+ Subsidies less current surplus of Federal government enterprises (table 3.1)	2.7
13	− Current surplus of state and local government enterprises (table 3.3)	1.8
14	= **Gross private domestic product**	418.2
	Factor outlay	
1	**Capital consumption allowances (table 1.9)**	38.9
2	+ Business transfer payments (table 1.9)	1.6
3	+ Statistical discrepancy (table 1.9)	1.6
4	+ Services of consumers' durables (our imputation)	39.6
5	+ Services of durables held by institutions (our imputation)	.3
6	+ Certain indirect business taxes (product account above, 9 + 10 + 11)	17.4
7	+ Income originating in business (table 1.13)	312.2
8	− Income originating in government enterprises (table 1.13)	4.8
9	+ Income originating in households and institutions (table 1.13)	11.4
10	= **Gross private domestic factor outlay**	418.2

[a] All table references are to *The National Income and Product Accounts of the United States, 1929–1965* [66].

product unaffected. We impute the value of services of consumers' durables and producers' durables owned by institutions from rental values implied by the imputed service flow for owner-occupied housing and institutional structures. We add the resulting service flow to the product of the private sector, increasing the value of the total product. The values of gross private domestic product and factor outlay for the year 1958 are presented in table 1.

2.2 Consumption, investment, labor, and capital

In measuring total factor productivity we find it useful to divide total product between consumption and investment goods and total factor outlay between capital and labor services. In the U.S. national income and product accounts total output is divided among durables and structures output (which we denote investment goods output) and nondurables and services output (which we denote consumption goods output). Our definition of services output includes the services of consumers' durables and institutional durables along with the services output included in the U.S. accounts.

The value of private domestic factor outlay includes labor compensation of employees in private enterprises and in private households and nonprofit institutions, plus the labor compensation of self-employed persons.[6] In measuring labor compensation of the self-employed we assume for each sector that average labor compensation of proprietors and unpaid family workers is equal to the average labor compensation of full-time equivalent employees in the same sector. Our estimates of nonfarm proprietors and employees are those of the Office of Business Economics. Our estimates of unpaid family workers are those of Kendrick, allocated among sectors in proportion to the number of proprietors in each sector.[7] Our estimates of persons engaged in the farm sector are from Kendrick.

All outlay on factors of production not allocated to labor is allocated to capital. Outlay on capital services includes property income of the self-employed; profits, rentals, and interest; capital consumption allowances; business transfer payments; the statistical discrepancy; indirect business taxes that are part of the outlay on productive factors, such as motor vehicle licenses, property taxes, and other taxes; and the imputed value of the services of consumers' durables and producers' durables utilized by institutions. [8] Gross private domestic product and factor outlay in current prices for 1950–62 are given in table 2. Total product is divided between gross private domestic investment and gross private domestic consumption. Total factor outlay is divided between labor compensation and property compensation.

Table 3.—Gross Private Domestic Product, 1950–62 (Constant Prices of 1958)

Year	Gross private domestic product, quantity index (billions of 1958 dollars)	Gross private domestic product, price index (1958=1.000)	Consumption goods product, quantity index (billions of 1958 dollars)	Consumption goods product, price index (1958=1.000)	Investment goods product, quantity index (billions of 1958 dollars)	Investment goods product, price index (1958=1.000)	Relative share of investment goods product (percent)
1950	328.8	0.818	214.766	0.828	113.904	0.801	0.339
1951	351.3	0.874	228.302	0.880	122.926	0.864	0.346
1952	360.3	0.896	237.211	0.905	122.962	0.880	0.335
1953	378.8	0.898	247.510	0.909	131.163	0.879	0.339
1954	375.7	0.913	250.210	0.927	125.154	0.886	0.323
1955	406.6	0.921	262.751	0.936	143.861	0.894	0.343
1956	416.2	0.952	272.847	0.956	143.261	0.945	0.341
1957	422.6	0.982	280.978	0.978	141.571	0.989	0.337
1958	418.2	1.000	287.791	1.000	130.419	1.000	0.312
1959	445.5	1.017	300.561	1.020	144.976	1.013	0.324
1960	457.1	1.033	309.834	1.044	147.261	1.010	0.315
1961	466.1	1.045	320.175	1.060	145.733	1.012	0.303
1962	495.1	1.057	334.799	1.075	160.428	1.019	0.312

Table 2.—Gross Private Domestic Product and Factor Outlay, 1950–62 (Current Prices)

[Billions of dollars]

Year	Gross private domestic product	Investment goods product	Consumption goods product	Labor compensation	Property compensation
1950	269.0	91.2	177.8	156.3	112.7
1951	307.2	106.2	200.9	177.4	129.8
1952	323.0	108.2	214.7	188.9	134.0
1953	340.1	115.3	225.0	202.7	137.4
1954	343.0	110.9	232.0	200.8	142.1
1955	374.5	128.6	246.0	216.5	158.1
1956	396.3	135.3	260.9	234.0	162.3
1957	415.0	140.0	274.9	246.0	169.0
1958	418.2	130.4	287.8	245.1	173.1
1959	453.2	146.8	306.4	265.5	187.6
1960	472.3	148.8	323.5	278.7	193.6
1961	487.0	147.4	339.5	284.7	202.3
1962	523.3	163.5	359.8	302.6	220.7

2.3. Price and quantity of output

We turn next to the measurement of real product. Product is allocated between consumption and investment goods. Consumption goods include nondurable goods and services and investment goods include durable goods and structures. We construct quantity index numbers of output for these two types of output from data for the corresponding components of gross national product in constant prices. The product of the rest of the world and government sectors is composed entirely of services. The price index for the product of each of these sectors is assumed to be the same as for services as a whole. Quantity index numbers for the services of consumers' durables and institutional durables are constructed as part of our imputation of the value of these services. The value of output from the point of view of the producing sector excludes certain indirect business taxes less subsidies. The price of output is implicit in the value of output and the quantity index of output described above. Price and quantity indexes for gross private domestic product are presented in table 3.

3. Measurement of Capital Input

3.1. Introduction

Our original estimates of capital input distinguished among five categories of capital input—land, residential and nonresidential structures, equipment, and inventories. Our approach has now been extended by Christensen and Jorgenson [19, 20] to 16 classes of assets, separating inventories into farm and nonfarm categories and adding consumers' durables to the other asset categories. Each asset category has been allocated among corporate, noncorporate, household, and institutional sectors.[9] This classification of assets permits a much more satisfactory treatment of the taxation of income from capital services. The original classification of assets was not sufficiently detailed to permit a fully satisfactory treatment of the tax structure. The relative proportions of capital stock by asset class for each sector for 1958 are given in table 4.

We have divided assets among sectors of the private domestic economy that differ in the tax treatment of property income. Households and institutions utilize the services of consumers' and institutional durables, owner-occupied dwellings, institutional structures, and land. No direct taxes are levied on this property income, but part of the income is taxed indirectly through property taxes. To incorporate property taxes into the capital service price, we add the rate of property taxation to the rate of return, the rate of replacement, and the rate of capital loss. Noncorporate business utilizes services from residential and nonresidential structures, producers' durable equipment, nonfarm and farm inventories, and land held by that sector. This property income is taxed directly through the personal income tax and indirectly through property taxes. We measure the noncorporate rate of return before personal income taxes.

Corporations utilize services from residential and nonresidential structures, producers' durable equipment, nonfarm inventories, and land. We employ the capital service prices for

Table 4.—Relative Proportions of Capital Stock by Sector, 1958

Asset class	Sector		
	Corporate business	Noncorporate business	Households and institutions
Consumers' durables	0	0	1.00
Nonresidential structures	.72	.18	.10
Producers' durables	.68	.31	.01
Residential structures	.08	.07	.85
Nonfarm inventories	.82	.18	0
Farm inventories	0	1.00	0
Land	.19	.50	.31

corporate capital input developed by Hall and Jorgenson [52, 53] for depreciable assets, modified to include indirect business taxes,[10] including property taxes. Corporate property income is taxed directly through the corporation income tax and through the personal income tax and indirectly through property taxes. We measure the corporate rate of return before personal income taxes but after corporation income taxes.

3.2. Perpetual inventory method

The starting point for a revised index of real capital input is the estimation of capital stock by the perpetual inventory method. In discrete time the perpetual inventory method may be represented in the form:

$$K_{it}=I_{it}+(1-\mu_i)K_{i,t-1}$$

where K_{it} is the end-of-period capital stock, I_{it} the quantity of investment occurring in the period, and μ_i the rate of replacement, all for the ith investment good. For each type of investment good we follow these steps in estimating capital stock by the perpetual inventory method: (1) a benchmark is obtained, (2) the investment series in current prices from the U.S. national accounts is deflated to obtain a real investment series, (3) a rate of replacement is chosen, and (4) the stock series is computed using the perpetual inventory method described above. Benchmarks for 1958, rates of replacement, and price indexes for each capital good are given in table 5. Price indexes for each asset class for 1950–62 are given in table 6.

Our method for separating price and quantity components of a flow of capital services is based on the corres-

Table 5.—Benchmarks, Rates of Replacement, and Price Indexes Employed in Estimating Capital

Asset class	1958 benchmark (billions of 1958 dollars)	Replacement rate	Deflator (sources given below)
Consumers' durables	115.2	0.200	Implicit deflator, national product accounts.[a]
Nonresidential structures	136.1	.056	Constant cost 2 deflator.[b]
Producers' durables	123.4	.138	Implicit deflator, national product accounts.[a]
Residential structures	226.2	.039	Constant cost 2 deflator.[b]
Nonfarm inventories	80.3		Investment: Implicit deflator, national product accounts.[c] Assets: BLS wholesale price index, goods other than farm products and food.[d]
Farm inventories	24.6		Investment: Implicit deflator, national product accounts.[c] Assets: BLS wholesale price index, farm products.[d]
Land	322.2		Goldsmith.[e]

[a] NIP [66], table 8.1.
[b] *Captial Stock Study* [49].
[c] NIP [66], tables 1.1 and 1.2.
[d] BLS [15].
[e] Goldsmith [35], tables A–5 and A–6.

pondence between asset prices and service prices implied by the equality between the value of an asset and the the value of its services. This correspondence is the counterpart in price estimation to the relationship between investment and changes in capital stock used in estimation of national wealth by the perpetual inventory method. Data on asset prices, rates of replacement, and investment are required for perpetual inventory estimates of capital stock.[11] Our method for separation of property compensation between the price of capital services and its quantity requires the same data as the perpetual inventory method for measurement of capital stock, together with data on property income and the tax structure. Data on property compensation by legal form of organization, such as those presented in the U.S. national income and product accounts, are essential for incorporating the effects of the tax structure. This straightforward extension of the perpetual inventory method makes it possible to allocate property income among different classes of assets.

To make the correspondence between asset prices and service prices explicit we must specify the relationship between the quantity of an asset acquired at one date and the quantity of the service flow of the asset at future dates. In our perpetual inventory estimates of the stock of assets, we have assumed that the service flow from the ith investment good declines geometrically over time,

$$1,\ (1-\mu_i),\ (1-\mu_i)^2\ \ldots\ .$$

To infer the capital service price from the sequence of asset prices, we first write the asset price as the discounted value of future services,

$$q^A_{it}=\sum_{\tau=t}^{\infty}\prod_{s=t+1}^{\tau+1}\frac{1}{1+r_s}\,p^S_{i,\tau+1}(1-\mu_i)^{\tau-t}$$

where r_s is the rate of return in period s, q^A_{it} is the price of the ith investment good at time t and p^S_{it} is service price of the ith investment good. Solving for the service price, we obtain

$$p^S_{it}=q^A_{i,t-1}r_t+q^A_{it}\mu_t-(q^A_{i,t}-q^A_{i,t-1}).$$

Given the sequence of asset prices $\{q^A_{it}\}$, the rate of replacement μ_i, and the rate of return r_t, we obtain the perpetual inventory estimate of the service price of the ith investment good p^S_{it}.

The correspondence between asset prices and service prices implied by the perpetual inventory method is precisely the same correspondence that underlies the measurement of net capital stock. As Denison points out, ". . . net stock measures . . . the discounted value of future capital services." [12] The measurement of net capital stock is well established in social accounting practice; our formula for the perpetual inventory estimate of the capital service price is an immediate implication of accounting methods for net capital stock. This formula may be generalized to alternative assumptions about the time pattern of the service flow associated with an asset. The formula developed by Haavelmo [50] for a constant service flow over the lifetime of the asset has been suggested as a means of aggregating capital services by Johansen and Sorsveen [56]. Arrow [4] has provided formulas for the service price for an arbitrary sequence of replacements. In Arrow's formula the rate of replacement μ_i, which we have assumed constant for each class of assets, is replaced by a weighted average of rates of replacement over the lifetime of the asset.

3.3. Price of investment goods

The price indexes used by Christensen and Jorgenson in constructing the capital stock series differ from our original ones in using the national income implicit deflator for producers' durable equipment and the WPI as the deflator of the *stock* of inventories. There is enough evidence that the various official capital deflator series are biased upward during this period for us to be unwilling to concede that our original attempt to substitute something else (the CPI durables index) for the official equipment investment deflator was an error. While this is not the place to go into great detail, there is ample evidence that components of the WPI, which in turn are a major source of deflators for the producers' durables investment, are (or at least have been) rather poor measures of price change. The WPI is based almost entirely on company and trade papers and association reports. Moreover, for a variety of reasons, it has had much less resources devoted to it relative to the CPI. All this has combined to produce what we believe to be a significant upward drift in components of this index during the post-World War II period.[13]

Table 6.—Price Indexes by Class of Asset, 1950–62

[1958=1.000]

Year	Consumers' durables	Structures, nonresidential and residential	Producers' durables	Investment, nonfarm inventories	Assets, nonfarm inventories	Investment, farm inventories	Assets, farm inventories	Land
1950	0.878	0.763	0.752	0.800	0.833	1.000	1.027	0.706
1951	.942	.836	.809	.919	.920	1.200	1.195	.760
1952	.954	.881	.822	.840	.899	1.429	1.127	.785
1953	.943	.895	.835	.786	.906	1.500	1.022	.786
1954	.929	.897	.840	.808	.909	1.200	1.008	.811
1955	.919	.902	.859	.917	.929	1.250	.945	.850
1956	.949	.959	.918	.944	.970	.667	.932	.897
1957	.984	1.001	.975	1.143	.997	1.000	.958	.951
1958	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1959	1.014	1.006	1.020	1.000	1.018	(a)	.938	1.069
1960	1.009	1.005	1.022	1.031	1.018	1.000	.935	1.143
1961	1.006	1.008	1.021	.944	1.013	1.500	.924	1.222
1962	1.008	1.024	1.023	1.019	1.013	1.000	.943	1.306

[a] Investment in constant prices is zero.

Our example of consumer durables was not intended to claim that the particular items were representative of most of the producers' durables but rather that such a comparison allowed one to detect the magnitude of the drift in the WPI which was due to the particular way in which its data were collected. The difference between the movement of prices for these identical items in the two index sources was interpreted not as property of the particular items, but as an estimate of the bias introduced by the basic procedure used in collecting the wholesale price data. The latter, we assumed, was generalizable to most of the other WPI items.

Table 7.—Evidence on Drift in Components of WPI

Item	Reference	Period	Approximate drift in percent per year [a]
Identical consumer durables [b] (10 items)	CPI	1947-49–1958	1.9
Circuit breakers	Dean-DePodwin [c]	1954-59	4.0
Power transformers	Dean-DePodwin	1954-59	.7
Power transformers	Census [d]	1954-63	1.2
Steam generators	Dean-DePodwin	1954-59	1.9
Steam generators	Census [e]	1954-63	6.4
Electric equipment	Dean-DePodwin	1954-59	1.2
Electric equipment	Census [d]	1954-63	1.9
Electric equipment	Barzel [f]	1949-59	4.4
Railroad equipment	Association of American Railroads. [g]	1961-67	.8
Tractors	Fettig [h]	1950-62	.6
Tubes, automobile	Flueck [i]	1955-59	1.4
Batteries, vehicle	Flueck [i]	1949-60	6.3
Storage batteries	Census [d]	1954-63	2.9
Plumbing and heating	Census [d]	1954-63	1.2
Oil burners	Census [d]	1954-63	2.8
Warm air furnaces	Census [d]	1954-63	1.1
Metal doors	Census [d]	1954-63	.7
Bolts and nuts	Census [d]	1954-63	2.3
Internal combustion engines	Census [d]	1954-63	1.8
Elevators and escalators	Census [d]	1954-63	1.1
Pumps and compressors	Census [d]	1954-63	2.0
Integrating instruments	Census [d]	1954-63	3.1
Electric welding	Census [d]	1954-63	−1.1
Electric lamps	Census [d]	1954-63	1.1
Trucks	Census [d]	1954-63	.3

[a] Last column is the average change, over the specified period, in the particular WPI component relative to the estimated price change over the same period in the alternative source.
[b] The following items were compared for this period: automobiles, tires, radios, refrigerators, sewing machines, ranges, washing machines, vacuum cleaners, toasters, and furniture.
[c] Dean and DePodwin [23] and an unpublished appendix to the original General Electric version.
[d] 1963 *Census of Manufactures* [8], Vol. IV, *Indexes of Production*, Appendix A.
[e] Census unit values, adjusted for capacity and horsepower differences, 1963 Census of Manufactures [8], Vol. IV, *Indexes of Production*, Appendix A.
[f] Barzel [5]. Indexes in table 3 holding size constant are essentially flat throughout this period. A similar story is also told by the indexes in table 6, where size is taken into account.
[g] Joint Equipment Committee Report [58] shows no significant increase in the "cost" of locomotives and freight and passenger cars during this period.
[h] Fettig [29], table 6, p. 609.
[i] J. Flueck [32].

Actually, there is quite a bit more evidence on this point than was alluded to in our original paper and some of it is presented in table 7. The first line recapitulates the CPI–WPI identical durables comparison. The other comparisons can be divided into three groups: (1) transaction price data (circuit breakers and power transformers from the Dean-DePodwin study and tubes and batteries prices from Flueck's staff report); (2) more detailed attention to quality change and/or more analysis of the changing specifications of the priced items, sometimes via regression techniques (Dean-DePodwin and Census on steam generators, Barzel on electric equipment, the Association of American Railroads on railroad equipment prices, and Fettig on tractor prices); and (3) wider coverage and transaction pricing (Census unit values data).

The last, Census based, set of data (summarized in table 8) is particularly interesting since one might have expected that unit values would themselves be upward biased due to the secular shift to more elaborate, higher "quality" models. In fact, they and all the other additional comparisons point strongly to the existence of an upward bias in the comparable WPI components, at least in the recent past. Our implied estimate of this upward drift of 1.4 percent per year between 1950 and 1962 is quite consistent with the new evidence presented in this table. While it is not used in the productivity computations we borrow from Christensen and Jorgenson we are willing to stand by this part of our original estimates.[14]

Our substitution of the new OBE "constant cost 2" construction deflator for the comparable implicit GNP de-

Table 8.—A Comparison of OBE Producers' Durables Investment Deflators With Census Unit Value Indexes, 1962 (1954=100)

Category	Percent direct [a] coverage by data from Census	Census [a] (cross weights)	OBE [b]	Drift in percent per year
Furniture and fixtures	42	110.9	119.1	0.8
Fabricated metal products	34	117.3	121.7	.4
Engines and turbines	54	93.3	134.7	4.2
Construction machinery	20	126.2	132.0	.5
Metalworking machinery	42	122.9	137.2	1.2
Special industry machinery	20	119.3	138.7	1.7
General industry machinery [c]	15	116.9	131.4	1.3
Service industry machinery	27	82.3	100.9	2.3
Electric machinery	27	98.7	112.0	1.4
Trucks and buses [d]	91	118.0	122.5	.4
Ships and boats	27	100.1	116.6	1.7
Railroad equipment	46	132.1	128.3	−.3

[a] 1963 *Census of Manufactures* [8], Vol. IV, *Indexes of Production*, Appendix A.
[b] NIP [66], Table 8.8. For tractors, agricultural machinery, mining and oil field machinery, office equipment, passenger cars, aircraft, and instruments Census unit values are based on less than 15 percent coverage from Census sources. For a comparison of tractor price indexes see table 7.
[c] OBE definition includes also materials handling machinery.
[d] Four separate Census categories aggregated using 1963 shipments as weights.

flator component is not ideal and could be improved on. The "constant cost 2" deflator is an average, implicitly, of the Bureau of Public Roads highway structures, the Bureau of Reclamation pumping and power plant indexes, and the A.T. & T. and Turner construction cost indexes. The latter two are basically input price rather than output price indexes with some feeble adjustment for productivity changes.[15] The Bureau of Reclamation indexes are hard to interpret and seem to be based, to a large extent, on list prices of raw materials. A recent study by Gordon [40] indicates that the constant cost 2 index may also be biased upward to an unknown degree.[16] It is likely, therefore, that if a more accurate construction price index were used it would imply a higher rate of growth in the structures component of capital input than was estimated in our original paper and is also used in this one. In short, more remains to be done in this area but we believe that our original procedures were on the right track. The estimates we borrow from Christensen and Jorgenson are conservative in their choice of investment deflators.

3.4. Price of capital services

3.4.1. Introduction.—The second step in the construction of a revised index of real capital input is to divide the value of capital services between price and quantity with price corresponding to the rental rate and quantity as the amount of capital services utilized. This division is precisely analogous to the separation of the value of labor services between a wage rate and the quantity of labor services. For property with an active rental market the separation may be carried out by means of market data on rental rates and corresponding data on the employment of capital. This method may be extended from rental property to property utilized by its owners if market rental values reflect the implicit rentals paid by owners for the use of their property. An imputation of this type is employed in the U.S. national income and product accounts in the measurement of services of owner-occupied housing.[17] A precisely analogous imputation occurs in measuring labor services of the self-employed. Market wage rates are used as a basis for imputing the implicit wage rates paid to the self-employed.[18] The main obstacle to application of this method to capital services on a comprehensive basis is the lack of sufficient data on market rental values.

To impute capital service prices we must estimate rates of return for corporate business, noncorporate business, and households and institutions.[19] As an accounting identity for each sector the value of all capital services is equal to total property income. We measure the value of capital services for each sector before either corporate or personal income taxes, but we measure the rate of return after corporate income taxes and before personal income taxes. In each sector asset prices and stocks, rates of replacement, and parameters describing the tax structure are given as data. The rate of return for each sector is chosen at each point of time so as to maintain the identity between property income and the value of all capital services in the sector.

Each capital service flow may be expressed as the sum of four terms, depending on the rate of return, the rate of replacement, the rate of capital losses accrued, and the rate of property taxation. Since property taxes are deducted from corporate income in determining corporate profits for tax purposes, the component of each capital service flow corresponding to property taxes is simply added to the other components. Similarly, the property tax component of each capital service flow for the noncorporate and household sector is simply added to the rest. Accordingly, our first step in estimating rates of return for the three sectors is to deduct all property taxes from the value of property compensation.

3.4.2. Household sector.—Our measurement of the flow of capital services for the household sector is independent of the measurement of flows of capital services for the corporate and noncorporate sectors. The value of services of owner-occupied farm and nonfarm dwellings is the space-rental value of dwellings less associated purchases of goods and services. We assume that the proportion of purchases is the same for farm as for nonfarm dwellings. The effective tax rate is the ratio of taxes as a component of total space-rental value to the asset value of owner-occupied dwellings, including both structures and land. The value of services of institutional structures is the space-rental value of institutional buildings. To estimate the rate of return we divide the space-rental values of owner-occupied dwellings and institutional buildings, less associated purchases of goods and services for dwellings, less current replacement values, accrued capital losses, and taxes as a component of total space-rental value for dwellings by the current asset value of owner-occupied dwellings and institutional structures, including land.

Our measurement of the output of the producing sector differs from that of the U.S. national income and product accounts in the treatment of consumers' and institutional durables. We assign personal consumption expenditures on durables to gross investment rather that to current consumption. We then add the service flow from consumers' and institutional durables to the value of output and the value of capital input. The value of each service flow is the product of the service price given above and the corresponding service quantity. The values of these service flows enter the product and factor outlay accounts given in table 1. We assume that the rate of return on durables is the same as that on structures for the household sector. The effective tax rate on consumers' durables is the ratio of the following State and local personal taxes—motor vehicle licenses, property taxes, and other taxes—plus Federal automobile use taxes to the current asset value of consumers' durables. The effective property tax rates on household property and the rate of return for the household sector are presented in table 9.

3.4.3. Noncorporate sector.—In measuring the rate of return for the noncorporate business sector we first estimate the effective tax rate on noncorporate property. We deduct property taxes on owner-occupied residential real estate from State and local business property taxes to obtain State and local property taxes for corporate and noncorporate sectors.[20] We allocate business

Table 9.—Effective Tax Rates and Rates of Return, Household and Noncorporate Sectors, 1950–62 (Annual Rates)

Year	Effective tax rate on owner-occupied residential real estate	Effective tax rate on owner-utilized consumers' durables	Effective tax rate on noncorporate property	Rate of return, household sector	Rate of return, noncorporate sector
1950	0.009	0.008	0.018	0.063	0.178
1951	.009	.007	.017	.103	.214
1952	.009	.007	.018	.062	.121
1953	.009	.007	.019	.030	.089
1954	.010	.007	.019	.032	.108
1955	.011	.007	.020	.040	.114
1956	.012	.007	.019	.083	.127
1957	.012	.007	.020	.069	.127
1958	.013	.007	.020	.035	.116
1959	.013	.007	.020	.047	.103
1960	.014	.008	.021	.043	.096
1961	.015	.008	.022	.047	.099
1962	.015	.009	.022	.058	.111

motor vehicle licenses between corporate and noncorporate sectors in proportion to the value of producers' durables in each sector; similarly, we allocate other State and local business taxes and Federal capital stock taxes in proportion to the value of all assets in each sector. The effective tax rate on noncorporate property is the ratio of the sum of property taxes, motor vehicle licenses, and other business taxes allocated to the noncorporate sector to the value of all assets held by the sector, including producers' durables, residential and nonresidential structures, inventories, and land.

The value of capital services for the noncorporate sector is the sum of income originating in business, other than income originating in corporate business, income originating in government enterprises, and interest and net rent of owner-occupied dwellings and institutional structures, less labor compensation in the noncorporate sector, including imputed labor compensation of proprietors and unpaid family workers, plus noncorporate capital consumption allowances, less capital consumption allowances of owner-occupied dwellings and institutional structures, and plus indirect business taxes allocated to the noncorporate sector, as outlined above. We also allocate the statistical discrepancy to noncorporate property income.[21] To obtain our estimate of the noncorporate rate of return we deduct property taxes and the current value of replacement, add accrued capital gains on noncorporate assets, and divide by the value of noncorporate assets. The effective tax rate on noncorporate property and the rate of return in the noncorporate sector are given in table 9.

3.4.4. Corporate sector.—In measuring the rate of return for corporate business we begin by estimating the effective tax rate on corporate property. We add State and local business property taxes, business motor vehicle licenses, other business taxes, and Federal capital stock taxes for the corporate sector to obtain total property taxes. The effective tax rate on corporate property is the ratio of these taxes to the value of all assets held by the corporate sector, including producers' durables, residential and nonresidential structures, inventories, and land. We measure corporate property income less property taxes as income originating in corporate business, less compensation of employees, plus corporate capital consumption allowances, plus business transfer payments.[22] The value of corporate capital input, which is equal to corporate property income, depends on the effective corporate income tax rate, the rate of return in the corporate sector, the investment tax credit, and the present values of depreciation deductions for nonresidential structures, producers' durables, and residential structures.

Corporate income taxes less the investment tax credit are equal to the effective tax rate applied to corporate property income, less property taxes and less deductions for capital consumption, expressed as proportions of current capital service flows after taxes. Our estimate of the effective rate of the investment tax credit is based on estimates of investment tax credit for corporations by the Office of Business Economics. The effective rate is defined as the amount of the investment tax credit divided by gross private domestic investment in producers' durables by corporations. We assume that the effective rate of the investment tax credit is the same for corporations and for noncorporate business. Although the nominal rate of the investment tax credit is 7 percent, certain limitations on its applicability reduce the effective rate considerably below this level.[23]

The present values of depreciation deductions on new investment depend on depreciation formulas allowable for tax purposes, the lifetimes of assets used in calculating depreciation, and the rate of return.[24] A reasonable approximation to depreciation practice is provided by the assumption that the straight-line depreciation formula was the only one permitted for assets acquired up to 1953 and that an accelerated depreciation formula, sum of the years' digits, was employed for assets acquired during the period 1954–62.[25] Given depreciation formulas and lifetimes for tax purposes, calculation of present values of depreciation deductions requires an estimate of the rate of return for discounting these deductions. We assume that this rate of return was constant at 10 percent.[26] Substituting the present values of depreciation deductions into expressions for capital service prices we reduce the unknown variables to two, the effective corporate tax rate and the rate of return in the corporate sector. Corresponding to these two unknowns, we have two equations. The first relates corporate property income and the sum of values of the individual capital services. The second relates corporate income taxes and the effective tax rate on corporate income, applied to the corporate income tax base, less the investment tax credit. We measure corporate income taxes as Federal and State corporate profits tax liability. Since the two equations are independent, we may solve for values of the effective corporate tax rate and the corporate rate of return in each time

Table 10.—Tax Structure and Rate of Return, Corporate Sector, 1950–62 (Proportions and Annual Rates)

Year	Effective tax rate on corporate property	Effective rate of investment tax credit	Statutory rate of investment tax credit	Effective tax rate on corporate income	Statutory tax rate on corporate income	Present value of depreciation deductions, nonresidential structures	Present value of depreciation deductions, producers' durables	Present value of depreciation deductions, residential structures	Rate of return, corporate sector
1950	0.015	0	0	0.481	0.420	0.273	0.397	0.262	0.107
1951	.014	0	0	.521	.508	.273	.397	.262	.157
1952	.014	0	0	.462	.520	.273	.397	.262	.079
1953	.015	0	0	.477	.520	.273	.397	.262	.065
1954	.015	0	0	.476	.520	.413	.543	.400	.061
1955	.016	0	0	.479	.520	.425	.560	.412	.093
1956	.016	0	0	.477	.520	.438	.579	.426	.124
1957	.016	0	0	.468	.520	.453	.596	.439	.103
1958	.016	0	0	.465	.520	.469	.614	.456	.059
1959	.016	0	0	.494	.520	.486	.632	.473	.079
1960	.016	0	0	.487	.520	.486	.632	.473	.063
1961	.017	0	0	.479	.520	.486	.632	.473	.062
1962	.017	.037	.070	.480	.520	.486	.632	.473	.085

period. Variables describing the corporate tax structure and the corporate rate of return for 1950–62 are presented in table 10.

3.5. Price and quantity of capital services

In separating the value of capital input into price and quantity components our basic accounting identity is that for each sector the value of all capital services or property compensation is equal to the sum of the values of the individual capital services. In constructing Divisia index numbers of capital service price and quantity we combine service prices and quantities by class of asset for all sectors. Finally, we combine service price and quantity indexes by class of asset into an overall capital service price index and potential service quantity index, again as Divisia index numbers. We note that the overall service price and quantity indexes include capital services from assets held by households and institutions as well as by businesses. Price and quantity indexes of potential capital services for corporate, noncorporate, and household sectors for 1950–62 are given in table 11.

4. Relative Utilization of Capital

4.1. Introduction

It has been common to assume that one may be able to approximate the unemployment of capital by the unemployment of labor. Solow [71] assumed that there is a proportionality relationship between these concepts (and his capital measure included land and buildings, too!) while Okun [67] suggested a nonlinear relationship between the two. It appeared to us that the unemployment of capital can be better approximated by the "unemployment" of one kind of capital (power-driven equipment), implicitly assuming a proportionality relationship between this type of capital and other capital, than by the assumption of proportionality between the employment of all labor and of all capital.

It is our assumption, for which we have no explicit evidence, that our measure of utilization measures not only the utilization of power-driven equipment but also the fraction of

Table 11.—Potential Gross Private Domestic Capital Input, 1950–62 (Constant Prices of 1958)

Year	Corporate capital input, quantity index (billions of 1958 dollars)	Corporate capital input, price index (1958=1.000)	Noncorporate capital input, quantity index (billions of 1958 dollars)	Noncorporate capital input, price index (1958=1.000)	Household capital input, quantity index (billions of 1958 dollars)	Household capital input, price index (1958=1.000)	Private domestic capital input, quantity index (billions of 1958 dollars)	Private domestic capital input, price index (1958=1.000)
1950	47.3	1.027	34.9	0.894	39.0	0.845	121.2	0.930
1951	49.9	1.103	36.6	1.029	43.8	.848	129.9	.999
1952	53.3	1.011	37.6	.968	46.6	.938	137.2	.977
1953	55.5	1.004	38.3	.939	48.7	.939	142.2	.967
1954	57.7	.970	38.9	.930	51.6	.969	147.9	.961
1955	59.0	1.141	39.5	.937	54.3	.989	152.5	1.037
1956	61.9	1.101	40.3	.864	58.7	1.011	160.7	1.101
1957	65.3	1.076	30.7	.909	61.6	1.003	167.5	1.009
1958	67.8	1.000	41.2	1.000	64.1	1.000	173.1	1.000
1959	68.7	1.154	41.6	.925	65.5	1.067	175.8	1.067
1960	70.9	1.119	42.2	.890	68.4	1.121	181.7	1.066
1961	73.4	1.110	42.8	.938	70.9	1.137	187.5	1.079
1962	75.2	1.211	43.2	1.025	72.9	1.171	191.7	1.151

calendar time that establishments or plants are in actual operation. That is, machine-hours per week are interpreted as a proxy for total hours per week operated by an establishment or industry. This, of course, is not an unambiguous concept, but it does explain why we were and still are willing to apply this estimated utilization rate not only to equipment but also to buildings. We are also willing, for lack of any better evidence, to extrapolate this to all industrial and agricultural equipment and structures and also to structures and equipment in the service industries. There is some scattered evidence that the hours operated per week by various retail establishments have increased in recent years.

4.2. Measurement of relative utilization

In measuring the change in utilization between 1945 and 1954 by the average estimated change in utilization (per annum) between 1939 and 1954, we overestimated the former. The estimates used in this paper (also taken from Christensen and Jorgenson) solve this problem by adding a cyclical adjustment to the previously computed secular one. The benchmark years are now used only to derive the ratio of installed horsepower to potential capital. This ratio is assumed to change slowly and is interpolated linearly between benchmarks. Installed horsepower is then estimated as the product of this ratio and our index of potential flow of (business) capital services. The ratio of electric power consumed by motors to this estimate of installed horsepower is our new measure of relative utilization. The resulting series grows at a significantly lower rate, 0.54 percent per year, during the 1950–62 period than the utilization index used in our original study (which rose at 10.6 percent per year).

Denison suggests that the weighting of utilization estimates for industry groups should be done by something other than the total horsepower of electric motors. Since we use it as a proxy for the utilization of all capital, the appropriate weights would be estimates of the value of capital services at the two-digit level. The closest we can come to it is to use weights based on the distribution of total fixed assets in 1962. Recomputing our estimates separately for each two-digit industry and then weighting them with these weights doesn't really change the numbers significantly (see table 12). If anything, it makes them slightly higher. The same is also true for mining during the 1954 to 1963 period (see table 13). The resulting weighted utilization index is still quite high and of the same order of magnitude as the manufacturing one (if allowance is made for the cyclical difference between 1963 and 1962). We conclude, therefore, that the unweighted figures we used are rather close to what the weighted figures would have been had we computed them.

Thus, except for the over-estimate of the rate of change of utilization from 1945 to 1954, our estimates appear to be reasonably good estimates of the

Table 12.—Relative Utilization of Electric Motors, U.S. Manufacturing, 1962

Industry [a]	Indexes, 1954=1.000			Total fixed assets weight [e]
	Horsepower of electric motors [b]	Total electricity consumption [c]	Utilization [d]	
	(1)	(2)	(3)	(4)
20	1.420	1.539	1.084	0.103
21	1.446	1.794	1.241	.004
22	1.155	1.229	1.064	.036
24	1.543	1.289	.835	.023
25	1.247	1.438	1.153	.008
26	1.616	1.624	1.005	.070
27	1.833	2.385	1.301	.034
28	1.552	1.769	1.140	.122
29	1.537	1.765	1.148	.069
30	1.554	1.579	1.016	.024
31	1.158	1.335	1.153	.004
32	1.529	1.447	.944	.055
33	1.289	1.394	1.081	.165
34	1.289	1.488	1.154	.049
35 and 36	1.344	1.713	1.275	.119
37	1.173	1.505	1.283	.076
38	1.234	2.187	1.773	.012
39 and 19	1.082	1.336	1.235	.014
Total [f]	**1.386**	**1.567**	**1.131**	
Total weighted [g]			**1.135**	

[a] "Two digit" manufacturing industries. Industry 23 apparel, excluded because no horsepower figures were asked for in 1954.
[b] Horsepower of electric motors from 1963 *Census of Manufactures* [7], "Power Equipment in Manufacturing Industries as of December 31, 1962", MC 63 (1)—6, table 2.
[c] Electricity, total purchased and generated minus sold, from 1963 *Census of Manufactures* [7], "Fuels and Electric Energy Consumed in Manufacturing Industries: 1962", MC 63 (1)—7, table 3.
[d] Utilization: column 2/column 1.
[e] 1962 fixed assets weights computed from 1964 *Annual Survey of Manufactures* [6], M 65 (AS)—6.
[f] Numbers differ from Table X in Jorgenson and Griliches [60], because no allowance could be made at the two-digit level for electricity consumption in nuclear energy installations. The comparable utilization index for total manufacturing allowing for this is 1.111.
[g] Σ (column 3×column 4)/0.987, where 0.987=Σ column 4.

Table 13.—Equipment Utilization Indexes, Mining Industries, 1963 (1954=100)

Industry	Horsepower of electric motors [a]	Electricity consumption [b]	Utilization index [c]	Depreciable assets weights [d]
	(1)	(2)	(3)	(4)
Metal mining	111.3	175.0	157.2	0.246
Anthracite	42.4	51.7	122.0	[e] .014
Bituminous coal	99.4	134.5	135.3	[e] .134
Oil and gas	224.0	229.6	102.5	.432
Nonmetallic minerals	152.2	156.9	103.1	.174
Total mining	**126.6**	**149.3**	**117.9**	
Adjusted			[f] **117.6**	
Weighted			[g] **120.7**	

[a] 1963 Census of Mining [8], Chapter 7, table 1.
[b] 1963 Census of Mining [8], Chapter 6, table 1; purchased and used.
[c] Column 2/column 1.
[d] From U.S. Internal Revenue Service, *1963 Statistics of Income* [55], *Corporation Income Tax Returns*, table 37, col. 3, p. 264.
[e] Total "coal mining" weight allocated on the basis of 1954 data for total capital given in Creamer [22], table B-11, p. 318.
[f] Adjusted for a small implied change in percentage of electric power used by electric motors (from 93.5 to 93.3) using the 1945 percentages given by Foss [33] and the 1954 and 1963 total electricity consumption as weights.
[g] Σ(column 3 x column 4).

Table 14.—Selected Utilization Measures

Year	Cotton broad woven goods: Average loom hours per loom in place [a]	Cotton-system spindle hours per spindle in place [b]	Manmade fiber broadwoven goods: Average loom hours per loom in place [a]
1947	5,042	5,074	5,220
1948	5,161	5,305	5,408
1949	4,689	4,433	4,991
1950	5,547	5,048	5,532
1951	5,276	5,823	5,045
1952	5,046	4,919	4,970
1953	5,579	5,513	5,240
1954	5,431	5,141	4,802
1955	5,658	5,501	5,326
1956	5,837	5,783	5,036
1957	5,425	5,512	5,463
1958	5,499	5,311	5,397
1959	6,114	5,853	5,718
1960	6,145	6,216	5,844
1961	6,020	5,830	5,717
1962	6,061	6,283	6,042
1963	6,124	6,074	6,105
1964	6,450	6,243	6,412
1965	6,741	6,489	6,513
Rates of growth, percent per year:			
1950–62	0.8	1.8	0.7
1947–65	1.6	1.4	1.7

[a] Computed from various issues of *Current Industrial Reports* [12], series M22T.1 and M22T.2. 1947–1953: Looms in place are averages of quarterly data as of the end of the quarter; 1954–64: Looms in place are averages of beginning and of year figures; 1965 for cotton broadwoven goods extrapolated on the basis of averages of monthly data on average hours per loom per week from the American Textile Manufacturers Institute [2], for manmade fibers based on looms in place at the end of 1964.

[b] Bureau of the Census, *Cotton Production and Distribution* [11], page 37. This is a more variable series, since the denominator is available only once during each year.

rate of utilization of electric motors in manufacturing. Similar estimates were presented for mining in table 13. An entirely different set of estimates, based on actual machine-hours worked for three textile subindustries, is presented in table 14. They, too, indicate an upward trend in utilization in the post-World War II period of about the same order of magnitude. Thus, there is something in these data. They are measuring something, at least as far as the utilization of electic motors in manufacturing and mining is concerned.

Given our data, it was an error on our part (and on the part of those who preceded us on this path) to adjust the residential housing, land, and inventories components by this measure of capacity utilization. Until better evidence comes along, however, we are willing to hazard the very strong assumption that the capacity utilization of all *business* equipment and structures may be approximated by our estimate of capacity utilization of power-driven equipment in manufacturing (and mining). Business equipment and structures account for about 46 percent of our total capital input. Applying this to the reduced rate of growth in utilization leads to a utilization adjustment on the order of 16 percent of our previous adjustment.

4.3. Actual and potential capital services

The index of relative utilization used in this paper is given in table 15. Since the value of the capital service flow as we have measured is independent of the rate of utilization, we define a price and quantity index of actual capital services as price and quantity indexes of potential capital services, divided and multiplied, respectively, by our index of relative utilization. Price and quantity indexes of actual capital services for corporate and noncorporate sectors and price and quantity indexes of actual capital services for the private domestic economy for 1950–62 are also presented in table 15.

To provide the basis for comparison of sources of growth of capital input with those for labor input, we present data on capital stock, potential service flow per unit of capital stock, and the relative utilization of capital in table 16. Capital stock is a Divisia index of capital stock for each class of asset—consumers' durables, nonresidential structures, producers' durables, residential structures, nonfarm inventories, farm inventories, and land. The potential service flow per unit of capital stock is the ratio of the quantity of potential gross private domestic capital input from table 11 to the index of capital stock. The relative utilization of *capital* is the ratio of the quantity of actual to potential gross private domestic capital input.

Table 15.—Actual Gross Private Domestic Capital Input, 1950–62 (Constant Prices of 1958)

Year	Corporate capital input, quantity index (billions of 1958 dollars)	Corporate capital input, price index (1958=1.000)	Noncorporate capital input, quantity index (billions of 1958 dollars)	Noncorporate capital input, price index (1958=1.000)	Private domestic capital input, quantity index (billions of 1958 dollars)	Private domestic capital input, price index (1958=1.000)	Index of relative utilization (1958=1.000)
1950	49.5	0.981	35.9	0.870	124.1	0.908	1.065
1951	53.2	1.034	37.9	.991	134.5	.965	1.092
1952	55.2	.977	38.5	.947	139.7	.959	1.046
1953	59.4	.938	39.8	.903	147.4	.932	1.098
1954	58.4	.958	39.3	.920	148.9	.955	1.020
1955	63.5	1.061	41.2	.896	158.6	.996	1.105
1956	66.6	1.024	42.1	.827	167.1	.971	1.105
1957	68.4	1.027	41.9	.883	171.9	.983	1.065
1958	67.8	1.000	41.2	1.000	173.1	1.000	1.000
1959	73.6	1.078	43.4	.887	182.5	1.028	1.092
1960	76.3	1.040	44.2	.850	189.0	1.024	1.098
1961	78.2	1.042	44.5	.902	194.1	1.043	1.085
1962	83.0	1.097	46.0	.962	202.3	1.091	1.137

Table 16.—Gross Private Domestic Capital Input, 1950–62 (Constant Prices of 1958)

Year	Private domestic capital stock (billions of 1958 dollars)	Potential capital input per unit of capital stock (percent)	Relative utilization of capital (1958=1.000)
1950	964.6	0.126	1.024
1951	1021.4	.127	1.035
1952	1068.5	.128	1.018
1953	1100.3	.129	1.037
1954	1134.6	.130	1.007
1955	1163.2	.131	1.040
1956	1213.9	.132	1.040
1957	1255.5	.133	1.026
1958	1287.9	.134	1.000
1959	1305.8	.135	1.038
1960	1341.4	.135	1.040
1961	1373.9	.136	1.035
1962	1399.1	.137	1.055

5. Measurement of Labor Input

5.1. Introduction

The labor input series used in this paper have also been borrowed from Christensen and Jorgenson. They are very similar to our original series except for the correction of an error in our original persons engaged series (it did not contain unpaid family workers) and the use of quality adjustments as extended by Griliches.[27] The Christensen-Jorgenson series add Kendrick's estimates of unpaid family workers to the OBE data on full-time equivalent employees and proprietors to arrive at a total persons engaged measure. Total man-hours in the private domestic sector are also based on Kendrick's series.[28]

Christensen and Jorgenson incorporate our original adjustment for the quality of the labor force based on the changing distribution of the labor force by years of school completed. They do not adjust, however, for the changing age-sex distribution of the labor force. An examination of the underlying labor force data indicates that there has been little relevant change in the age distribution of the employed in the 1950–62 period. There has been some relative increase in the number of young people in the labor force which has been largely counterbalanced by a decline in the proportion of older (above 65) employees. A pure age adjustment would have a very minor effect on our estimates.[29] There has been, however, an increase in the proportion of women in the labor force. We investigated the magnitude of an appropriate adjustment for this, using data on the average shares of men and women in total earnings during the years 1958–64, and the number of men and women employed in 1950 and 1958. The resulting adjustment is somewhat smaller but of the same order of magnitude as that reported by Denison for 1950–62.[30]

We also attempted to estimate a more detailed quality adjustment for men for the 1950–60 period, allowing for changes in education, age, race, and region (South and non-South). The basic data for this calculation were taken from Miller's monograph [65] and the associated Census volumes and refer to the population of men "with income", between the ages of 25 and 65. For this population, using the average of 1950 and 1960 income shares as weights, a straight education adjustment using average incomes by education for the population as a whole leads to an estimated 8.7 percent improvement in "quality." Using separate weights by region, race, age, and education leads to an estimated 12 percent rise in total labor quality, of which about 11 percent is due to the average improvement in the educational distribution within each age-race-region category and about 1 percent to the changing mix of these categories. In this case, a more detailed quality calculation for men produced a higher correction than the simple overall measure used by us. All this is just intended to indicate our belief that if we had developed a really detailed age-sex-race-region-education correction, it would as likely as not result in a higher rate of growth of labor input than was estimated by us originally.

5.2. Hours of work

Up to this point we have proceeded on the assumption that *hours per man* changed at the same rate for all categories of labor. If this is not the case, a more detailed labor input index is called for. The rate of growth in total labor should be measured by

$$\frac{\dot{L}}{L}=\sum v_i\frac{\dot{h}_i}{h_i}+\sum v_i\frac{\dot{n}_i}{n_i}$$

where n_i is the number of workers in the ith category, h_i are the hours per man worked by men in this category, and

$$v_i=w_ih_in_i/\sum w_ih_in_i=y_in_i/\sum y_in_i$$

is the share of the ith category of labor in total labor payments (w_i=wage per hour and $y_i=w_ih_i$=total earnings per man-year). Adding and subtracting N/N and $\dot{H}/H$, the rate of growth in total employment and the rate of growth in average hours worked per man, respectively, we can write

$$\frac{\dot{L}_i}{L_i}=\frac{\dot{N}}{N}+\frac{\dot{H}}{H}+\sum v_i\left(\frac{\dot{n}_i}{n_i}-\frac{\dot{N}}{N}\right)+\sum v_i\left(\frac{\dot{h}_i}{h_i}-\frac{\dot{H}}{H}\right)$$

$$=\frac{\dot{N}}{N}+\frac{\dot{H}}{H}+\sum v_i\frac{\dot{e}_i}{e_i}+\sum v_i\frac{\dot{m}_i}{m_i}$$

$$=\frac{\dot{N}}{N}+\frac{\dot{H}}{H}+\frac{\dot{E}}{E}+\frac{\dot{M}}{M}$$

where $e_i=n_i/N$ is the relative fraction of employment accounted for by the ith category and $m_i=h_i/H$ is its relative employment intensity (per year). $\dot{E}/E$ is then the rate of growth of average labor "quality" per man while $\dot{M}/M$ is the rate of growth in the

relative quality of the average hour. In our original computations we left out the $\dot{M}/M$ term, assuming that all hours changed proportionately. To the extent that there has been a secular improvement in the employment experience of the educated versus uneducated, our index actually underestimates the "quality" improvement in the total labor force.

Unfortunately, the published data on hours and weeks worked per man from the 1950 and 1960 Censuses of Population [9, 10] were not cross-classified by education and hence we cannot construct a comparable $\dot{M}/M$ index. Some idea, however, of the direction and order of magnitude of such an adjustment can be gathered from scattered data on hours worked by occupation. These are summarized in table 17 and imply about a 0.2 percent rate of growth per annum in the quality of the average hour during the 1950–65 period. This, however, is somewhat of an overestimate, since during the 1950–60 period (the only one for which we have data) a similar measure of "quality" of weeks worked deteriorated at about —0.04 percent per year (see table 18). That is, while the decline of hours was relatively smaller for some of the "higher quality" categories, this was counterbalanced to some extent by the improved annual employment experience of several of the less well paid occupations. On net we would estimate $\dot{M}/M \cong 0.16$, which if multiplied by the average labor share would more than counterbalance (0.11 versus —0.09) the estimated decline in overall quality of the labor force due to the increased participation of females.

Many of these adjustments are small and well within the range of possible error in the data. We conclude, nevertheless, that our original estimate of the rate of growth of total labor input stands up rather well under reexamination and that a more thorough and detailed analysis would in all likelihood result in a higher rather than lower figure.

Table 17.—Average Hours Worked Per Week by Employed Persons at Work

Occupation	1950 [a]	1960 [a]	1960 [b]	1965 [b]	1959 weights [c]
Total	**44.6**	**43.2**	**40.5**	**40.5**	
Professional, technical, and kindred	44.1	46.9	41.3	41.4	.167
Farmers and farm managers	60.0	54.2	52.0	52.1	.031
Managers, etc., except farm	51.7	49.3	49.5	49.4	.192
Clerical and kindred	41.3	40.8	37.6	37.4	.062
Sales workers	45.1	42.9	38.2	37.8	.077
Craftsmen, etc	41.6	42.1	41.0	42.3	.214
Operatives and kindred	42.0	42.2	40.3	41.2	.169
Private household workers	40.8	32.8	26.6	24.1	.003
Service workers except private household	44.7	41.9	38.7	37.8	.037
Farm laborers and foremen	48.5	43.2	39.3	39.4	.007
Laborers except farm and mine	39.3	37.1	35.9	35.5	.041

[a] Employed *males*. 1950 data computed from table 5, page 42, of Finegan [30]. The separate figures for self-employed and wage and salary workers were averaged using the numbers given in 1950 Census of Population [9], *Occupational Characteristics*, tables 14 and 15. The 1960 data are from 1960 U.S. Census of Population [10], *Occupational Characteristics*, table 13. Average hours for farm and service workers estimated for 1950 using Finegan's procedures. Both average hours figures are for the Census survey week.

[b] All persons at work, annual average, from Bureau of Labor Statistics, *Special Labor Force Reports* [16], 14 and 69.

[c] Computed from data on mean earnings of *males* 18 to 64 years of age and on the number of such males with earnings in 1959, from 1960 U.S. Census Population [10], *Occupation by Earnings and Education*. The service weight allocated between private household workers and other workers using median incomes from the *Occupational Characteristics* volume.

Rate of growth of quality of average hours per man:

$\Sigma w_i \frac{h_{it}}{h_{it-1}} - \frac{H_{Tt}}{H_{Tt-1}}$		per annum
1950–60	2.30	0.23
1960–65	.79	.16

Table 18.—Average Weeks Worked by Males in the Experienced Civilian Labor Force [a]

Occupation	1949	1959
Total	**45.1**	**45.6**
Professional	46.9	47.6
Farmers and farm managers	47.4	47.7
Managers	48.6	49.6
Clerical	46.7	46.5
Sales workers	46.0	46.3
Craftsmen	45.4	46.2
Operatives	44.1	44.9
Private household workers	41.7	37.4
Service, except private household	44.7	37.4
Farm laborers	40.2	38.6
Laborers, except farm	41.0	39.7

[a] Average for those who worked in the particular year. Computed from the *Occupational Characteristics* volumes of the 1950 and 1960 Censuses of Population [9, 10]. Midpoints used: 50–52: 51; 40–49: 45; 27–39: 33; 14–26: 20; and 1–13: 7.

Rate of growth of quality of average week worked, using weights from table 17, can be computed as follows:

$$\left(\Sigma w_i \frac{W_{i\,1959}}{W_{i\,1949}}\right) - \frac{W_{T\,1959}}{W_{T\,1949}} = -0.38.$$

5.3. Price and quantity of labor services

The assumption that effective labor services are proportional to the stock of labor is obviously incorrect. On the other hand the assumption that effective labor services can be measured directly from data on man-hours is equally incorrect, as Denison [24] has pointed out. The intensity of effort varies with the number of hours worked per week, so that effective labor input can be measured accurately only if data on man-hours are corrected for the effects of variations in the number of hours per man on effective labor input. Denison [26] suggests that the stock of labor provides an upper bound for effective labor services while the number of man-hours provides a lower bound. He estimates effective labor input by correcting man-hours for variations in labor intensity. We employ Denison's correction for intensity, but we apply this correction to actual hours per man rather than potential hours per man, as in our original study.

Our current measure of labor services

Table 19.—Private Domestic Labor Input, 1950–62

Year	Private domestic persons engaged (millions)	Educational attainment per person (index) (1958=1.000)	Private domestic hours per person (thousands per year)	Effective labor input per hour (1958=1.000)	Private domestic labor input, quantity index (billions of 1958 dollars)	Private domestic labor input, price index (1958=1.000)
1950	52.972	0.948	2.197	0.978	228.8	0.683
1951	55.101	.954	2.185	.981	239.0	.742
1952	55.385	.960	2.187	.980	241.7	.782
1953	56.226	.965	2.159	.986	245.2	.827
1954	54.387	.971	2.139	.990	237.4	.846
1955	55.718	.977	2.161	.986	245.9	.880
1956	56.770	.982	2.151	.988	251.6	.930
1957	56.809	.988	2.121	.995	251.5	.978
1958	55.023	1.000	2.099	1.000	245.1	1.000
1959	56.215	1.012	2.122	.995	254.9	1.042
1960	56.743	1.020	2.126	.994	259.6	1.074
1961	56.211	1.028	2.110	.998	258.1	1.103
1962	57.078	1.036	2.117	.996	264.6	1.144

is based on the stock of labor as measured by persons engaged, adjusted for effective hours per person and for changes in the composition of the labor force by educational attainment. The cost of labor services index is calculated by dividing total labor compensation by the quantity index of labor services. The number of persons engaged, the index of quality change, actual hours per worker, effective labor input per man-hour, and the quantity of labor input for 1950–62 are given in table 19. The price of labor services implicit in private domestic labor compensation is also given in table 19. It would obviously be desirable to incorporate additional aspects of labor force composition in adjusting the stock of labor for quality change. It would also be desirable to adjust the number of hours per man for changes in the relative number of hours worked by persons differing in educational attainment. But as outlined above, this would require a data base that is much more detailed than anything currently available.

6. Measurement of Total Factor Productivity

6.1. Introduction

Total factor productivity is defined as the ratio of real product to real factor input, or equivalently, as the ratio of the price of factor input to the product price. Growth in total factor productivity has a counterpart in growth of the price of factor input relative to the price of output. We may define a Divisia index of total factor productivity, say P, as:

$$\log \frac{P_t}{P_{t-1}} = \log \frac{Y_t}{Y_{t-1}} - \log \frac{X_t}{X_{t-1}},$$

where Y is the quantity index of total product and X is the quantity index of total factor input.

To obtain an estimate of real factor input for the U.S. private domestic economy we combine estimates of labor and capital input. The basic data on labor input—number of persons engaged, educational attainment per person, and hours per person—are presented in table 19. The corresponding data on capital input—capital stock, potential service flow per unit of stock, and the relative utilization of capital—are presented in table 15. The index of educational attainment per person provides an adjustment of persons engaged for the aggregation bias that results from combining different types of labor into an unweighted aggregate. Similarly, capital stock is an unweighted aggregate; the index of potential capital services per unit of the capital stock provides an adjustment for aggregation bias. Potential capital services must be adjusted for relative utilization to obtain the actual flow of capital services. We construct price and quantity index numbers of factor input by combining Divisia indexes of labor and capital input into a Divisia index of total factor input. Price and quantity indexes for 1950–62 are given in table 20. The relative share of property compensation for the same period is also given in table 20.

To provide a detailed accounting for the sources of growth in real factor input, we can separate the growth of quantity indexes of labor and capital input into the growth of the stock, growth in the quantity of input due to shifts in composition of such unweighted aggregates as persons engaged and capital stock or "quality change",[31] and growth in relative utilization. The growth in labor input is the sum of

Table 20.—Gross Private Domestic Factor Input, 1950–62 (Constant Prices of 1958)

Year	Gross private domestic factor input, quantity index (billions of 1958 dollars)	Gross private domestic factor input, price index (1958=1.000)	Property compensation, relative share (percent)
1950	350.0	0.768	0.419
1951	371.3	.827	.423
1952	379.8	.850	.415
1953	391.5	.869	.404
1954	385.6	.889	.414
1955	404.3	.926	.422
1956	418.7	.947	.410
1957	423.4	.980	.407
1958	418.2	1.000	.414
1959	437.4	1.036	.414
1960	448.5	1.053	.410
1961	452.0	1.077	.415
1962	466.5	1.122	.422

growth in the number of persons engaged, the quality of the labor force, and the effective number of hours per person. The growth in capital input is the sum of growth in capital stock, the quality of capital, and relative utilization. Geometric average annual rates of growth for 1950–62 are given for each component of the growth of labor and capital input in table 21.

Table 21.—Sources of Growth in Factor Input, 1950–62

[Annual percentage rates of growth]

1. **Capital input:**	
a. Stock	3.14
b. Quality change	.70
c. Relative utilization	.25
2. **Labor input:**	
a. Stock	.63
b. Quality change	.75
c. Relative utilization	−.16

Price and quantity indexes of output are given above in table 3. The index of total factor productivity for 1950–62 corresponding to the quantity index of output from table 3 and the quantity index of gross private domestic factor input from table 20 is given in table 22. The conventions for measurement of factor services underlying our concept of gross private domestic factor input were employed in our original study. Our revised estimates, based on those of Christensen and Jorgenson, differ in two significant respects: First, we have converted the index of relative utilization to an annual basis and reduced the scope of adjustments of potential flows of capital services for changes in relative utilization. Second, we have measured the flow of capital services for sectors distinguished by legal form of organization in order to provide a more detailed representation of the tax structure. These differences have an important impact on the estimate of total factor productivity.

6.2. Alternative measures of productivity change

To provide a basis for comparison of our estimate of total factor productivity with estimates that result from alternative conventions for the measurement of real factor input, we present a number of variants based on alternative accounting conventions. We begin with an estimate of total factor productivity based on the actual flow of labor and capital services. We compare this estimate with alternatives based on potential flows of labor and capital services and on stocks of labor and capital. The services of consumers' durables and producers' durables used by institutions are allocated directly to final demand so that growth in the quantities of these services does not affect growth of total factor productivity. Similarly, the services of owner-occupied dwellings and institutional structures are allocated directly to final demand.

Kendrick and Solow use a stock concept of capital input, measuring neither changes in relative utilization nor changes in the quality of capital services due to changes in the composition of the capital stock.[32] Denison weights persons engaged by an index of labor quality that incorporates the effects of growth in educational attainment but differs in a number of important respects from the index we have used.[33] Denison also adjusts man-hours for changes in labor efficiency that accompany changes in hours per man.[34] Solow uses unweighted man-hours, omitting the effects of changes in the composition of the labor force on the quantity of labor input.[35] Kendrick adjusts labor and capital input for changes in the industrial composition of labor force and capital stock.[36] However, changes within an industial sector due to shifts in composition are not included in his measures of real factor input.

We present measures of total factor productivity based on potential service flows and on stocks of labor and capital in table 22. The first variant on our estimate of total factor productivity omits the relative utilization adjustment for capital, the second the relative utilization adjustment for labor; the second variant is based on potential service flows for both labor and capital input. The third variant omits the quality adjustment for capital, while the fourth omits the quality adjustment for labor, providing a stock measure of total factor productivity. Two final variants provide combinations of alternative measures of labor input with the stock measure of capital. The fifth combines actual labor input with the stock of capital, while the sixth combines unweighted actual man-hours with capital stock, It is obvious from a comparison of the alternative estimates of total factor productivity given in table 22 that the results are highly sensitive to the choice of conventions for measuring real factor input The effects of varying the convention

Table 22.—Total Factor Productivity, 1950–62 (1958=1.000)

Year	Labor and capital services	Actual labor services; potential capital services	Potential labor and capital services	Potential labor services; capital stock	Labor and capital stock	Actual labor services; capital stock	Unweighted man-hours; capital stock
1950	0.939	0.948	0.961	0.935	0.906	0.922	0.882
1951	.946	.960	.971	.949	.923	.938	.902
1952	.949	.956	.967	.949	.927	.938	.904
1953	.968	.982	.990	.974	.954	.966	.938
1954	.974	.977	.982	.969	.953	.964	.942
1955	1.006	1.022	1.031	1.020	1.006	1.012	.989
1956	.994	1.010	1.018	1.011	1.001	1.004	.986
1957	.998	1.009	1.012	1.009	1.002	1.006	.996
1958	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1959	1.019	1.034	1.038	1.039	1.046	1.035	1.039
1960	1.019	1.036	1.040	1.043	1.056	1.039	1.048
1961	1.031	1.046	1.048	1.054	1.072	1.053	1.068
1962	1.062	1.086	1.088	1.097	1.120	1.094	1.114

are summarized for the period 1950–62 in table 23; geometric average annual rates of growth are given for each variant of total factor productivity.

Table 23.—Growth in Total Factor Productivity, 1950–62

[Average annual rates of growth]

1. Actual labor and capital services	1.03
2. Actual labor services; potential capital services	1.14
3. Potential labor and capital services	1.04
4. Potential labor services; capital stock	1.34
5. Labor and capital stock	1.78
6. Actual labor services; capital stock	1.44
7. Man-hours and capital stock	1.96

6.3. Sources of U.S. economic growth, 1950–62

Finally, to evaluate the relative importance of growth in real factor input and growth in total factor productivity as sources of economic growth, we consider the relative proportion of growth in real factor input. Geometric average annual rates of growth are given for real product and real factor input for 1950–62 in table 24. The relative proportion of growth in total factor productivity in the growth of real product is also provided.

We find that the growth in real factor input predominates in the explanation of the growth of real product for the period 1950–62. These findings are directly contrary to those of Abramovitz [1], Kendrick [61, 62] and Solow [70] in earlier studies of productivity change. We have estimated real factor input on the basis of capital stock and actual man-hours, the conventions used by Solow and subsequently adopted by Arrow, Chenery, Minhas, and Solow [3], 1950–62. The resulting estimates of the distribution of the growth of real product between growth in real factor input and total factor productivity are comparable to those of Solow's earlier study. On the basis of our data and Solow's conventions total factor productivity grows at the average rate of 1.96 percent per year while real factor input grows at 1.51 percent per year. Our estimates, given in table 24, are that total factor productivity grows at 1.03 percent per year and real factor input at the rate of 2.42 percent per year.

Table 24.—The Relative Importance of Productivity Change, 1950–62

[Average annual rates of growth]

Gross private domestic product:		
Real product		3.47
Real factor input		2.42
Capital input:		
Stock	1.30	
Quality change	.30	
Relative utilization	.11	
Labor input:		
Stock	.37	
Quality change	.44	
Relative utilization	−.10	
Total factor productivity		1.03
Relative proportion of productivity change		.30

We also present estimates of real factor input based on capital stock and actual labor input, which provide the best approximation to the conventions adopted by Denison [28]. Denison finds that total factor productivity grows at 1.37 percent per year, not adjusted for intensity of demand. We find that estimates of real factor input based on our data suggest that total factor productivity grows at the average rate of 1.44 percent per year while real factor input grows at 2.03 percent per year. The discrepancy between estimates based on our conventions, given in table 23, and those based on capital stock and actual labor input is accounted for almost entirely by our adjustments of the measure of capital input for quality change and relative utilization. Denison has incorporated about half the growth in real factor input over and above the growth of capital stock and actual man-hours into his estimates of real factor input.

7. Major Issues in Growth Accounting

7.1. Introduction

Denison has examined our approach to productivity measurement in his paper, "Some Major Issues in Productivity Analysis: An Examination of Estimates by Jorgenson and Griliches" [25]. Denison's detailed examination of our estimates contributes significantly to the definition of unresolved issues in the measurement of total factor productivity. This contribution is especially valuable in view of the underlying agreement between our objectives and Denison's objectives in his pathbreaking studies of productivity change [26, 28]. Although the basic agreement between our objectives in productivity measurement and Denison's is reassuring, important differences in methods of measurement and in substantive conclusions remain.

We have attempted to indicate the quantitative magnitude of disagreement between Denison's estimates of total factor productivity and ours by reworking our estimates in order to provide a direct comparison among the results of three different approaches to the measurement of total factor productivity—the conventional approach, Denison's approach, and our own approach. We have concentrated on the period 1950–62 employed by Denison in his most recent study, *Why Growth Rates Differ* [28]. For convenience of the reader we follow the order of topics in Denison's paper [25].

7.2. Scope of product

We begin our examination of the issues raised by Denison with an analysis of the effects of the concept of real product on the measurement of productivity change. Denison regards both gross and net product measures as legitimate for productivity analysis,[37] but gives priority to the net product measure: "Insofar as a larger output is a proper goal of society and objective of policy, it is net product that measures the degree of success in achieving this goal. Gross product is larger by the value of capital consumption. There is no more reason to wish to maximize capital consumption—the quantity of capital goods used up in production—than there is to maximize the quantity of any other intermediate product . . ." [38].

The first problem with Denison's argument is that the difference be-

tween gross product and net product is equal to depreciation, while the quantity of capital goods used up in production is equal to replacement. Depreciation is equal to replacement if and only if the decline in efficiency of capital goods is geometric. Under Denison's characterization of decline in efficiency, depreciation is not equal to replacement, so that Denison's argument is internally contradictory.[39] This contradiction can be removed by defining net product as gross product less depreciation.

In the estimates of productivity change given in Section 6 above, the decline in efficiency of capital goods is assumed to be geometric so that depreciation and replacement are equal. Our product measure is gross product from the producers' point of view. Under our assumptions, Denison's argument justifying net product as a product measure is irrelevant to productivity measurement. Net product is associated with precisely the same measure of the absolute contribution of productivity change as gross product from the producers' point of view. Denison's argument provides no basis for discriminating between net and gross product as a basis for productivity measurement. Furthermore, the measure of the absolute contribution of productivity change is the same for our measure of gross product and for gross product at factor cost, the gross product concept Denison prefers for productivity analysis.[40]

The contribution of productivity change may be expressed as the absolute amount of growth in real product accounted for by changes in productivity.[41] This contribution is equal to the difference between period to period changes in real product and changes in real factor input. The contribution of productivity change may be expressed relative to any of the alternative concepts of real product, gross product from the producers' point of view, gross product at factor cost, and net product. Alternative measures of relative productivity change differ only in the concept of real product employed, not in the measure of the absolute contribution of productivity change.

We first demonstrate that the absolute contribution of productivity change is the same for gross product from the producers' point of view, gross product at factor cost, and net product. The difference between gross product from the producers' point of view and gross product at factor cost is indirect taxes on factors of production, such as property taxes. These taxes appear as part of both output and input and leave the absolute contribution of productivity change unaffected. The difference between gross product and net product is depreciation. Depreciation also appears as part of both output and input, leaving the contribution of productivity change unaffected. Problems that arise in measuring the depreciation component of gross capital input also arise in measuring depreciation to convert gross product to net product. The data required for measurement of gross product from the producers' point of view, gross product at factor cost, and net product are identical.

The absolute contribution of productivity change to the growth of real output is the difference between changes in output and changes in input, both evaluated at current prices; this is equal to the difference between changes in the prices of output and input, each multiplied by the corresponding quantity:

$$q\dot{Y}-p\dot{X}=\dot{p}X-\dot{q}Y.$$

The relative contribution of productivity change, say $\dot{P}/P$, is obtained by dividing the absolute contribution by the value of output (or input):

$$\frac{\dot{P}}{P}=\frac{q\dot{Y}-p\dot{X}}{qY}=\frac{q\dot{Y}}{qY}-\frac{p\dot{X}}{pX}=\frac{\dot{Y}}{Y}-\frac{\dot{X}}{X}.$$

Dividing output between consumption and investment goods and input between capital and labor services, the identity between the value of output and the value of input may be written:

$$q_C C+q_I I=p_K K+p_L L,$$

where C and I are quantities of consumption and investment goods and K and L are quantities of capital and labor input. The corresponding prices are denoted q_C, q_I, p_K, and p_L. To represent gross value added from the producers' point of view we suppose for simplicity that tax depreciation and economic depreciation are the same. Under this simplifying assumption the price of capital services may be written:[42]

$$p_K=q_I\left(\rho+\mu+\tau-\frac{\dot{q}_I}{q_I}\right),$$

where ρ is the (before-tax) rate of return, μ the rate of depreciation, and τ the rate of indirect taxation of property. The accounting identity may then be rewritten:

$$q_C C+q_I I=q_I\left(\rho+\mu+\tau-\frac{\dot{q}_I}{q_I}\right)K+p_L L.$$

Identifying the change in the aggregate quantity of output with the sum of changes in consumption and investment goods output, evaluated at current prices, and defining the change in aggregate input similarly, the absolute contribution of productivity change may be represented in the form:

$$q_C\dot{C}+q_I\dot{I}-q_I\left(\rho+\mu+\tau-\frac{\dot{q}_I}{q_I}\right)\dot{K}-p_L\dot{L}.$$

To obtain corresponding measures of the contribution of productivity change for alternative concepts of social product, we first derive gross product at factor cost by subtracting the value of property taxes from both sides of the basic accounting identity, obtaining:

$$q_C C+q_I(I-\tau K)=q_I\left(\rho+\mu-\frac{\dot{q}_I}{q_I}\right)K+p_L L.$$

Defining the absolute contribution of productivity change as before we obtain:

$$q_C\dot{C}+q_I(\dot{I}-\tau\dot{K})-q_I\left(\rho+\mu-\frac{\dot{q}_I}{q_I}\right)\dot{K}-p_L\dot{L}$$

$$=q_C\dot{C}+q_I\dot{I}-q_I\left(\rho+\mu+\tau-\frac{\dot{q}_I}{q_I}\right)\dot{K}-p_L\dot{L}$$

which is identical to the contribution of productivity change for gross product from the producers' point of view.

Second, we derive net product by subtracting the value of depreciation from both sides of the identity given above:

$$q_C C+q_I[I-(\tau+\mu)K]$$
$$=q_I\left(\rho-\frac{\dot{q}_I}{q_I}\right)K+p_L L.$$

The resulting measure of the absolute contribution of productivity change is the same as for gross value added:

$$q_C\dot{C}+q_I[I-(\tau+\mu)\dot{K}]$$
$$-q_I\left(\rho-\frac{\dot{q}_I}{q_I}\right)\dot{K}-p_L\dot{L}$$
$$=q_C\dot{C}+q_I I-q_I\left(\rho+\mu+\tau-\frac{\dot{q}_I}{q_I}\right)\dot{K}-p_L\dot{L}.$$

We conclude that the measure of productivity change in absolute terms is the same for all three concepts of real product we have considered—gross product from the producers' point of view, gross product at factor cost, and net product. The absolute contribution of productivity change may be expressed relative to any measure of output. Alternative measures of relative productivity change differ in the concept of output employed as a standard of comparison, but not in the measure of the absolute contribution of productivity change.

The absolute contribution of productivity change has the important property that the contribution to the growth of the economy as a whole is the sum of contributions to the growth of individual sectors. This property is maintained for measures of output of an economic sector that include intermediate goods purchased from other sectors, as in interindustry studies. Intermediate goods appear as real output in the sector of origin and real input in the sector of destination. Changes in the output of intermediate goods cancel out in any measure of the contribution of productivity change to the economy as a whole.

In our original estimates we used gross product at market prices; we now employ gross product from the producers' point of view, which includes indirect taxes levied on factor outlay, but excludes indirect taxes levied on output. Denison employs net product, which excludes all indirect taxes and depreciation along with a number of minor items. Our revised product measure covers the private domestic economy, incorporating the services of durables used by households and institutions along with the services of structures used in this sector. Our original product measure did not include the services of durables used by households and institutions. Denison covers the entire national economy. Our revised product measure provides for a more satisfactory treatment of indirect taxes. It also treats durables symmetrically with structures in the household sector.

To reconcile our revised product measure with Denison's it would be necessary to exclude the services of durables used by households and institutions and to eliminate indirect taxes and depreciation at replacement cost. The product of government and rest of the world sectors would have to be added. None of these changes would alter our estimate of the absolute contribution of productivity change. Any difference in percentage rates of growth of total factor productivity would be due to the product measure relative to which productivity change is expressed. The more comprehensive the product measure the less the relative rate of growth of total factor productivity associated with any absolute contribution of productivity change. To adjust estimates of the relative growth of total factor productivity based on our data to a net national product basis, percentage rates of growth should be multiplied by the ratio of gross product to net national product in each period. A similar adjustment can be made to convert relative rates of growth of total factor productivity to any other product measure.

7.3. Index numbers

To separate flows of product and factor outlay into prices and quantities, we introduce price and quantity index numbers. As an example, suppose that there are m components to the value of output,

$$qY=q_1Y_1+q_2Y_2+\ \ldots\ +q_mY_m.$$

Index numbers for the price of output q and the quantity of output Y may be defined in terms of the prices $[q_i]$ and quantities $[Y_i]$ of the m components. Differentiating the value of output totally with respect to time and dividing both sides by total value,

$$\frac{\dot{q}}{q}+\frac{\dot{Y}}{Y}=\sum w_i\left[\frac{\dot{q}_i}{q_i}+\frac{\dot{Y}_i}{Y_i}\right];$$

weights $[w_i]$ are the relative shares of the value of the ith output:

$$w_i=\frac{q_iY_i}{\sum q_iY_i}.$$

We define the price and quantity indexes of output as weighted averages of rates of growth of prices and quantities of individual components:

$$\frac{\dot{q}}{q}=\sum w_i\frac{\dot{q}_i}{q_i},\ \frac{\dot{Y}}{Y}=\sum w_i\frac{\dot{Y}_i}{Y_i},$$

obtaining Divisia price and quantity indexes.[43] Rates of growth of the Divisia indexes of prices and quantities add up to the rate of growth of the value (factor reversal test) and are symmetric in different directions of time (time reversal test). A Divisia index of Divisia indexes is a Divisia index of the components.

For application to data for discrete points of time an approximation to the continuous Divisia indexes is required. Price and quantity index numbers originally discussed by Fisher [31] have been employed for this purpose by Tornquist [74]:

$$\log q_t-\log q_{t-1}=\sum\overline{w}_{it}[\log q_{it}-\log q_{i,t-1}],$$

$$\log Y_t-\log Y_{t-1}=\sum\overline{w}_{it}[\log Y_{it}-\log Y_{i,t-1}],$$

where the weights $\overline{w}_{it}$ are arithmetic averages of the relative shares in the two periods,

$$\overline{w}_{it}=\frac{1}{2}w_{it}+\frac{1}{2}w_{i,t-1}.$$

A discrete Divisia index of discrete Divisia indexes is a discrete Divisia index of the components. Divisia index numbers for discrete time are also symmetric in data of different time periods (time reversal). Theil [72] has demonstrated that the sum of changes in logarithms of discrete Divisia indexes

of price and quantity is approximately equal to the change in the logarithm of the value (factor reversal). It is convenient to have the product of price and quantity indexes equal to the value of transactions, so that we construct discrete Divisia price indexes as the value in current prices divided by the discrete Divisia quantity index.

The estimates of Christensen and Jorgenson [19, 20] are based on a different discrete approximation to Divisia index numbers from that employed in our original estimates; the results are essentially unaffected for the period 1950–62. Denison's estimates are based on an alternative discrete approximation. The three approximations appear to produce essentially similar results. Our approximation satisfies both time reversal and, approximately, factor reversal tests for index numbers.

7.4. Capital and labor weights

The value of labor input includes labor compensation of employees and the self-employed. Our estimates of the labor compensation of the self-employed are based on the assumption that average labor compensation of the self-employed in each sector is equal to average labor compensation of full-time equivalent employees in each sector. This method of imputation of the labor compensation of the self-employed is only one of many that have been proposed. Our original method did not separate labor and property components of noncorporate income by industrial sector. Our new method, discussed in detail by Christensen [18], has the effect of allocating a larger share of factor outlay to capital, overcoming Denison's objection to our original method.[44] The resulting rates of return in corporate and noncorporate sectors are essentially the same, taking into account the effect of the corporate income tax. The revised allocation of noncorporate income seems to us to be superior to our original allocation and to Denison's allocation.[45]

Second, the concept of gross product from the producers' point of view enables us to eliminate an error in our original allocation of indirect tax liability.[46] Our original concept of gross product at market prices included sales and excise taxes and customs duties in the earnings of capital. Our present estimates include only taxes levied on income from property. This measure of capital earnings is the appropriate one, given our concept of gross product from the producers' point of view. The implied weights for labor and capital meet Denison's objections to our original treatment of indirect business taxes.[47]

7.5. Weights for components of capital and land

The major difference between our measure of total factor input and Denison's is in the assignment of relative weights to components of land and capital input. An ideal measure of capital input is strictly analogous to an ideal measure of labor input. Both measures combine rates of growth of individual components into an overall rate of growth, using relative shares of the individual components as weights. While factor shares for components of labor can be estimated from data on wages and employment, factor shares for components of capital must be imputed from accounting data on total property income. The problem for productivity measurement is to provide a practical method for carrying out this accounting imputation. Our method of imputation is described in detail in Section 3 above.

Our original estimates, like those of Denison, distinguished alternative capital inputs by class of asset. For the private domestic economy we distinguished among five categories of assets—land, residential structures, nonresidential structures, equipment, and inventories. For this sector of the economy Denison distinguishes between residential and nonresidential land; otherwise the breakdown of assets is the same. Neither of these breakdowns is fully satisfactory for the incorporation of the effects of the tax structure on property income.

In our revised estimates inventories are allocated between farm and nonfarm sectors and consumers' durables are introduced as a new and separate class of assets. Each of the seven classes of assets is then allocated among sectors that differ in legal form of organization —corporate, noncorporate, and households and institutions. We assume, following Christensen and Jorgenson [19], that the rates of return on all assets held within a given sector are the same. Property income in the corporate sector is subject to both corporate and personal income taxes. Noncorporate property income is subject only to the personal income tax. The property income of households and institutions is subject to neither tax. This new, more detailed, asset classification enables us to meet a number of valid objections Denison has raised to our original treatment of the tax structure.[48]

Our new estimates incorporate the tax structure for property income in a more satisfactory way than our original estimates. Property taxes are separated from other earnings from capital and treated as tax deductible for income tax purposes. Depreciation for tax purposes is incorporated at its present value for the lifetime of an asset, so that the effects of accelerated depreciation are simultaneous with the adoption of the depreciation provisions of the Internal Revenue Act of 1954. Our revised estimates also incorporate the investment tax credit adopted in 1962. The rate of the investment tax credit and the rate of the corporate income tax are effective rates, measured from national accounting data.

Denison incorporates part of the tax structure implicitly by excluding property taxes from his measure of social product. This procedure is equivalent to our treatment of property taxes for the purposes of measuring absolute productivity change. Denison's estimates do not take explicit account of direct taxation of income from property. He distinguishes among property income in housing, agricultural, and all other sectors of the economy, but this breakdown of the economy does not coincide with the breakdown associated with the structure of taxation of property income. The availability of data on property income by legal form of organization from the U.S. national accounts makes it possible to improve on Denison's treatment of property income and on our original estimates. We conclude that Denison's classifica-

tion of assets, like our original classification, fails to capture differences in direct taxation of property income for enterprises that differ in legal form of organization. Denison's estimates of property income fail to incorporate depreciation for tax purposes and the investment tax credit in a satisfactory way.

The rates of return included in our capital service prices are real rates of return rather than nominal rates of return. Nominal rates are assumed to be the same for all assets within a given sector. Real rates differ by differentials between rates of growth of asset prices for different classes of assets. The allocation of property income among asset classes depends on differentials among rates of growth of prices. If all asset prices are growing at the same rate, real rates of return are the same for all assets within each sector. Denison objects to the use of real rates of return on the grounds that price changes in assets other than land are always unanticipated.[49] His proposed procedure would amount to ignoring differentials among assets other than land and to setting the differential between land and other assets equal to the rate of growth of land prices. For the 1950–62 period land prices grow more rapidly than other asset prices, but there is substantial inflation in the price of structures and producers' durables. On the other hand the price of farm inventories actually falls. It is clear that Denison's proposed procedure, or his actual practice of ignoring differential rates of inflation,[50] introduces distortions in the allocation of property income among asset classes.

A serious accounting problem arises in attempting to integrate Denison's proposed allocation of property income among assets into national accounts for saving and wealth. Changes in the value of national wealth are equal to saving plus capital gains from the revaluation of assets. Saving is equal to labor income less consumption plus property income less depreciation. These definitions hold for individual wealth holders as well as for the economy as a whole. Capital gains from the revaluation of assets must be taken into account in allocating property income among capital assets and, implicitly, among individual wealth holders. The changes in the value of assets that enter individual and national wealth accounts must be consistent with the property income attributed to those assets in individual and national income accounts. The use of real rates of return is necessitated by internal consistency of the complete system of national accounts. Capital gains should be incorporated into the allocation of property income among classes of assets. Denison is in error, not only in failing to take capital gains into account in measuring income from land, but in omitting capital gains in measuring income from other assets.[51] We conclude that Denison's proposed allocation of property income among assets is inconsistent with the integration of property income into individual and national accounts for saving and wealth.

Finally, Denison defends Kendrick's exclusion of depreciation on the grounds that Kendrick uses net product and net earnings from capital in measuring total factor productivity.[52] Actually, Kendrick employs both net and gross measures of output and uses net earnings for allocating property income for both, which is the error we originally pointed out.[53] Denison is in error in asserting that we recommend the inclusion of depreciation in weights for the analysis of net product and in associating himself with Kendrick's weighting scheme.[54]

The most serious problem with Denison's treatment of depreciation is the lack of consistency between depreciation as it enters his measure of real product and the corresponding treatment of capital assets in his measure of real factor input. In Section 3.2 above we have outlined a perpetual inventory method for measurement of depreciation and capital assets based on the assumption that the service flow from an investment good declines geometrically. To describe Denison's method, we must generalize our treatment to alternative assumptions about the time pattern of the service flow. We assume that the relative efficiency of the ith investment good may be described by a sequence of nonnegative numbers,

$$d_{i0}, d_{i1} \ldots .$$

Denison points out, correctly, that a capital input measure depends on the relative efficiency of capital goods of different ages:

> In principle, the selection of a capital input measure should depend on the changes that occur in the ability of a capital good to contribute to net production as the good grows older (within the span of its economic life). Use of net stock, with depreciation computed by the straight line formula, would imply that this ability drops very rapidly—that it is reduced by one-fourth when one-fourth of the service life has passed, and by nine-tenths when nine-tenths of the service life has passed. Use of gross stock would imply that this ability is constant throughout the service life of a capital good. [55]

Denison argues, further, that:

> I believe that net value typically declines more rapidly than does the ability of a capital good to contribute to production. . . . On the other hand, the gross stock assumption of constant services throughout the life of an asset is extreme. [56]

Under our assumption, that decline in efficiency is geometric:

$$d_{i\tau}=(1-\mu_i)^\tau, \ (\tau=0,1, \ldots).$$

Under Denison's gross stock assumption relative efficiency is constant over the economic lifetime of the equipment:

$$d_{i\tau}=1, \ (\tau=0,1, \ldots, T_i-1),$$

where T_i is economic lifetime of the ith investment good. Under Denison's net stock assumption, efficiency declines linearly

$$d_{i\tau}=1-\frac{1}{T_i}\tau \qquad (\tau=0,1, \ldots, T_i-1),$$

where $\frac{1}{T_i}$ is the rate of decrease in

efficiency of the ith investment good from period to period.

Capital stock at the end of the period, say K_{it}, is the sum of past investments, say $\{I_{i,t-\tau}\}$ each weighted by its relative efficiency:

$$K_{it}=\sum_{\tau=0}^{\infty} d_{i\tau}I_{i,t-\tau}.$$

With a geometric decline in efficiency we obtain the capital stock measures used in Section 3 above. With constant relative efficiency we obtain Denison's gross stock measure; with linear decline in relative efficiency, we obtain Denison's net stock measure. In Denison's study, *Sources of Economic Growth* [26], gross stock is employed as a measure of capital input. In *Why Growth Rates Differ* [28, p. 141] an arithmetic average of gross stock and net stock is employed; the implied relative efficiency of capital goods is an average of constant and linearly declining relative efficiency,

$$d_{i\tau}=1-\frac{1}{2T_i}\,\tau \qquad (\tau=0, 1, \ldots, T_i-1)$$

where $\frac{1}{2T_i}$ is the rate of decrease in efficiency.

Replacement requirements, say R_{it}, are a weighted average of past investments with weights given by the mortality distribution:

$$R_{it}=\sum_{\tau=1}^{\infty} m_{i\tau}I_{i,t-\tau},$$

where:

$$m_{i\tau}=-(d_{i\tau}-d_{i,\tau-1}),\ (\tau=1,2, \ldots).$$

For geometric decline in efficiency, replacement requirements are proportional to capital stock,

$$R_{it}=\mu_i K_{i,t-1}.$$

Turning to asset and service prices, the price of the ith asset is equal to the discounted value of future services:

$$q_{it}{}^{A}=\sum_{\tau=t}^{\infty}\prod_{s=t+1}^{\tau+1}\frac{1}{1+r_s}\,p_{i,\tau+1}{}^{S}d_{i,\tau-t}.$$

Depreciation on a capital good is a weighted average of future rental price with weights given by the mortality distribution:

$$q_{it}{}^{D}=\sum_{\tau=t+1}^{\infty}\prod_{s=t+1}^{\tau+1}\frac{1}{1+r_s}\,p_{i,\tau+1}{}^{S}m_{i,\tau-t}.$$

For geometric decline in efficiency depreciation is proportional to the asset price:

$$q_{it}{}^{D}=\mu_i q_{it}{}^{A}.$$

Depreciation and replacement must be carefully distinguished in order to preserve consistency between the treatment of capital services and the treatment of capital assets. Depreciation is a component of the price of capital services. The value of capital services is equal to property income, including depreciation. Replacement is the consequence of a reduction in the efficiency of capital assets or, in Denison's language, the ability of a capital good to contribute to production. The value of depreciation is equal to the value of replacement if and only if decline in efficiency is geometric:

$$q_{it}{}^{D}K_{i,t-1}=\mu_i q_{it}{}^{A}K_{i,t-1}=q_{it}{}^{A}R_{it}.$$

Otherwise, replacement and depreciation are not equal to each other. Replacement reflects the current decline in efficiency of all capital goods acquired in the past. Depreciation reflects the current value (present discounted value) of all future declines in efficiency on all capital goods.

A confusion between depreciation and replacement pervades Denison's treatment of real product, real factor input, and capital stock. The first indication of this confusion is Denison's definition of net product: "Net product measures the amount a nation consumes plus the addition it makes to its capital stock. Stated another way, it is the amount of its output a nation could consume without changing its stock of capital." [57] The correct definition of net product is gross product less depreciation; this is the definition suggested by Denison's second statement quoted above. The first statement defines net product as gross product less replacement, since the addition to capital stock is equal to investment less replacement. The two definitions are consistent if and only if depreciation is equal to replacement, that is, if and only if decline in efficiency is geometric.

Denison measures capital consumption allowances on the basis of Bulletin F lives and the straight line method.[58] Under the assumption that relative efficiency (Denison's "ability to contribute" to production) declines linearly, this estimate corresponds to replacement rather than depreciation. To measure net product Denison reduces gross product by his estimate of capital consumption allowances.[59] Since his estimate of capital consumption allowances is a measure of replacement, this procedure employs the incorrect definition of net product as consumption plus investment less replacement. This inappropriate measure of net product is reduced by labor compensation to obtain property income net of capital consumption allowances. Thus, Denison's measure of property income is also net of replacement rather than depreciation. This erroneous measure is allocated among capital inputs to obtain weights employed in measuring capital input as a component of real factor input; Denison's weights for different components of capital input are measured incorrectly. These weights should reflect property income less depreciation; in fact, they reflect property income less replacement.

The final confusion in Denison's treatment of capital in *Why Growth Rates Differ* [28] arises in the adoption of an arithmetic average of gross and net stock as a measure of capital input. As indicated above, this measure of capital input implies that efficiency declines linearly up to the end of an asset's economic lifetime; at that point half the asset's "ability to contribute" to production remains so that all the remaining decline in efficiency takes place in one year. Denison's measure of capital consumption allowances by the straight-line method fails to measure either replacement or depreciation. We conclude that Denison's treatment of capital consumption allowances in the measurement of net product and net factor input is inconsistent with his treatment of capital assets in the measure of real capital input that is incorporated into his measure of real

factor input. A similar problem arises in Denison's earlier study, *Sources of Economic Growth* [26]. There gross product is employed as a measure of capital input.[60] Denison's measure of capital consumption allowances corresponds to replacement rather than depreciation so that his measures of net product and net factor input are inconsistent with his measure of capital input.

We assume that the decline in efficiency of capital goods is geometric; under this assumption depreciation and replacement are equal, so that the inconsistencies in Denison's procedure outlined above do not arise. If we were to assume that the decline in efficiency is linear, as in Denison's arithmetic average of net and gross stock, depreciation would be measured differently from replacement. The first step would be to estimate the value of capital assets of each age at each point of time as the discounted value of future capital services. This is the definition of net stock suggested by Denison,[61] but not the definition used in his measure of net stock, which is net of replacement rather than net of depreciation.[62] The second step would be to estimate depreciation on capital goods of each age by discounting the mortality distribution, as indicated above in the definition of depreciation $q_{it}{}^{D}$. The third step would be to obtain total depreciation as the sum over all types of capital goods and all ages. Only at this point would it be possible to measure net product as gross product less depreciation.

It is clear that the selection of an appropriate assumption about the decline in efficiency of capital goods is both important and difficult. We selected geometrically declining efficiency on the basis of its convenience and consistency with scattered empirical evidence. The available evidence arises from two sources—studies of replacement investment and studies of depreciation in the market prices of capital goods. Geometric decline in efficiency has been employed by Hickman and by Hall and Jorgenson in studies of investment.[63] This assumption has been tested by Meyer and Kuh, who find no effect of the age distribution of capital stock in the determination of replacement investment.[64] Geometric decline in efficiency has been employed in the study of depreciation on capital goods by Cagan, Griliches, and Wykoff.[65] This assumption has been tested by Hall, who finds no effect of the age of a capital good in the determination of depreciation as measured from the prices of used capital goods.[66] The power of these tests is not high and some contrary evidence is presented by Griliches.[67] Nevertheless, the weight of the evidence suggests that Denison's treatment of capital could be radically simplified and made internally consistent by adopting our assumption of geometric decline in efficiency of capital goods. Any alternative assumption about the decline in efficiency requires redefinition of Denison's measures of replacement, depreciation, and capital stock to make them consistent.

A conceptual issue that can be clarified at this point is the role of disaggregation in the measurement of real product and real factor input. Our original presentation included an extensive discussion of two alternative concepts of "quality change" in productivity analysis.[68] We indicated that quality change in the sense of "aggregation error" should be eliminated by disaggregating product and factor input measures so as to treat distinct products and factors as separate commodities wherever possible. The term quality change is often used in a different sense. Estimates of quality change are sometimes made by attributing changes in productivity to changes in the quality of a particular factor *without disaggregation.*

A particularly graphic example of inappropriate use of quality change occurs in the analysis of the "vintage" model of capital. The correct measure of quality change across vintages would require data on the price and quantity of capital services for each vintage at each point of time. Aggregation over vintages could then be carried out in the same way as any other type of aggregation and biases due to quality change could be eliminated.[69] In the absence of the required data, productivity change itself has been employed to estimate the quantity of capital input corrected for quality change.[70] Denison registers disagreement with this approach to the problem of quality change;[71] in fact, our view of this problem is identical to Denison's.

If it were possible to implement our original suggestion that different vintages of capital goods be weighted in measuring capital input by their marginal products, this would not have the effect of incorporating "embodied" technical progress, as Denison [25, p. 26] suggests. In fact the position attributed to us by Denison, the use of "unmeasured" quality change to correct capital input for changes in quality by vintage, is precisely the position we originally rejected [60, p. 260]. Of course implementation of our suggestion would require data on service prices by vintage at each point of time.

7.6. Measurement of capital and land

Our estimates of the value of land are revised considerably from the Goldsmith estimates employed in our original paper.[72] While we have assumed that nonresidential land has remained constant, this assumption could be improved upon. There are scattered data on types of land, their relative value, and the changing composition of land actually in use in the private economy. Very little of the investment related to shifts of land from one category of use to another is captured in the standard investment series. Some of these investments are directly expensed and others are government subsidized. A rough measure of the effects of shifts in the use of land to higher valued urban uses from 1945 to 1958 can be constructed from Goldsmith's data. Land input rises 1.4 percent per year by this measure.[73] If this figure were extrapolated to the 1950–62 period it would raise our estimated growth of total factor input by 0.14 percent per year.

Our estimates of the stocks of inventories and depreciable assets are based on those of OBE. Estimates of depreciable assets for corporate and noncorporate sectors are based on the OBE Capital Goods Study [49]. Our perpetual inventory estimates of stocks of resi-

dential structures and durables used by households are based on methods similar to those employed in the Capital Goods Study. The main difference between our estimates of capital stock and Denison's is in our use of declining balance depreciation. Denison uses a mixture of the one-hoss-shay and the straight-line method, [74] which gives rise to the problems in maintianing internal consistency among depreciation, replacement, and capital stock outlined above.

Our original estimates of capital input were based on price indexes that attempted to correct for various biases in the deflators employed in the U.S. national accounts. Since a positive bias in the investment goods price index results in underestimation of the growth of both product and capital input, correction of biases does not affect estimates of total factor productivity substantially. Our present estimates, based on those of Christensen and Jorgenson [19, 20] are conservative in the choice of price deflators. We use national accounts deflators except for structures; for both residential and nonresidential structures we employ OBE "constant cost 2" as a price deflator. [75] We also incorporate both asset and investment deflators for inventories, overcoming another of Denison's objections to our original estimates. [76] Finally, we did not replace the producers' durable equipment price index by the comparable consumers' durable series, a practice Denison objects to but which we have defended above. [77] Thus, there is no practical difference between the price series we use and those recommended by Denison.

7.7. Utilization adjustment

Denison directs his strongest criticisms, and correctly so, against what is probably the weakest link in our chain. While we have accepted most of his criticism, we still believe that the question posed by our utilization adjustment is interesting, the numbers used are not all that bad, and something has been learned from this exercise.

Denison's criticisms can be summarized under the following headings:

(1) the basic numbers are faulty (because of cyclical and weighting problems);

(2) they are extrapolated too widely, from electric motors in manufacturing to "everything";

(3) they are misused by not allowing for double counting, i.e., these changes are due to other inputs and hence have already been measured;

(4) they are misinterpreted as an increase in input rather than an advancement in knowledge.

We have reviewed our adjustment for relative utilization in Section 4 above. Our revised estimates differ very substantially from our original estimates. In the original estimates we estimated the contribution of utilization to the explanation of growth in total factor productivity at 0.58 percent per year. By reducing the scope of the adjustment to business structures and equipment and by incorporating annual estimates of horsepower or capacity, we have reduced the contribution of utilization to 0.11 percent per year for the period 1950–62. This may be contrasted with Denison's estimate of −0.04 percent per year for the same period.

Denison points out that we do not discuss the "sources" of changes in utilization rates and wonders if there has been some double counting. We do not see why the possibility of a change in machine-hours per year per machine is more mysterious than a change in man-hours per man-year. Obviously, there is a need for an explanation of the sources of such changes and an analysis of the prospects for additional such changes in the future. Although we have not provided such an explanation, we did point out and localize what may be an important source of observed growth in output. An attribution of growth to investment, education, research and development, economies of scale, or capacity utilization is always just the beginning of a relevant line of analysis. But that is as far as one can go within the framework of national income accounting. A more "causal" analysis requires different models, tools, and data.

As to the actual points enumerated by Denison, we see no evidence that the sources of such utilization changes have already been counted in the other inputs. There is no evidence that our rather faulty machinery price deflators have allowed for such improvements in the quality of capital. Nor is there any evidence that this has been already counted in the contribution of labor or inventory input. For example, the ratio of inventories to shipments in manufacturing has remained virtually unchanged between 1947 and 1965.[78]

From our point of view, the main difficulty with the capacity utilization adjustment is that it is not articulated well with our theory and measurement of capital services and their rental prices. We lack an explicit theory of capacity utilization. It is either a disequilibrium phenomenon, or is related to differential costs of working people and machines at different hours of the day and different days of the year. Neither case fits well into the equilibrium, all - prices - are - equalized, framework of national income accounts. One possible basis for such a theory is to make depreciation a function of utilization. Thus, industries where machines worked a higher number of hours per year would have a higher rate of depreciation. In such a world, a mix change such as discussed by Denison would show up as an increase in aggregate capital input, with the weight of industries with higher δ's increasing in the total. And from our point of view, this would be a correct interpretation of the data. An economy that succeeded in recovering its capital in a shorter period would in fact experience a growth in output, and our measure would provide an "explanation" for it.

The issue whether this growth should be attributed to "advances in knowledge" or to increase in "inputs", is ultimately a semantic one. What is important is to know whence it has come, not what its name is. We don't think it very fruitful to put utilization into the "advances in knowledge" category because (a) the latter is already a "residual" category and throwing something more into it will just muddle up its meaning further, and (b) the types of change which are likely to be the sources of the increased rates of utilization, be they institutional or a consequence of changing relative scarcities of machine versus human time, are only very vaguely and probably misleadingly related to the ideas associated with the concept of "advances in

knowledge". In any case, our contribution was to isolate and identify a potentially important source of growth. Since we have not really "explained" it, and we agree that this is the important next task, we are unwilling to argue too much over "naming" it. We find it more convenient to work within a broader definition of "input," minimizing thereby the role of the amorphous "residual." But we concede that the same questions can be also asked in a different language.

7.8. Labor input

Our methods for measuring labor input are similar to Denison's, except that Denison reduces the observed income differentials among components of the labor force classified by years of school completed to allow for the correlation between education and "ability." At the same time, Denison also makes an adjustment for the increase in the length of the school year over time. We have made neither of these adjustments and have come out to about the same numbers as Denison, indicating that these two adjustments just about cancel out. Elsewhere one of us has argued that Denison's "ability" adjustment may be too large.[79] Thus, if we had made a smaller ability adjustment and had accepted Denison's "days per school year" adjustment our total labor input would probably grow somewhat faster over most of this period.

Our labor input measure is very similar to Denison's. Careful examination of the issues raised by Denison leads us to the conclusion that our original estimate of labor input can be left unchanged. This estimate has been incorporated into our measure of total factor productivity, but with a relative weight that differs due to changes in our method for allocating noncorporate income between labor and capital. We have also corrected the error of omitting unpaid family workers from our estimates of persons engaged; this leaves the final results unaffected.

7.9. Conclusions and suggestions for further research

We have summarized the differences among our estimates of the rate of growth of total factor productivity for the period 1950–62, based on the results of Christensen and Jorgenson [20], our original estimates [60], and Denison's estimates [28]. At this point it is useful to compare these alternative estimates and to attempt a reconciliation among them; a partial reconciliation is given in table 25. From this comparison it is apparent that our new estimates represent a compromise between our original position and Denison's position. Referring to table 25, we may now summarize our conclusions. From an empirical point of view the greatest differences among our original estimates, our revised estimates, and Denison's estimates are in the adjustment for utilization of resources. Denison estimates that the utilization of resources declines between 1950 and 1962. We estimate that utilization increased, but by considerably less than we originally suggested. The revision in our adjustment for relative utilization accounts for 0.47 percent per year of the total discrepancy of 0.73 percent per year between our original estimate of the rate of growth of total factor productivity and our revised estimate.

From a conceptual point of view the greatest difference among alternative procedures is in the allocation of income from property among its components. Except for our assumption that replacement requirements should be estimated by the double declining balance formula, our estimates of capital stock for each class of assets are very similar to Denison's estimates. Our estimates of capital input differ very substantially from his due to differences in treatment of the tax structure for property income, the use of real rates of return rather than nominal rates for each class of assets, and the use of declining balance depreciation and replacement. Part of the unexplained residual between our version of Denison's estimate of total factor productivity and his own is accounted for by his separation of assets among those held by housing, agricultural, and all other sectors of the economy. This separation goes part of the way toward a satisfactory treatment of the tax structure, but should be replaced, in our view, by a breakdown by legal form of organization.

Table 25.—Reconciliation of Alternative Estimates of Growth in Total Factor Productivity, 1950–62

(percent per year)

Denison, adjusted for utilization, his data		1.41
Denison's utilization adjustment	−0.04	
Denison, unadjusted, his data		1.37
Unexplained difference	.07	
Denison, unadjusted, our data		1.44
Capital input:		
Quality change	.30	
Our utilization adjustment	.11	
Jorgenson-Griliches, adjusted, revised		1.03
Revision in utilization adjustment	.47	
Other revisions	.26	
Jorgenson-Griliches, adjusted, original		.30

In revising our original computations we have made a number of conservative assumptions and did not correct for some obvious errors in the data where the data base for such adjustments appeared to be too scanty. This is particularly true of the deflators of capital expenditures that we used and of our measure of land input. More research is needed on these and on the magnitude and sources of changes in utilization rates, on capital deterioration and replacement rates, and on the changing characteristics of the labor force.

While better data may decrease further the role of total factor productivity in accounting for the observed growth in output, they are unlikely to eliminate it entirely. It is probably impossible to achieve our original program of accounting for all the sources of growth within the current conventions of national income accounting. But this is no reason to accept the current estimates of total factor productivity as final. Their residual nature makes them intrinsically unsatisfactory for the understanding of actual growth processes and useless for policy purposes.

To make further progress in explaining productivity change will require the extension of such accounts in at least three different directions: (1) allowing rates of return to differ not only by legal form of organization but also by industry and type of asset; (2) incorporating the educational sector into a total economy-wide accounting framework; and (3) constructing measures of research (and other intangible) capital and incorporating them into such productivity accounts.

To allow rates of return to differ among industries and assets would require a much more detailed data base

than is currently available and would introduce the notion of disequilibrium (at least in the short and intermediate runs) into such accounts. Such a framework would be consistent with a more general view of sources of growth [80] and would introduce explicitly the changing industrial composition of output as one such source.

In measuring labor input, OBE data on persons engaged should include estimates of the number of unpaid family workers, such as those of Kendrick [61, 62]. Estimates of man-hours for different components of the labor force should be compiled on a basis consistent with data on persons engaged as Kendrick has done. Although Denison [28] has given additional evidence in support of his adjustment of labor input for intensity of effort, a satisfactory treatment of this adjustment requires data on income by hours of work, holding other characteristics of the labor force constant. Until such data become available it may be best to exclude this adjustment from the measure of real labor input incorporated into the national accounts. Quality adjustments for labor input based on such characteristics of the labor force as age, race, sex, occupation, and education should be incorporated into the labor input measure.

The basic accounting framework should also be expanded to incorporate investment in human capital along with investment in physical capital. Investment in human capital is primarily a product of the educational sector, which is not included in the private domestic sector of the economy. In addition to data on education already incorporated into the national accounts, data on physical investment and capital stock in the educational sector would be required for incorporation of investment in human capital into growth accounting.

Another issue for long-term research is the incorporation of research and development into growth accounting. At present research and development expenditures are treated as a current expenditure. Labor and capital employed in research and development activities are commingled with labor and capital used to produce marketable output. The first step in accounting for research and development is to develop data on factors of production devoted to research. The second step is to develop measures of investment in research and development.[81] The final step is to develop data on the stock of accumulated research. A similar accounting problem arises for advertising expenditures, also currently treated as a current expenditure.

Both education and investment in research and development are heavily subsidized in the United States, so that private costs and returns are not equal to social costs and returns. The effects of these subsidies would have to be taken into account in measuring the effects of human capital and accumulated research on productivity in the private sector. If the output of research activities is associated with external benefits in use, these externalities would not be reflected in the private cost of investment in research. Some way must be found to measure these externalities. Once such measures are developed and the growth accounts expanded accordingly, this would result in a significant departure from the conventions of national accounting, more far-reaching than the departures contemplated in our original paper. A new accounting system is required to comprehend the whole range of possible sources of economic growth.

Footnotes

1. Estimates of real capital input are presented in [19]; estimates of total factor productivity are given in [20]. Our original estimates are presented in [47, 60].

2. Christensen and Jorgenson [19], pp. 314–319.

3. Denison [26], pp. 35–87, and Griliches [43], pp. 1414–1417.

4. Accounts are given by Christensen and Jorgenson [20].

5. All references to data from the U.S. national income and product accounts are to *The National Income and Product Accounts of the United States, 1929–1965, Statistical Tables, A Supplement to the Survey of Current Business*, August 1966, henceforward *NIP* [66].

6. Self-employed persons include proprietors and unpaid family wor kers. The method for imputation of labor compensation of the self -employed that underlies our estimates is discussed in detail by Ch ristensen [18]. Alternative methods for imputation are reviewed by K ravis [63].

7. Kendrick [61, 62]. Office of Business Economics data on nonfarm proprietors and employees are from *NIP* [66], tables 6.4 and 6.6.

8. Christensen and Jorgenson [20] assume that the statistical discrepancy reflects errors in reporting property income rather than labor income.

9. This allocation is described by Christensen and Jorgenson [20], pp. 297–301.

10. A derivation of prices of capital services is given by Hall and Jorgenson [52, 53] for continuous time. Christensen and Jorgenson [19] have converted this formulation to discrete time, added property taxes, and introduced alternative measurements for the tax parameters. Similar formulas have been developed by Coen [21].

11. The perpetual inventory method is discussed by Goldsmith [36] and employed extensively in his *Study of Saving* [38] and more recent studies of U.S. national wealth [34, 35, 37]. This method is also used in the OBE *Capital Goods Study* [49] and in the study of capital stock for the United States by Tice [73].

12. Denison [28], p. 140.

13. Detailed evidence on the quality of the price quotations underlying the WPI is presented by Flueck [32].

14. See Gordon [39] for additional evidence supporting this position.

15. The A.T. & T. structures index uses American Appraisal Company indexes with essentially negligible productivity adjustments since 1955.

16. Gordon's "final Price of Structures" index rises by 11 percent less between 1950 and 1965 than the constant cost 2 deflator. See Gordon [40], table A–1, pp. 427–428. Gordon errs, in a paper published a year later than ours, in failing to notice that the final version of our paper did not incorporate the Bureau of Public Roads index as a deflator but used the more representative but still imperfect OBE constant cost 2 index.

17. The imputation of the value of services from owner-occupied dwellings and structures is imputed by this method in the U.S. national accounts. *NIP* [66], table 7.3.

18. See footnote 6.

19. This division of the private domestic economy follows the U.S. national accounts; see *NIP* [66], table 1.13. Other sectors included in the accounts are government and rest of the world.

20. These data were provided by the Office of Business Economics.

21. Christensen and Jorgenson [20] assume that errors in reporting property income occur mainly in noncorporate business.

22. Christensen and Jorgenson [20] assume that business transfer payments are taken mainly from corporate income.

23. Alternative provisions for the investment tax credit are discussed by Hall and Jorgenson [52].

24. Christensen and Jorgenson [19] assume that no depreciation is taken during the year of acquisition of an asset.

25. Formulas for the present values of depreciation deductions are:

straight-line:

$$\frac{1}{rt}\left[1-\left(\frac{1}{1+r}\right)^{t}\right]$$

sum of the years' digits:

$$\frac{2}{rt}\left[1-\frac{1+r}{r(t+1)}\left(1-\frac{1}{1+r}\right)^{t+1}\right].$$

where r is the discount rate and t is the lifetime of assets allowable for tax purposes. Depreciation practices have adapted to the use of accelerated methods only gradually, as Wales [75] has demonstrated.

26. The appropriate rate of return for this purpose is the long-term expected rate of return; 10 percent is close to the average of corporate after-tax rates of return for the period 1929–67. See Christensen and Jorgenson [19], table 5, pp. 312–313.

27. Griliches [45], pp. 77–78.

28. See footnote 7.

29. See for example [13], p. 7, where it is estimated that the quality of men deteriorated by less than 1 percent over the 10 year period between 1956 and 1966 due to changes in their age distribution.

30.

	Index Numbers; 1958=100			
	Men	*Women*	*Total*	*Weighted total*
1964	107.7	120.8	112.1	110.2
1950	99.1	81.9	93.8	95.7

The weights used were 0.805 for males and 0.195 for females. The share of men in total earnings was 0.81 in 1958 and 0.80 in 1964. These figures imply a −0.13 percent per year decline in the quality of the labor force due to the increase in the female population. Given our average labor share, this would imply a −0.09 percent contribution to the rate of growth of total input. These numbers are taken from [14].

31. "Quality change" in this sense is equivalent to aggregation bias. For further discussion, see Jorgenson and Griliches [60], especially pp. 259–260.

32. Kendrick [62], pp. 252–289, and Solow [70], p. 315.

33. Denison [26], especially pp. 67–72.

34. Dension [26], especially pp. 35–41.

35. Solow [70], p. 315.

36. Kendrick [62], especially pp. 252–289.

37. Denison [25], p. 4.

38. Denison [25], p. 2.

39. See Section 7.5 below for further discussion.

40. Denison [27], fn. 1, p. 2.

41. The absolute contribution of productivity change is discussed by Denison [25], pp. 2–3.

42. See Hall and Jorgenson [52]; see also [53]. We assume here that the decline in efficiency of capital goods with age is geometric so that capital consumption allowances are proportional to capital stock. If decline in efficiency is not geometric, capital consumption allowances are not proportional to capital stock and depreciation is not equal to replacement. Since Denison assumes that decline in efficiency is linear rather than geometric [28, p. 140], serious difficulties arise in preserving internal consistency in his accounts for gross product, net product, factor input, and capital stock. See Section 7.5 below for further discussion.

43. The interpretation of Divisia indexes is discussed by Solow [70], Richter [68], and Jorgenson and Griliches [60].

44. Denison [25], p. 4.

45. Denison [25], p. 4, bases his allocation of noncorporate income on relative shares in the nonfinancial corporate sector. This procedure has the effect of ignoring the impact of the corporate income tax. For further discussion, see Christensen [18].

46. See Denison [25], p. 5.

47. In fact, our revised estimates can be regarded as solving the problem of simultaneously incorporating both property taxation and the corporate income tax posed by Denison as follows:

> For one tax classified as indirect, that on real property, this assumption [that the tax be included in the earnings of capital] may be preferable. Indeed, in the context of considering the effect of taxes on the allocation of resources among sectors of the economy, I have myself suggested that one should not consider the impact of the corporate income tax, which bears only on the corporate sector, without simultaneously considering the property tax, which bears most heavily on the principal noncorporate sectors of the private economy: housing and farming [25, p. 5].

48. Denison [25], pp. 6–13.

49. Denison [25], p. 8.

50. Denison [25], p. 8, suggests adjusting the weight of land, but not that of other capital, for inflation. His actual procedure [26, 28] for allocating property income ignores the effects of inflation for all assets. Denison [25], p. 8, argues that:

> Their [our] idea is that current asset values are proportional to . . . the discounted value of the anticipated stream of earnings and capital gains . . . .

He then states that prices of depreciable assets

> . . . are firmly anchored to the present price level and present production costs of capital goods and are not affected by capital gains.

Actually, the contradiction between our view and his is only apparent. From the point of view of producers of capital goods the prices are anchored to present production costs. From the point of view of purchasers of capital goods these prices are related to the discounted value of future earnings, including capital gains or losses. Thus prices are simultaneously anchored to the current price level and to anticipations of future earnings.

51. Denison [25], pp. 8, 13, acknowledges the possibility that his results could be improved by taking capital gains into account in measuring earnings from land.

52. Denison [25], p. 13.

53. Jorgenson and Griliches [60], p. 257. See Kendrick [61, 62].

54. Denison [25], p. 13.

55. Denison [28], p. 140.

56. Denison [28], p. 140.

57. Denison [28], p. 14.

58. Denison [28], p. 351.

59. Denison [28], p. 14.

60. Denison [26], pp. 112–113.

61. Denison [28], p. 140.

62. Denison [28], p. 351.

63. Hickman [54], pp. 223–248; Hall and Jorgenson [52], pp. 28–31. Many other references could be given. Geometrically declining efficiency is the standard assumption in econometric studies of investment behavior.

64. Meyer and Kuh [64], pp. 91–94.

65. Cagan [17], pp. 222–226; Griliches [42], pp. 197–200; Wykoff [76], pp. 171–172.

66. Hall [51], pp. 19–20.

67. Griliches [41], pp. 121–123 and 129–131.

68. Jorgenson and Griliches [60], pp. 259–260; see also [44].

69. Jorgenson and Griliches [60], p. 260.

70. See Solow [69, 71]; for an interpretation of the resulting measure of capital input, see Jorgenson [59].

71. Denison [25], p. 26.

72. For a detailed discussion, see Christenson and Jorgenson [19], p. 296.

73. Our calculations are based on data from Goldsmith [35], table A–13:

Category of private land	In constant prices (1947–49=100)			Average (1945–58) relative weight in total value of private land
	1945	1958	Rate of change per year 1945–58	
	(1)	(2)	(3)	(4)
Agricultural	53.8	52.9	−0.15	0.40
Residential	31.3	44.6	2.77	.23
Nonresidential	47.7	64.6	2.37	.33
Forests	6.4	6.9	.60	.04

NOTE.—Rate of growth of private stock of land per year=Σ[column 3×column 4]=1.38.

74. Denison [19] employs OBE estimates of inventory stocks [25], p. 13; we have employed the same estimates of inventory stocks. We also incorporate estimates of stocks of depreciable assets from the OBE Capital Goods Study [49]. Although Denison did not employ these estimates, he indicates that:

> Had the OBE study been completed, I would have used OBE capital stock series based on Bulletin F lives, on the use of the Winfrey distribution for retirements, and on the use of the OBE "price deflation II" [25, p. 14].

This accords with our estimates except for the use of the Winfrey distribution.

75. See [49].

76. Denison [25], pp. 12–14.

77. Denison [25], p. 16.

78. There is also some confusion about the measurement of marginal contributions in some of Denison's examples. These examples seem to imply that if higher skill workers are required to run new machines, the contribution of such machines cannot be measured separately and is already included in the contribution of labor input. But this is clearly wrong.

79. Griliches [45] and [48].

80. See Johnson [57] for an outline of a similar position.

81. See Griliches [46] for further discussion of this topic and for some order of magnitude estimates.

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By EDWARD F. DENISON

Final Comments

I. Changes and Clarifications

Dale Jorgenson and Zvi Griliches amend and clarify their views in the preceding article [24]. I am pleased that revisions bring their estimates close to mine, and appreciate their statement that my critique of their earlier estimates was helpful.

The reappearance of productivity change

Jorgenson and Griliches abandon or greatly mute the main point of their earlier article. They had asserted that analysts who preceded them were wrong to attribute a substantial part of the growth of United States output to rising productivity. On the contrary, Jorgenson and Griliches stated, there has been little or no change in productivity. The conflicting results obtained by the rest of us stemmed from procedural errors in measurement which they "weeded out," and these errors had caused us to misinterpret the very fundamentals of economic growth.

The basis for their claim was their own estimate that real GNP per unit of input increased only 0.10 percent a year in the private domestic economy from 1945 to 1965 [18]. This was supported by previous research in which they had almost eliminated productivity increase over the whole period since 1929 [15]. They suggested that still more precise accounting for inputs would probably show that there had been no change at all in productivity.

Their series showed that from 1950 to 1962 rising productivity contributed 0.30 percentage points to the growth rate of private domestic GNP. My estimates for the same period implied 1.38 points.[1] My SURVEY article investigated the reasons for the discrepancy, concluded their series was wrong, and showed why [19].[2] They have now accepted much of my criticism. As against their former 0.30, their new estimate appears to be about 1.14.[3] Their revision comes chiefly from (1) discarding most of their capital utilization adjustment and (2) eliminating most sales and excise taxes from their estimates of the earnings of capital. Some of the other errors (as in their measurement of inventories) have been corrected. Their new figure, though in my opinion still too low, is 83 percent of mine, so the "disappearance" of productivity change has vanished. The remaining difference of 17 percent between our estimates raises no question about the fundamentals of economic growth.

Jorgenson and Griliches now conclude (p. 89) that "While better data may decrease further the role of total factor productivity in accounting for the observed growth in output, they are unlikely to eliminate it entirely." This is a reversal of their original position. But one might have hoped for a less equivocal statement. Better data may always raise or lower an estimate. But this sentence implies an undocumented belief that they would probably *reduce* the estimated growth in total factor productivity; that this reduction would not be achieved by a mere reclassification of growth sources from productivity to input; and that it remains possible, if unlikely, that all the advances in technology and managerial knowledge that we have observed, the expansion of markets, shifts of surplus labor from farming, etc., have done nothing to raise productivity.

I do not share these beliefs. The idea that productivity may not have changed at all is as farfetched as ever. Moreover, better data are as likely to raise as to lower estimates of productivity gain. A

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Very helpful comments from George Jaszi and T. K. Rymes are gratefully acknowledged. Neither shares responsibility for views expressed or any errors I may have committed.

1. This was after adjustment, for comparability with their estimate, of my figure of 1.37 points for the contribution of output per unit of input to the growth rate of total national income.

2. My brief but similar comments on their previous article had been disregarded [16].

3. They show 1.03 in their table 24, which refers to an output series whose scope has been changed by addition of a large imputation for depreciation of and imputed rent on consumer durables. All of the amount imputed is necessarily counted as a contribution of capital input. The addition to the scope of the output measure much reduces the productivity estimate when, as in this figure, it is expressed as a growth rate or contribution to the growth rate of total output. They describe the need to adjust the figure for comparability with their earlier estimates or mine, but their table 25, which compares the three estimates, surprisingly repeats the 1.03 figure so cannot have been adjusted. They give insufficient Pata to adjust precisely, but an adjustment to 1.14 for comparability appears conservative.

careful reworking of my own estimates is, in fact, yielding slightly higher figures for the contribution of output per unit of input than those obtained previously, which were already above the amended figures of Jorgenson and Griliches.

Clarification of Jorgenson-Griliches treatment of unmeasured quality change in capital goods

I welcome the clarification by Jorgenson and Griliches of their views concerning "unmeasured quality change" in capital goods. Such quality change consists of improvements in the design of capital goods that raise their marginal products relative to their costs.

All readers of the original article by Jorgenson and Griliches whom I encountered were reluctant to attribute to them the view that advances in knowledge, economies of scale, and reallocation of resources together have contributed only trivially, if at all, to longrun growth because this view is alien to common sense and contradictory of previous research. They believed the Jorgenson-Griliches finding of almost no productivity change must derive from use of a different classification.[4] Most thought, not without encouragement from the wording of the article [18, especially pp. 36-37], that one aspect of this reclassification was the transfer of some of the contribution of advances in knowledge from productivity to input by counting unmeasured quality improvement in capital goods as an increase in capital input. My article pointed out that nothing in their statistical procedures would produce this result. Moreover, it pointed out, it was not really clear from their text whether or not Jorgenson and Griliches even thought they had made such a transfer. Their current article agrees that they made no such transfer, and states that they did not think they had done so. They agree that no part of the difference between either their earlier or present estimates and mine is caused by a different treatment of unmeasured quality change. This is a welcome clarification.

Desired treatment of unmeasured quality change

But what Jorgenson and Griliches would *like* to do about quality change that is not measured by present procedures still requires discussion. Although they indicate that their view of embodiment is the same as mine (p. 87), it is not clear whether this means that their view of the appropriate treatment of unmeasured quality change is the same. To clarify this point it is necessary to retrace old ground once more.

Although present measures of capital investment, and hence of capital stock, in constant prices do not conform exactly to any definition because good price data are scarce, they do have a general characteristic which can be described and illustrated and is the characteristic under discussion.

Suppose that in Year 1 a certain kind of factory building costs $1 million (inclusive of all costs including the return to equity capital of builders and suppliers) and that it also sells for $1 million. By the time some subsequent Year 2 arrives, a certain architect, Mr. Smith, has devised a new factory layout that is more efficient, and new factories are now constructed in accordance with his design. Factories of the old design may not be built at all in Year 2, but they could be built and sold for $1½ million; because of inflation their cost is higher than it was in Year 1. The new factory costs and sells for $2 million in Year 2.

The price index for factories in Year 2 (Year 1=100) that is used in deflation will (barring measurement errors) be 150 ($1½ million÷$1 million), and this is the crucial number. Deflating current dollar expenditures by the price index yields values in constant prices of Year 1 of $1 million for an old-type factory and $1⅓ million for a new-type factory. These constant-price values for the two types of factories are, of course, used in all years in which they are produced. The new-type factory is thus always counted as the equivalent of 1⅓ old-type factories; this is the number of old-type factories that could be built in Year 2 with the resources actually devoted to building each new-type factory in Year 2, because $2 million is 1⅓ times as much as $1½ million. The difference between 1 and 1⅓ is measured quality change. Capital stock series in constant prices are constructed by cumulating past investment in constant prices, so new-type factories are counted as 1⅓ times as much capital as old-type ones in capital stock series too. The marginal product of a new-type factory after it is in service is more than 1⅓ times as great as that of an old-type factory because of the improved layout that Mr. Smith has devised. We can infer that this is so because buyers' preference for the new type means they believe the ratio of marginal product to cost is higher for the new-type factory than for the old. But we have no way of knowing by how much this ratio exceeds 1⅓. If factories were rented, the rent on a new-type factory would also be more (by the same unknown amount) than 1⅓ times the rent on an old-type factory, if neither had deteriorated from use, because the relative rental values would be proportional to relative marginal products. The difference between the cost ratio of 1⅓ and the unknown but higher marginal product ratio is the "unmeasured quality change" that has occurred in factories. The result is similar, because of the nature of price data used in deflation, for producers' durable goods (and, indeed, for consumers' goods if "marginal utility" is substituted for "marginal product" in the description).

In my view, often stated, (1) it is impossible to substitute marginal products for costs in equating capital goods of different vintages because unmeasured quality change cannot be measured, and (2) for growth analysis it is better to equate (weight) unused

4. When Jorgenson and Griliches first suggested that a complete accounting would eliminate changes in output per unit of input, I myself wondered whether they might somehow consider that anything measured directly becomes an "input," which would make output per unit of input a synonym for the "residual." The "residual" in growth analysis obviously and by definition would disappear if the effects of changes in all determinants of output—whether components of output per unit of input or of total input—could be and were directly and precisely measured. Even in their present article, passages on pages 66 and 89 seem to use "output per unit of input" and the "residual" interchangeably and thus to support the original suspicion. But their explicit disavowal of this interpretation of the earlier article and the general thrust of their present article indicate that when they say output per unit of input (or total factor productivity) they mean this, and not the residual.

capital goods of the types represented in different vintages by their actual or hypothetical relative cost at a common date than by marginal products. With this procedure, to which actual "conventionally measured" data approximately correspond, unmeasured quality improvement does not raise capital input when earlier vintages are replaced by later ones. Gains achieved from designing better capital goods are counted as contributions af advances in knowledge—in the previous example, as the contribution of Mr. Smith's discovery of an improved factory layout.

A theoretical alternative would count capital goods of a later vintage which embody unmeasured quality improvements as more capital relative to those of an earlier vintage by substituting the ratio of their marginal products for the ratio of their costs at a common date as weights to combine them. If it could be implemented, this procedure would cause the capital stock in constant prices and hence capital input to rise more over time than the present procedure, and would transfer the the gains provided by improved design of capital goods from advances in knowledge to capital. This would eliminate the possibility of a rise in the efficiency of capital and would destroy the possibility of analyzing advances in knowledge as a separate source of growth.

Jorgenson and Griliches repeat in the present article the statement that was the original cause of confusion about this whole subject: that they would like to weight capital goods of different vintages which are in simultaneous use by their relative marginal products if services prices were available from which relative marginal products could be inferred (p. 87). Service prices per dollar of conventionally measured gross stock would be lower for older than for newer vintages not only because they are older and their performance may have deteriorated more from the time they were new (which everyone agrees should be taken into account in measuring capital input) but also because newer vintages incorporate design improvements. What would this procedure mean for the measurement of capital input? Presumably, Jorgenson and Griliches would change the input of any one vintage during its service life only to allow for physical deterioration occurring in the services provided as time passes. Apart from this, each vintage would be the same amount of input so long as it was in use. Because of design improvement, each successive vintage would be counted as more input, relative to a vintage remaining in use, than the preceding vintage when it had been in the same physical condition. Hence, replacement of each vintage by a later vintage would raise capital input. The procedure would therefore raise the growth rate of the capital stock in constant prices (and hence capital input) relative to the conventional capital stock measure, and change the classification of growth sources by transferring from advances in knowledge to capital the output effects of improvements in the design of capital goods.[5] It is not clear whether Jorgenson and Griliches deny that this is so (a position that previous writing by Jorgenson [14] may imply) or whether they mean that they *wish* to make such a transfer.

To try to avoid further confusion, I must comment upon the following sentence from Jorgenson and Griliches (p. 87): "If it were possible to implement our original suggestion that different vintages of capital goods be weighted in measuring capital input by their marginal products, this would not have the effect of incorporating 'embodied' technical progress, as Denison suggests." The term "embodied technical progress" has often been used with a very broad though rather vague meaning to cover the *total* effects on productivity of any change in processes of production that requires a change in the physical attributes of a capital good—no matter how trivial the change in the capital good may be, and regardless of whether or not the new knowledge that is being introduced stems from or has any relationship to knowledge about capital goods design. Jorgenson and I [12, 14, and elsewhere] both indicated years ago that we saw little or no value to this concept nor possibility of obtaining estimates conforming to it, and had no wish to adopt it. This is not a source of disagreement between us, nor is it what I have been discussing. I have been discussing only embodiment into the capital input measure of the difference between the growth rates of capital stock when different vintages are equated by (a) marginal products at a common date, and (b) cost at a common date, and the resulting transfer, from the contribution made to the growth rate of output by advances in knowledge to that of capital, of this difference times the weight in total input assigned to structures and equipment. My view, to repeat once more, is that this transfer (1) cannot be made and (2) would be undesirable in any case because it would yield a less useful classification of growth sources; what is really the contribution of advances in knowledge would be counted as a contribution of capital [19, p. 27; 23]. Jorgenson and Griliches (1) agree that this transfer cannot be made, at least for most goods at the present time, but (2) whether they would like to make it I still do not know.

Clarification of views on inclusion of depreciation in weights

A more complete clarification concerns the Jorgenson-Griliches view of the appropriate treatment of depreciation when earnings are used to weight labor, capital, and land. They had stated vigorously that other analysts erred in obtaining earnings weights by using property earnings measured net, rather than gross, of depreciation. On at least three occasions they attacked John Kendrick, specifically, for using net earnings. They made no distinction between analyses of gross and net product. Kendrick's valuable analyses of productivity change have concentrated on growth of net product, but he has also derived gross product as an incidental by-product of his analysis.

5. This result would be avoided only if the input (in constant prices) of any vintage were made to decline each year within its service life to reflect not only deterioration but also obsolescence resulting from the availability of better goods. No intention to use this novel procedure can be inferred from their writing, and the procedure could not be implemented by use of service prices because, even if they existed, service prices would not permit effects of obsolescence on service price differentials to be distinguished from those of wear and tear.

My article stated that net earnings should be used to analyze net product, and gross earnings to analyze gross product.[6] Thinking only of Kendrick's net product analysis, I defended his use of net earnings for weights. Jorgenson and Griliches now state that their criticism of Kendrick referred only to his gross product analysis. Thus we agree on this important point.

II. New Estimates

Time passes. Much of the new Jorgenson-Griliches article is devoted to the reproduction, description, and defense of estimates that were recently published elsewhere by Christensen and Jorgenson, are here endorsed by Griliches, and are presented as replacements for the previous Jorgenson-Griliches estimates. I have also been reworking and extending my estimates, and have introduced numerous refinements in data and technique. A later publication will present and describe them.

I shall neither undertake here a general examination of the new Christensen-Jorgenson estimates and the Jorgenson-Griliches discussion of them nor describe the changes being made in my own procedures. It is unnecessary because my views as expressed in the previous SURVEY OF CURRENT BUSINESS article have not changed and need not, in general, be reiterated.[7] Alterations being made in my procedures are consistent with those expressed there. Any sufficiently diligent and perspicacious reader can discover the extent, which is substantial, that Christensen-Jorgenson have changed the Jorgenson-Griliches procedures to meet my objections. I shall, however, offer brief observations on three aspects of the new estimates and their discussion, and then turn in part IV to an extended discussion of various aspects of a general topic which permeates their article.

III. Miscellaneous Brief Comments

This section comments upon three unrelated aspects of the new article by Jorgenson and Griliches.

Statistical errors

Some of the simple statistical errors in the original Jorgenson-Griliches estimates have now been weeded out, but the procedure that Christensen and Jorgenson use to obtain private GNP in constant prices by their definition (p. 68) contains an odd new error that is very large. From OBE's estimates of GNP in constant prices one would expect them to subtract OBE's general government and rest-of-the-world GNP in constant prices and an estimate for government enterprises. Instead, from OBE's total GNP in constant prices they subtract estimates for general government, government enterprise, and rest-of-the-world GNP that they obtain by dividing OBE's current dollar figures for government, government enterprise, and rest-of-the-world GNP by the average price of all services in the GNP. Consequently, they take out of OBE's GNP in constant prices numbers for general government and rest-of-the-world GNP that are quite different from those that OBE has put in, and the difference becomes part of their private GNP series. It causes them to understate the increase in private GNP in 1958 prices by $5 billion from 1950 to 1962 and by $12 billion from 1948 to 1967, and to understate productivity growth accordingly.

Change in classification of gains from reallocation of resources

The new Christensen-Jorgenson estimates transfer some of the effects of improving or worsening the allocation of resources from productivity to input. Other procedures that Jorgenson and Griliches recommend would go much further in this direction. They do not note these classification effects.

Christensen and Jorgenson separate corporate assets of each type from noncorporate assets, separate farm from nonfarm inventories, and measure each component as a separate input with its own weight (p. 69). The effect is to transfer from output per unit of input to total input gains or losses in output that result from an improved or worsened distribution of each type of capital and of land between corporate and noncorporate use, and in the case of inventories between farm and nonfarm use. Jorgenson and Griliches recommend (pp. 67, 77) treating labor in each occupation and region as a separate input in measuring labor input, although they have not actually done so. This would transfer from output per unit of input to total input gains resulting from an improved allocation of labor among occupations or regions (with no change in the personal attributes of workers). Because of the close correspondence of occupations and industry in the case of farming, gains from shifting labor from farm to nonfarm activities would also be transferred. They also suggest counting as separate inputs different types of investment, and investment in different industries in which rates of return vary; in this case they say the results will help in "explaining" productivity change (rather than that the differences in earnings should be "reflected" in input), but the difference in wording appears to be accidental.

If the distinction between output

6. Alternatively, I noted, if the opposite were done depreciation could be treated as a separate deduction from, or addition to, output that is ascribable to capital.

7. Among many others which I shall not mention again, these include views on long-term changes in capital utilization and the measurement of capital gains in the Jorgenson-Griliches and Christensen-Jorgenson estimates.

growth achieved by an increase in total factor input and output growth achieved by an increase in total factor productivity has any meaning, output gains or losses resulting from the shift of an input from one use to another surely belong in the productivity series. Hence, the changes in input measurement that Jorgenson and Griliches make and suggest are inappropriate. The proper course, in my opinion, is to retain these gains and losses in productivity, but to try to isolate them as a separate productivity component.[8]

Additional duplication from imputations

Objections to the use of gross output in growth analysis become stronger if imputations for consumer durables or human capital are added to the scope of output. The reason I consider even the OBE version of GNP to be an unsatisfactory and uninteresting output measure for growth analysis is that it is a duplicated measure and there is no reason to wish to maximize its value (relative to real costs incurred). Some economists whose judgment I respect nevertheless prefer it on the grounds that it is so difficult to measure capital consumption that GNP may yield a better index than NNP of the growth rate of net output itself. I believe this is incorrect; but even if it were correct, use of GNP leads to wrong conclusions as to the increases in net output that result from adding to capital.

Because no basic principle underlies the amount of duplication in GNP, it is always easy to raise its value by increasing the amount of duplication. By introducing into GNP an imputation for the gross return on consumer durables, Jorgenson and Griliches more than double the value placed upon them. Most of the addition is for depreciation; consumer durables are quite short-lived so they depreciate quickly. This addition greatly increases the duplication already present in the OBE version of GNP.

In contrast to business depreciation, which is subtracted from GNP to obtain NNP, this imputed depreciation on consumer durables must be added to NNP to obtain GNP. If there were merit to the statistical case for using GNP with its present coverage because depreciation is hard to measure, this would argue for *not* adding imputed depreciation on consumer durables.

One effect on growth analysis of the imputation for consumer durables is to change the growth rate of GNP, unless the imputation moves like the rest of GNP. But the main effect is to raise greatly the apparent contribution of capital to the growth rate of output and to lower that of productivity and labor, because all of the absolute increase from one date to another in the imputed depreciation on (as well as the net return to) consumer durables is counted as a contribution of capital. The resulting estimates of contribituons to the growth rate refer to an output measure for which I can see no use. The imputation would not seem to advance the "measurement of total factor productivity from the perspective provided by the economic theory of production," the avowed purpose of Jorgenson and Griliches in preparing their new output measure (p. 65), nor correspond to "the value of output and factor input from the point of view of the producer" (p. 67).[9] If "human capital" is measured as Jorgenson and Griliches recommend (p. 90) I hope it too will not be entered twice.

IV. Capital Input, Depreciation, and Use of Asset Values in Deriving Weights

The Jorgenson-Griliches discussion of the measurement of capital input, net output, net property earnings for use in weights, and the relationships among these series calls for more extended comment, and the remainder of my reply is devoted to these topics.

Jorgenson and Griliches unfortunately introduce into their discussion a false identity and an erroneous description of my depreciation series which greatly confuse the issues and which also make their discussion of the remaining matters obscure. I must deal with these topics before I take up real issues, and the first two of the six subtopics in this section try to clear away this underbrush.

The third subtopic, the most substantive, reexamines the time pattern of capital input, which Jorgenson and Griliches appraise very differently than I do.

The last three subtopics consider the best methods of obtaining depreciation for net product and net earnings estimation, but they are introduced mainly as a response to sweeping and erroneous claims by Jorgenson and Griliches that my estimates are inconsistent in several respects and their own estimates are free of such inconsistencies because they use the double declining balance formula to measure everything. Their specific charges are that (1) the depreciation series I use to obtain net product is inconsistent with my capital input series, that (2) the depreciation series I use to obtain the net earnings of capital and land (which are used to weight these inputs with labor) is inconsistent both with my series for capital input and with the depreciation series I use to obtain net product, and that (3) the series for net stock I use to allocate the total weight of capital and land among components is inconsistent with my capital input series.

The format of a reply to this article by Jorgenson and Griliches is rather inconvenient for a general discussion of the difficult problems involved in handling capital in the measurement of output and input. It not only introduces terminological problems but also forces me to concentrate upon the matters raised by their article, some of which would arise in no other context, at the cost of complicating and restricting discussion of subjects of greater interest and importance. One aspect

8. See [23] for a more complete discussion of the classification of the effects of reallocation.

9. Use of GNP is sometimes advocated for short-term employment analysis. Imputed depreciation certainly creates no employment so its inclusion worsens the GNP measure for this use too.

of the difficulty is that the Jorgenson-Griliches advocacy of use in empirical estimation of the double declining balance formula to measure everything is uncommon if not unique. Curiously, just when Griliches and Jorgenson were first introducing this unusual (and, I believe, quite unacceptable) convention into their growth analysis [15], Griliches himself was discussing related matters more realistically [11, especially pp. 118–25], plotting (for tractors) different curves for the market values of capital goods and for their services, and examining the relevance for different measures of discounting, deterioration, and obsolescence. Use of that article as a starting point might have made for a less complex discussion.

An accounting identity?

Jorgenson and Griliches state as a general principle that "the value of total product is equal to the value of total factor input as an accounting identity" (p. 65) and, again, that "for any concept of gross product the fundamental accounting identity for productivity measurement is that the value of output is equal to the value of input" (p. 67). Their algebraic presentation starts with this supposed identity and long sections of their paper are based upon it. They criticize my methodology because, they say, I violate it.

In fact, no such identity exists except in one special case: a current-dollar series for gross or net national product valued at factor cost.

National accountants recognize market price and factor cost as the two main alternative ways of valuing the components of output, and the new United Nations system recognizes still others. In their original article Jorgenson and Griliches valued output at market prices. Reliance upon their nonexistent "identity" misled them into counting all indirect business taxes and some other assorted items as earnings of capital and land, a mistake they have partially remedied in their new estimates.[10] The identity does and can hold in a current price output measure only if output is valued at factor cost; in that series it must hold because the value placed upon each unit of output is, by definition, the amounts earned by the factors in providing it.

But current price measures have little to do with "productivity measurement," and the identity does not hold in constant prices even at factor cost—unless one abolishes the concept of productivity change. Productivity change is precisely a measure of the degree to which the identity does not hold.[11] There is no such accounting relationship between input and output at constant prices by any method of valuation. The two must be defined and calculated independently.

Christensen and Jorgenson introduce a new valuation for the components of output which they call "gross value added from the point of view of the producer" [22]; similar language is used here on p. 82 and thereafter. Components of gross output are given a value which in current prices is equal to their factor cost plus the following items listed on p. 67:

—The statistical discrepancy in the national income and product account: —$4.5 billion in 1970, but often positive, and erratic from year to year;

—Motor vehicle licenses: $1.6 billion in 1970;

—Property taxes: $35.4 billion in 1970;

—"Other" State and local indirect business taxes: $6.9 billion in 1970, of which, in billions, $3.1 was State selective sales taxes; $1.3 miscellaneous corporate, business, and occupational licenses; $0.7 severance taxes; $0.3 stock and other transfer taxes; and $1.5 miscellaneous local licenses and taxes;

—Business transfer payments: $3.9 billion in 1970, of which, in billions, $1.6 was auto liability payments for personal injury; $1.1 bad debts; $1.0 corporate contributions to nonprofit organizations; and $0.1 unrecoverable thefts.[12]

Given this method of valuing end products, one might wonder how Jorgenson, Christensen, and Griliches can make their own estimates satisfy the "accounting identity" they adduce, even in current prices. The answer is easy. By counting whatever is not labor earnings as capital earnings (p. 68), they simply add all the items not in factor cost to the earnings of capital and land as well as to the value of output. Jorgenson and Griliches give no real explanation of why they adopt this particular method of valuing output. A possible justification, which they do not suggest, would be that the new valuation is meant to provide better estimates of the value of output at factor cost and of the earnings of capital and land than those which emerge from the standard national accounting procedures. There is a minority view that property taxes should be included in factor cost, so this position might be argued with respect to this one large item or part of it. But one must hold extraordinary views indeed as to the source of the statistical discrepancy and as to the incidence of most of the other tax items and transfer payments to support their inclusion in property earnings.

Language problems and a misstatement

Is it really acceptable for Jorgenson and Griliches to allow their penchant for shocking statements to be carried to the extent of incorrectly describing

10. The mistake, of course, was that there is no identity, not that there is some defect in market prices. Market prices provide perfectly sensible valuations of output, and I have shown [19, p. 5] that is it perfectly possible to analyze the growth of national product at market prices in a sensible and consistent way.

11. The Jorgenson-Griliches paper does contain (p. 79) the following sentence: "Total factor productivity is defined as the ratio of real product to real factor input, *or equivalently, as the ratio of the price of factor input to the product price* [italics mine]." The italicized portion may have been included to protect their assertion of an identity; their discussion on page 82, where they say productivity is *equal to* the difference between changes in the *prices* of output and input, each multiplied by the corresponding quantity, supports this inference. Viewing the ratio as a difference in the price movements of input and output would make the identity hold in constant prices by making input definitionally equal to output, that is by measuring inputs over time as the product of their quantities and marginal products. This is the definition they have consistently denied using.

12. I ignore here their imputation for consumers' durables and capital owned by institutions, and their deletion of government enterprises, because these raise issues of scope rather than of valuation.

other people's procedures, considering that there is a danger they might be believed? In this article they make with no qualification a statement that is false in terms of the definitions used for generations by accountants, economists, businessmen, the Department of Commerce, and dictionary writers alike: "Denison measures net national product as gross product less replacement; the correct definition is gross product less depreciation" (p. 65).[13] Jorgenson and Griliches know very well that what I deduct is an estimate of depreciation computed by the straight-line method. Whether this is the best method of estimating depreciation is debatable, but I never before have heard it denied that it *is* an estimate of depreciation.

"Replacement" has usually been used in this field with its ordinary meaning, to distinguish between actual new gross investment that is made for the purpose of replacing capacity to be discarded and gross investment that is made for modernization, to expand capacity, or to produce new products [e.g., 4, p. 36; 5, p. 9]. It has nothing to do with my depreciation estimates.

Jorgenson and Griliches mean something else by "replacement." The meaning they give it has nothing to do with my net product estimates either, but it does confuse any attempt to exchange ideas. In their special language, replacement occurs even if there is no gross investment at all (see the formula on p. 69)! By replacement they seem to mean the decline from the beginning to the end of a period in the input of, or current services provided by, the capital goods that were present at the beginning of the period—a decline that may result either from discarding or from deterioration in the performance of goods not discarded as a result of wear and tear. This could be described as the amount of capital input that would have to be replaced through gross investment if capital input were to be kept unchanged from the beginning to the end of a period (and hence output, in the absence of any other change). It is obvious that "replacement" in this sense is not the same as capital consumption (or depreciation, or the amount of gross investment that would be needed to keep capital intact). Consequently, it is not the proper amount to deduct to obtain net product, and it is not the amount I do deduct. Capital input from the wonderful one-hoss shay did not decline from its 70th to its 71st year, so "replacement" in this sense was zero, but there was nevertheless capital consumption because its remaining period of usefulness was reduced by one year. My procedure, of course, would make a deduction; I do not deduct "replacement" in their sense, so their statement that I "deduct replacement" is incorrect even by their special definition.

Jorgenson and Griliches claim to have one series that simultaneously measures *both* the decline in capital input *and* capital consumption. "Replacement" in their terminology can perhaps be defined then as that magnitude which has the magic property of being equal to two things which are not equal to each other.

Capital input

I turn now to a more substantive topic, the timing of *capital input*. The necessity for this discussion arises mainly because Jorgenson and Griliches continue to measure capital input in a way I regard as wholly implausible and recommend their procedure to me. But it is also needed for my subsequent discussion of their claim that I use inconsistent procedures and that their own estimates are free of such sins.

The discussion of this and the following subtopics will inevitably convey a greatly exaggerated impression of the sensitivity of actual growth analyses of real economies to the choice of series and procedures. In most periods actual results are not sensitive to the choices made for measurement of capital input and net product. But one cannot be indifferent among them.

For growth analysis, a series for the input of a structure or producer's durable good is meant to measure the change that occurs each year in its ability to contribute to annual production. This is not the same as the change in its money earnings (or service price) even if the prices of output and of capital goods do not change. As a capital good grows older its earnings may be reduced by competition from newer types of capital goods which appear on the market, the cause of most obsolescence.[14] Such obsolescence is simply the counterpart of "unmeasured" quality change in capital goods. The appearance of better goods does not reduce the ability of existing goods to produce and therefore should not be allowed to affect capital input.[15]

Series that are used to measure the total input of structures and equipment (jointly or separately) are explicitly or implicitly a weighted average of estimates for each "vintage" of each type of capital good. The implications of the Jorgenson-Griliches procedure and mine can therefore be compared by contrasting the results we obtain for one vintage of one type of capital good.

Let 100 units of some type of nonresidential structure or equipment, costing $1,000 per unit, enter the stock at the middle of some year.[16] Suppose that with normal use and maintenance these goods would have an average service life of, say, 30 years if no better capital goods were designed in the interim, but that because of obsolescence it will actually be profitable to scrap them after an average of 20 years so that 20 years is the observed average service life. It is common for these two figures to differ; surveys (as well as observa-

13. They even repeat the statement (as on pp. 82, 86)! They also say (p. 87) that my net stock is "net of replacement rather than net of depreciation" and cite in evidence a page from my writing which says unambiguoulsy "the estimates based on . . . straight-line depreciation were selected."

14. Obsolescence may also occur because of a decline in demand for the products a capital good is best able to produce or a change in the location that is best for its installation. I intrepret this type of obsolescence as impairing its ability to contribute to annual production, and thus as properly reflected in capital input, but I believe this type to be of relatively minor importance. For brevity, I shall henceforth exclude it when I refer to obsolescence.

15. I presume Jorgenson and Griliches would agree with this statement so long as it is clear that in their case I (1) refer to what they call in their table 11 "potential capital input," so that their utilization adjustment is not at issue, and (2) refer to their present capital input estimates which do not incorporate unmeasured quality change. I need not speculate on their views as to the treatment of obsolescence if unmeasured quality change were to be incorporated.

16. The OBE capital stock estimates are based on the simplifying assumption that each year's new investment is made at midyear. The series shown in chart 1 follow OBE procedures. Jorgenson and Griliches evidently assume that all investment is made at the end of the year (see their footnote 24).

tion) show obsolescence of existing capital goods by technical change to be a common reason for discarding them and incurring the expense of new gross investment [e.g., 4, p. 36]. In our actual estimates Jorgenson-Griliches and I use the same numbers for the figures corresponding to the 20-year period and make no use of figures corresponding to the 30-year period because none are available. But the difference between the two should be kept in mind in evaluating the reasonableness of alternative methods of measuring capital input.

Suppose also that when the goods are discarded they will have no scrap value. Suppose, finally, that goods identical to those introduced in Year 0 (as well as improved ones, after the initial year) could be bought at the same price throughout the service life of these goods, so that historical cost, current cost, and conventionally measured constant cost value are all the same. These assumptions simplify the example and discussion without affecting the issues. Chart 1(A) shows the series we would each obtain for the capital input provided by these goods over time. It is obvious that I estimate the decline in input to be far less rapid than do Jorgenson and Griliches.

The Denison series is estimated by calculating a weighted average of gross stock (weighted 3) and net stock (weighted 1) when these series are computed by use of the Winfrey distribution of retirements around the mean service life and the net stock is computed by use of straight-line depreciation.[17] The Winfrey distribution avoids the unrealistic assumption that the entire vintage is discarded on the same date. The distribution of discards that it imposes is indicated by the gross stock series shown in chart 1(C), which corresponds to the numbers of goods remaining in the stock at each date.[18] My procedure of weighting gross and net stock is simply a convenient way to obtain a capital input series that moves in a way I regard as reasonable. So long as all of the goods remain in the stock the input series declines moderately; this decline is intended to reflect any decline in performance and rising expenditures for repairs and maintenance (which must be deducted to arrive at the contribution of capital goods to GNP or NNP whether they are incurred by the user or by the seller under a guarantee). The faster decline starting in the ninth year marks the beginning of the complete discarding of some of the 100 capital goods as estimated by the Winfrey distribution, and the subsequent changes in the rate of decline reflect the time scatter of discards. When half the average service life is exhausted, 99 percent of the goods are estimated still to be in use and capital input is estimated to be 87 percent of its amount at the beginning. When the average service life of 20 years (which is less than the average physical life) is reached and half the goods remain in the stock, capital input is 39 percent of its amount at the start.

No doubt the correct time pattern for the change in total capital input for a vintage varies among types of capital goods, but this seems to me a realistic judgment of the typical pattern, reasonably adequate when large numbers of such series are combined so that the benefits of offsetting errors are obtained.[19] A small improvement, especially in the case of such major investments as a whole new manufacturing or power plant, would be to let capital input rise for a short time after installation before it reaches its present initial level in order to take account of break-in time and the remedying of initial defects. However, such a change would not alter aggregate series much.

The time pattern for a single capital good within its own service life is much the same as that I show for all 100—except that the drop toward the end of service life is more abrupt[20]—if a capital good typically is well maintained until a decision is made to retire it, the decision to retire occurs because of obsolescence well before it would occur if wear and tear were the only consideration, and maintenance is cut back after a decision to retire is reached so that performance deteriorates sharply just before retirement. Tibor Barna found these conditions to be typical of plant and equipment used in British manufacturing [10], and I believe them also to be representative of much plant and equipment in the United States.

What happens to capital input if the original capital goods are replaced when they are discarded?[21] If each of the 100 were replaced by a new but otherwise identical good just as it was discarded, capital input would rise by 0.33 percent as each good was replaced, and if (contrary to the Winfrey distribution) all were simultaneously replaced after 20 years capital input would rise by one-third; this results from my 3–1 weighting of gross and net stock. The rise would reflect the better performance and lower maintenance cost of unused capital goods.[22] If replacement were by goods of new and improved design costing the same amount as the old type, the effect on the capital input series would be the same. But as the new goods entered production, output would rise more than if replacement had been by new goods of the old type. The difference is the contribution of the development of better capital goods which can be supplied at the same cost as the old, a contribution which I wish to ascribe to advances in knowledge.

The pattern of capital input within the actual service life correctly takes no account of obsolescence due to

17. See [19, p. 14] for the rationale, and the reasons different weights have been used in different studies. I use this method only for *nonresidential* structures and equipment; I do not use a capital input series to measure the contribution of dwellings to growth.

18. Comprehensive capital stock series are little affected by changing the distribution of discards that is assumed. *Some* type of distribution around the average service life is desirable, however, to prevent an annual gross stock series from incorrectly mirroring too exactly sudden changes in past gross investment.

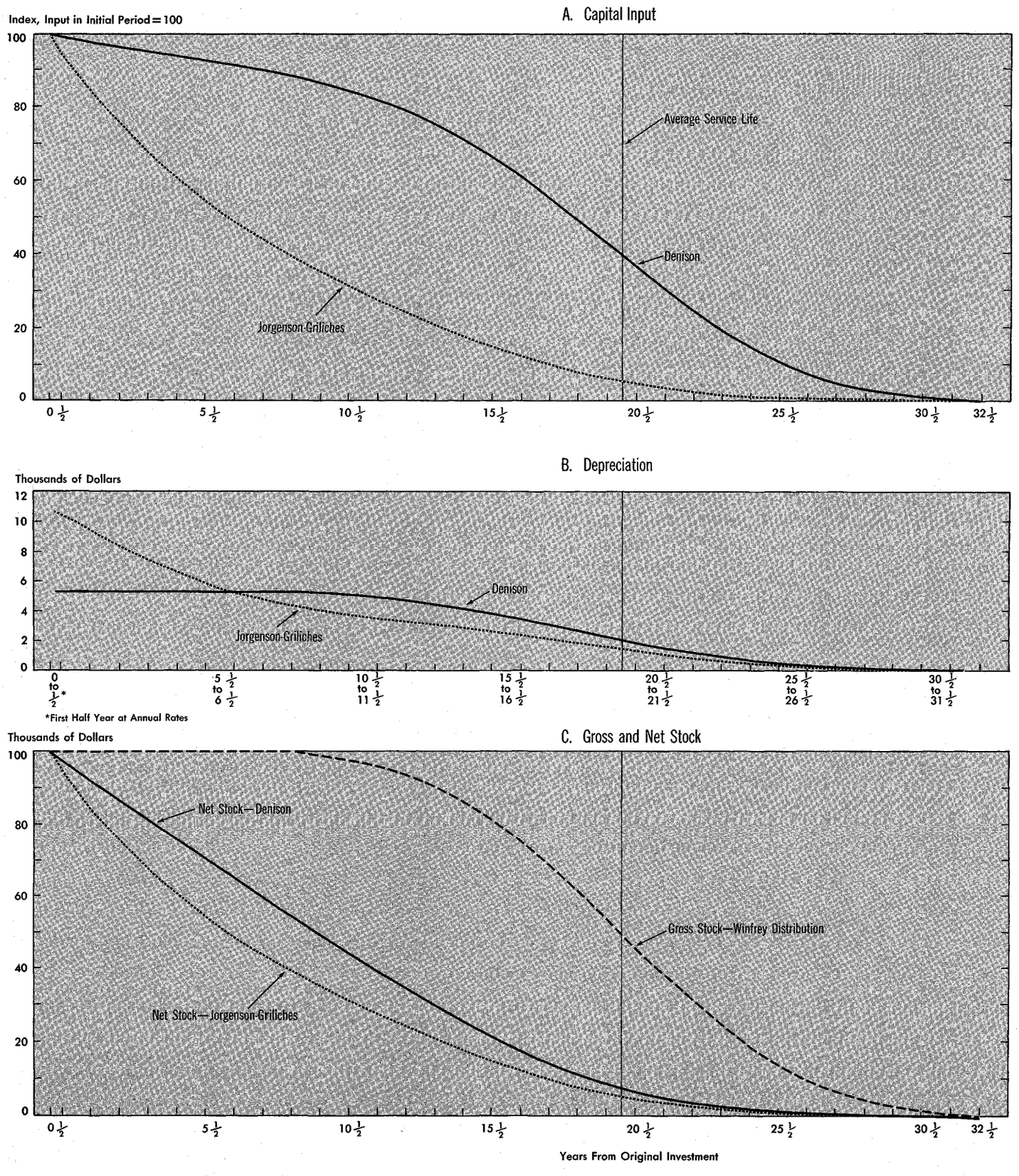
19. In the United States aggregate data for nonresidential gross and net stock usually move so much alike that even a substantial alteration in the 3–1 weights assigned scarcely changes the capital input index.

20. The tendency for abrupt decline is mitigated by the fact that some capital goods are used in a standby capacity before they are completely discarded.

21. I, of course, use "replaced" with its ordinary meaining.

22. Replacement by identical goods would not actually happen after an average of 20 years under the terms of the example because, if the original capital goods were to be replaced by identical ones, the original ones would be continued in service longer—for an average of 30 years; replacement occurs at the end of 20 years, on the average, only because better goods have become available and made replacement profitable.

Chart 1. Time Patterns of Capital Input, Depreciation, and Capital Stock for 100 Capital Goods Costing $1,000 Each, With Average Service Life of 20 Years Comparison of Denison and Jorgenson-Griliches Estimates



availability of better capital goods, which in no way reduces the ability of existing capital goods to contribute to output.

The Jorgenson-Griliches series for capital input (i.e., their "quantity of potential service flow") is the same as the value of the net stock at constant prices that is computed by use of the declining balance formula at double the straight-line rate.[23] They state (p. 70): "We must specify the relationship between the quantity of an asset acquired at one date and the quantity of the service flow of the asset at future dates . . . we have assumed that the service flow from the ith investment good declines geometrically over time." The rate of decline (μ), which of course is crucial, is equal to 2 divided by the average service life [21, p. 295; 22, p. 34].

The services that capital goods with a 20-year average service life perform are estimated to decline by 10 percent in the first 12 months, and by 10 percent of the remaining amount every succeeding 12 months. The services of capital goods are thus assumed to drop sharply in the early years of their lives, then slowly. When only half the average service life is reached, and nearly all the goods may be presumed still to be in use, capital input is estimated to be only 33 percent of its amount at the beginning. When the average service life of 20 years is reached, capital input is estimated to be only 6 percent of its initial amount even though about one-half of the goods are still in use [24] and even though the reason that the average service life is not longer is commonly obsolescence rather than physical exhaustion. For short-lived goods the immediate reduction in services that is implied by the method is very extreme: for equipment with a 5-year average service life as shortened by obsolescence, it is 40 percent in the first 12 months. When one good is replaced by another at the expiration of service life, capital input jumps from almost nothing to the original value of the new good.

As I stated in my earlier article [19, p. 15], Jorgenson and Griliches assume that the ability of capital goods to contribute to current production drops very much faster and farther within their service lives than seems to me at all plausible. In my experience this judgment is widely shared. Why Jorgenson and Griliches use their pattern puzzled me then as it does now, and I am surprised that their present article neither makes any serious attempt to defend it (that some econometricians find it convenient is hardly expert testimony) nor abandons it. I can only leave it to the reader to judge which of the two patterns is the more reasonable on the basis of his own observation or experience.

Depreciation deduction to secure net product

This section will examine the first of the allegations that my estimates contain an inconsistency which those of Jorgenson and Griliches avoid. It will also consider which of our depreciation series is more reasonable for net product measurement.

Jorgenson and Griliches claim that the depreciation series I deduct from gross product to obtain net product is is inconsistent with my measure of capital input (pp. 65, 82, 86).[25] They recommend that in order to achieve consistency I use the declining balance formula to measure capital input, as they do, and also to measure depreciation (p. 87). Adoption of the latter recommendation would substantially raise my depreciation series and lower my net product estimates.

I have no desire to be consistently wrong, so I would be prepared to forego consistency if it could be obtained only by adopting capital input estimates which, as already indicated, I regard as unreasonable.[26] The situation, fortunately, requires no such choice.

Only the constant-dollar net output series enters the productivity calculations so only the constant-dollar depreciation series is relevant to this first allegation of inconsistency. To discuss it, I first describe the alternative depreciation series for the derivation of net product. Mine is computed by the straight-line formula. Jorgenson and Griliches recommend use of the double declining balance formula (p. 82). Chart 1(B) shows the two depreciation series for the example. They have two things in common. First, over the whole period the sum of annual depreciation charges in constant prices equals the cost of the asset in constant prices. Second, in constant prices depreciation in any period is equal to the change in the value of the net stock over that period, computed by use of the same formula. However, the two depreciation estimates in any period are very different. Theirs is higher in the earlier years and lower in the later yeas. The corresponding net stock values are compared in chart 1(C). The Jorgenson-Griliches net stock estimate is always lower than mine except at the installation date, when the two are the same. Aggregate depreciation for the economy is always higher by their method.

Because of disagreement as to just what the depreciation series deducted to obtain the net product of the nation is intended to measure (disagreements center on discounting and obsolescence), at least two views need to be considered in order to examine the issues.

The first view, to which I adhere, is that the best *implementable* procedure would be to obtain depreciation by allocating the cost of each asset over its service life in proportion to its estimated input at different dates.[27] My

23. The net value of a capital good would never drop to zero if this formula were applied literally but in practice some cutoff date must be used because gross capital formation data are not available for the infinitely remote past. OBE's procedure followed in the series plotted in chart 1 is to drop the remaining value when it is completely trivial.

24. Jorgenson and Griliches do not distinguish the reduction in input caused by discarding from the reduction caused by deteriorating performance of goods remaining in the stock, but it must be assumed that the implied pattern of discarding is consistent with the actual average service life from which the calculation starts.

25. The exact nature of this alleged inconsistency, as they see it, I cannot decipher because each time they discuss it, and particularly on p. 82 where their discussion is most extended, they misrepresent my depreciation series as an estimate of "replacement," which is it not by either the usual meaning of the word or their special meaning.

26. Jorgenson and Griliches could make their capital input estimates somewhat less unrealistic, while retaining the declining balance formula and its alleged advantage in convenience, by greatly reducing the value of μ.

27. As explained in footnote 31, this procedure differs from that which I would regard as theoretically best only in that obsolescence is spread over the life of the asset instead of charged when it is discarded.

depreciation estimates closely approximate those which would be obtained by this method and those of Jorgenson-Griliches meet it.

I could apply this method exactly but it requires a great deal of work that is unnecessary because, given my pattern for capital input, this "capital input" method would produce depreciation estimates that are very close to those obtained by straight-line depreciation. To take a simple example, suppose that an individual asset lasts 4 years and its services behave as I suppose when I weight gross stock 3 and the "straight-line" net stock 1. The following results, expressed as percentages of the original value, are obtained by these two methods and the double declining balance method.

	Denison capital input	Straight-line	Double declining balance
1st year	27.7	25	50.00
2d year	25.9	25	25.00
3d year	24.1	25	12.50
4th year	22.3	25	6.25
5th and later years, total			6.25

By merely relabeling the "years" in this table "quarters of total service life," the table can be applied to a capital good with any service life. For the nonresidential capital stock as a whole and its broad components the actual percentages of service lives exhausted invariably fall well within the two middle quarters of service life. The difference between the "Denison capital input" and "straight-line" depreciation estimates is trivial within this range, much too small to warrant the laborious calculations required by the "capital input" method.[28] For all practical purposes the straight-line depreciation estimates are consistent with my capital input series.[29]

If the time pattern of capital input is measured by the net stock computed by the double declining balance formula, the time allocation of depreciation by the capital input method is necessarily the same thing as direct use of the double declining balance formula, whose results are shown in the text table. Accordingly, if the capital input method is accepted, the Jorgenson-Griliches estimates too are consistent.

Jorgenson and Griliches deny that my estimates are consistent. They take pride in their own identity and are apparently untroubled that it is obtained only by their unrealistic assumption about capital input.

But Jorgenson and Griliches do not share my view that for net product measurement it is appropriate to obtain depreciation by the capital input method, and I shall bring out the strange fact that if their view of what depreciation should measure is accepted the consistency between their capital input and depreciation series, which pleases them so much, need no longer hold.

The second view, to which Jorgenson and Griliches adhere, is that the depreciation to be deducted to measure net national product should be the same as would be appropriate for business accounting for profits: it is the change that takes place during a year in the discounted value of expected future earnings of the asset.[30] Expected future earnings are governed by the number of years of remaining service life, and by the present value of each remaining year as it is affected by discounting future earnings to the present, by physical deterioration, and by obsolescence.[31]

Although I cannot accept this view, the choice between the two views seems to me to be of no great practical importance because I think the straight-line formula yields results that correspond better to those needed to account for *profits themselves* than does the double declining balance formula, and would therefore be the more appropriate of the two for computation of depreciation to secure net product even if the two series should be the same.[32] Let us explore the considerations.

The decline that takes place in the net value of an asset each year results from deletion of the present value of one year of remaining service life. Each year of life has an equal present value if (a) the discount rate is zero, (b) the good is of the one-hoss shay type so that there is no change in its physical ability to provide services throughout its service life, and (c) there is no actual or anticipated obsolescence. Under these conditions the exhaustion of every year of service life would reduce net value by the same absolute amount; the decline in value would be the same each year. The straight-line depreciation pattern clearly is appropriate in this case. But how does the pattern change if assumption (a), (b), or (c) is changed while the other two are retained?

A discount rate above zero makes the nearer years in the remaining life of an asset more valuable than the later years. A year in the remaining life of an

28. For each vintage of each separate category of structures or equipment, it requires a separate calculation for goods that are estimated by the Winfrey distribution to be discarded at each date.

29. The series for capital input themselves result from an assumption that, though realistic, is merely an approximation, and one should seek no greater precision from a depreciation estimate.

30. Presumably a constant discount rate is to be used for the life of the asset.

31. In my view, as already stated, net product measurement calls for the application of different criteria to the measurement of depreciation from those used in business accounting for profits. First, although it is correct to discount future income in computing depreciation to account for profits, it is not correct to do so in computing depreciation to obtain net national income or product, series in which every year is regarded from the standpoint of that year, not from the vantage point of some earlier year, and which include interest costs as well as profits [6, pp. 246-48: 8, pp. 281-82]. Second, obsolescence should be deducted when a good is retired rather than be spread over the good's service life. (If the capital stock is growing, this would yield lower estimates of aggregate depreciation in any year than the "capital input" method I have described as the best implementable method.) Even when a good is retired (although this point does not affect the numbers at all), obsolescence should not be thought of as a deduction from the value of the old good but as an offset to the value of the new, improved good which replaces the old good before its physical service life is exhausted [6, pp. 242-45]. (If there is no obsolescence it will not be prematurely discarded.) To deduct obsolescence at retirement, one would need to know the amounts by which obsolescence shortens service lives. In the total absence of such information, the best expedient is to spread obsolescence over the actual service life in proportion to capital input, the procedure adopted in the foregoing text table.

There are still other views on the appropriate measurement of depreciation for net output measurement. One, expressed by Richard Ruggles and at one time (though later withdrawn) by Simon Kuznets, differs from mine only in holding that no deduction at all for obsolescence is appropriate [3, pp. 469-70; 2, pp. 66-67; 7, pp. 277-79]. I presume this is a theoretical point because Ruggles did not explain how he would isolate obsolescence.

32. There are, of course, reasons to favor use of double declining balance in business accounting that are not pertinent here. Besides the fact that the double declining balance formula may appeal to business because it yields tax advantages and to others because allowing its use may stimulate investment, its popularity stems in part from the fact that in a period of sustained inflation its use offsets, though very imperfectly, the understatement of depreciation which results from use of original cost values. This is not a relevant consideration when, as in both the Jorgenson-Griliches-Christensen estimates and mine, depreciation is valued consistently at either current or constant cost.

asset that is 20 years in the future has less present value than a year immediately ahead—only one-third as much if the discount rate is as low as 6 percent. Shortening the remaining service life of a 20-year asset from 20 years to 19 years therefore deducts much less than 1/20 from its value. With discounting, the exhaustion of the first year of life is of the least value; the appropriate depreciation charge is small at first and steadily rises. The appropriate curve for net value is convex to the origin, the opposite of the declining balance pattern. The degree of convexity is greater the longer the asset's service life and the higher the discount rate. At any realistic discount rate the convexity is pronounced except for quite short-lived assets. For long-lived assets such as houses or other structures it is extreme. For example, assets with a 60-year life that meet conditions (b) and (c) would not lose half their value until they are 45 years old even if the interest rate were as low as 4 percent.

Deterioration of physical services works the other way; it makes the year of an asset's service that is used up each year more valuable than the average remaining year. However, if the typical pattern is at all as I suppose, the effect on depreciation is small, at least until the very end of an asset's service life is near.

Obsolescence also makes the later years less valuable. As it ages the asset must compete with better, newer goods simultaneously in service and this reduces its earnings. How important this is depends on the amount and timing of obsolescence that takes place within the good's service life. Both deterioration and obsolescence tend to make the pattern of net asset values concave.

Use of the straight-line formula in accounting for business profits assumes the effects of discounting to be approximately offset by those of deterioration and obsolescence, so that as a year is dropped from an asset's remaining service life its net value declines by the same percentage as does the number of years of remaining life or (what is the same thing) by the same absolute amount each year. If this assumption is correct—and it seems to me as reasonable as any alternative—the inconsistency between my capital input and constant price depreciation series that Jorgenson and Griliches allege is not present even by their criteria for measuring depreciation.

Insofar as Jorgenson and Griliches make any attempt to defend use of double declining balance, it rests on the alleged pattern of asset values. Use of a declining balance pattern for asset values assumes that the effect of discontinuing is *more* than offset by the effects of deterioration and obsolescence. Use of the declining balance formula at *double* the straight-line rate assumes that discounting is far more than offset. It implies either extremely fast deterioration of physical services or an extremely high rate of obsolescence. Jorgenson and Griliches do not say which they assume. If it is the former I can only repeat that so fast a pattern of deterioration strikes me as utterly unreasonable. More reasonable defenses of the use of double declining balance to measure net value of assets have rested on the proposition that obsolescence is very fast. This argument may well be valid for certain kinds of machinery which have been recently invented and are being rapidly improved. But even if double declining balance described the general pattern of asset values, and if the pattern were due to obsolesence being a much more potent factor than discounting, this would not mean that the double declining balance method would be appropriate to measure *capital input*. Because its pattern should not reflect obsolescence, capital input should decline much less rapidly than asset values. Use of the double declining balance formula for both capital input and depreciation is then *inconsistent*. The fact is that there is no way to be sure whether or not a capital input series and a depreciation series are consistent if one accepts the "second view" of what depreciation should measure unless one knows all the facts about discounting, deterioration, and obsolescence.

So much for this first charge of inconsistency. Let me return to the more interesting question of what probably does happen to asset values as capital goods age. In my opinion, the rate of obsolescence for structures and equipment as a whole that would be required to justify general use of double declining balance depreciation in accounting for business profits far exceeds any likely rate. To appraise the probable implications of the two formulas for obsolescence, an example, based on use of assumed illustrative numbers for the first year of life of an asset with a 20-year service life, may be instructive.

(1) If each year of its life is assigned the same value, as would be the case with no discounting, deterioration, or obsolescence, the loss of value (depreciation) in the first year is 5 percent.

(2) But it is necessary to allow for discounting. Assume an 8 percent interest rate. At that rate an annuity of 19 remaining future annual payments of equal amount is worth only 2.2 percent less than an annuity of 20 remaining payments of the same amount. Allowance for discounting consequently cuts the initial 5 percent first year depreciation to only 2.2 percent (or by 2.8 points).

(3) If there is deterioration, the first year's services represent more than 5 percent of the total services provided in the 20-year life span. For example, my method of measuring capital input would assign 5.7 percent, or 0.7 points more, to the first year. Moreover, the latter figure must be raised to take account of the fact that these extra services are more valuable because they occur in the first year than they would be in an average year of the 20-year period. At 8 percent, the 0.7 must be raised to 1.3.

(4) By adding to the 2.2 percent obtained in step (2) the 1.3 obtained in step (3), we obtain first year depreciation of 3.5 percent of total value. At first sight this would appear to be the appropriate first year depreciation before allowing for obsolescence. But this figure already includes an allowance for obsolescence unless the service life with which we started was not shortened by obsolescence. I have no information as to how much service lives are actually shortened by obsolescence on the average. I assume for this calculation, as I did in the example upon which the charts are based, that it was from 30

years to 20. In that case, the calculation should have started in step (1) with a figure of only 3.3 percent of original value instead of 5 as first year depreciation in the absence of discounting, deterioration, or obsolescence. This is a reduction of one-third, and the figure of 3.5 percent at which we have arrived up to now must be similarly reduced, to 2.3 percent, to obtain the first year depreciation appropriate in the absence of obsolescence.[33]

(5) The straight-line method charges 5 percent of original value in the first year, and thus on the assumption of this calculation allows for a rate of obsolescence of nearly 3 percent a year (5.0—2.3). The double declining balance method charges 10 percent in the first year and thus allows for a rate of obsolescence of nearly 8 percent a year (10.0—2.3). If the percentage rate of "unmeasured" quality improvement in capital goods is constant, then this rate—the annual percentage increase in the average quality of capital goods over and above that obtained by purchasing more costly capital goods—is the same as the rate of obsolescence. Thus, the two formulas imply about 3 and 8 percent, respectively, as the rate of unmeasured quality change.

These results depend on the terms of the example, but these were selected to be fairly representative and give a reasonable approximation of the situation for all structures and equipment.[34]

There are at least two reasons, besides general observation, to believe that a figure of the order of 8 percent a year is far too high to be representative of unmeasured quality improvement in all structures and equipment. One is that the combination of such a rate with observed service lives would be grossly inconsistent with rational business behavior. If, in the case of assets with a 20-year life, new capital goods that were 8 percent more efficient than the *previous* year's goods had been when they were new became available every year at the same price as the old, the original capital goods should be discarded by the time half of their 20-year life had expired. In only 9 years new goods would be twice as efficient as those in the original vintage had been even when they were new. The second reason is that the rate at which productivity advances—whether one accepts my estimates or those of Jorgenson and Griliches—is insufficient to accommodate the contribution that would be made by such a rate of quality improvement.[35]

Can one check directly on the way values change as goods age? If original cost, current cost, and constant cost are the same, the net stock series corresponding to the concept of business accounting for profits would be similar to one which might in principle be constructed by valuing each item in the stock by the higher of (1) the price the present owner would have to be offered to induce him to part with it, and (2) the highest price any prospective purchaser would be willing to pay for it. For many reasons, the first price is typically the higher, as evidenced by the small fraction of capital goods that are sold in any year, but this is not always the case and some goods are sold.

One is tempted to try to draw inferences from the study of second-hand prices. But there are only a few commodities for which markets are wide and representative enough to permit this even to be attempted; most are customarily tied in use to others (which makes transfer costs high and design unsuitable in another use) or even immovable. Houses and certain types of transportation equipment or other mobile machinery like tractors are the most promising. Even in these cases care is required to take proper account of transfer costs, changes in guarantees and other terms as goods that are sold pass from new to used and become older, differences between the condition of goods retained by owners and those offered for sale, changes in the price of new items, the strength of demand, the difference between list or asking prices and transaction prices for new commodities, and other complications.

Jorgenson and Griliches appeal to second-hand market values for a few equipment items to support use of the declining balance formula to measure net stock. Even for these items they do not try to support the *high rate* of attrition that they assume. They mention some conflicting results but fail to notice important studies by Raymond Goldsmith, Paul Taubman, and R. H. Rasche. Goldsmith [1] obtained the very opposite of the double declining balance formula for what is by far the biggest capital stock component to which Jorgenson, Griliches, and Christensen apply this formula. Using data from the 1934 Financial Survey of Urban Housing, he found that houses, for which a service life of 50 to 60 years is usually used, retained half the value of new houses when they were 45 years old.[36] This implies that depreciation on houses rises sharply as they age, and a highly convex pattern for net stock. Taubman and Rasche obtained similar patterns for office buildings, another large component of the capital stock, and believe them applicable also to factory buildings [20]. The evidence of second-hand prices can be used more effectively to argue that the straight-line formula makes asset values fall too fast than that it makes them fall too slowly. Indeed, if the general pattern for structures is that found by Goldsmith, Taubman, and Rasche; and if one also considers that large components of "equipment" are not production machinery but items like furniture, or such items as trucks, on which there is little obsolescence; then it is hard to see how the overall decline can be more than linear even if that for production machinery is. Certainly the evidence lends no support to the very fast decline which the double declining balance formula yields.

33. The result depends, among other assumptions, on the rate used for discounting. It would be raised from 2.3 to 2.9 percent of original value if a 6 percent interest rate were substituted for 8 percent. However, Jorgenson and Griliches use 10 percent as the rate of return; its use would yield a figure lower than 2.3.

34. It is quite possible that they overstate the average extent to which service lives are shortened by obsolescence, but it is certain that 20 years understates the average service life; and changes in these two assumptions have offsetting effects.

35. This is not a new way of looking at the matter [see e.g., 17, pp. 149, 150; and 13, p. 725].

36. This is not a surprising result. In the absence of deterioration or obsolescence, discounting alone would cause houses to retain half the value of new houses after 45 years of service if their total life were 60 years and the discount rate 4 percent, or if total life were 55 years and the discount rate 7 percent.

It may be anticlimatic to point out that the growth rate of net product is barely affected by the way depreciation is measured. In a real economy like the United States in which the capital stock is growing, depreciation is, to be sure, persistently higher and net product lower in constant as well as current prices if the double declining balance formula is used. But comparisons show that the difference is so stable that, except in quite unusual periods, it scarcely affects the growth rate of real net product. For measurement of output growth, the choice of formula is of minor importance.

Weighting: Total property weight

For analysis of the sources of growth of net product, the fact that the double declining balance formula, which Jorgenson and Griliches recommend, yields larger depreciation estimates in *current* prices than does the straight-line formula which I use *is* important. Its use yields a smaller estimate of the net (after-depreciation) earnings of capital and land—much too small an estimate, in my opinion. It thus reduces the weight assigned to capital and land relative to labor in the calculation of an index of total input and lowers the estimated contribution of capital to the growth of net product.

The second Jorgenson-Griliches charge of inconsistency (pp. 65, 85, 86) is that the depreciation series I use to obtain net property earnings and therefore the weights I use to combine labor with capital and land are inconsistent with my capital input series whereas, they claim, their capital input and depreciation series are consistent with one another. Because there is no conceptual distinction between depreciation appropriate for the measurement of net product according to the "second view" and depreciation appropriate for use in measuring capital earnings to be used in weights (p. 86), my showing in the preceding subsection that their charge that my depreciation for net product measurement and my capital input are not inconsistent on the "second view" is equally a response to this second charge of inconsistency.

However, it may be useful to look at this charge in another way. It is apparently because in my estimates the ratio of (1) capital input to (2) the net stock that is consistent with depreciation rises as a capital good ages, whereas in their estimates it is constant, that Jorgenson and Griliches think my series are inconsistent.[37] This notion could hardly be more wrong. The ratio clearly should rise to reflect the reduction in the remaining years of service life; the only question is whether my ratio rises too much or too little. It rises by the correct amount if there is no discounting, obsolescence, or deterioration or if the effects of discounting on the net value of an asset just offset those of obsolescence and deterioration, the assumption underlying use of straight-line depreciation for this purpose. If discounting is not fully offset, my ratio does not rise fast enough. The direction or size of the error, if any, cannot be determined without exact data for the appropriate discount rate, for obsolescence, and for deterioration.

Failure of the Jorgenson-Griliches ratio of capital input to net stock to rise as the remaining service life of an asset diminishes is *prima facie* evidence that their series are inconsistent, not an indication of consistency. As I said in my earlier article [19, p. 15], "value must decline as remaining service life diminishes whereas a measure of current services must not do so" for this reason. If they insist upon using the declining balance formula, they should at least use a lower rate of attrition for capital input than for net stock.

Jorgenson and Griliches also assert that the depreciation series I use to obtain capital earnings and the depreciation series I use to obtain net product are inconsistent with one another; indeed, they call this the "most serious" problem with my treatment of depreciation (p. 85). This is an especially puzzling charge. Except that one is in current and the other in constant prices, my two depreciation series are the same. They should be the same if one believes, as they do, that the same criteria are appropriate for both depreciation series. If (as in my case) he does not, then the two should be the same only if the same measure conforms to both sets of criteria. I have argued above that the straight-line formula in fact gives the best approximation to both, and this is why I use the same series.

Although Jorgenson and Griliches find my two series, which are identical, to be inconsistent with one another, they find the two series they recommend, which also are identical, to be consistent with one another!

Weighting: Allocation of total property weight

Because the double declining balance formula used by Jorgenson and Griliches yields much smaller values for the net stock of structures and equipment in current prices than does the straight-line formula, without affecting land and inventory values, its use reduces (I believe understates) the share of the total capital and land weight (itself already reduced by double declining balance depreciation) that is assigned to structures and equipment, and raises the shares assigned to land and inventories. This is because asset values are used to allocate their total weight among these types of assets.

Let me now refer to what I take to be the last of the Jorgenson-Griliches charges of inconsistency in my estimates: that the allocation of my total weight for capital and land among detailed components is inconsistent with my measure of capital input (pp. 65, 75).

As I have stressed, the ratio of input to value rises as a depreciable asset grows older and fewer years of future service life remain. This fact does introduce a small error into my allocation of weights among nonresidential structures and equipment, inventories, and land. I shall describe this defect in a moment. It does not affect my weight for dwellings and residential land, and it is reduced by treating sectors, in which the proportions of the other three types of assets differ, separately in deriving

37. At least, this is the only interpretation I can place upon this charge.

weights.[38] It creates an "inconsistency" between my detailed weights and my capital input series in the same sense that any series which contains an error is inconsistent with any other series which does not contain the same error.

The aroma of discovery with which Jorgenson and Griliches disclose this error is surprising inasmuch as I pointed it out in my first growth study and have noted it repeatedly, even in the article to which Jorgenson and Griliches are responding [19, footnote 20, and references given there]. Only by producing a set of series which contain the basic inconsistency of implying a constant ratio of capital input to net stock value do Jorgenson and Griliches themselves avoid this inconsistency in detail.

38. In published studies the sectors are farm and nonfarm nonresidential business. My present study also divides the nonfarm component between corporate and noncorporate entities. These divisions are made only to improve the weights attached to structures and equipment, inventories, and land. Unlike the new Christensen-Jorgenson procedure described under the heading "Change in Classification of Gains from Reallocation of Resources," I do not treat capital or land used in different sectors as separate inputs.

The error is easy enough to describe. I wish to assume that the rates of return on inventories, land, and fixed capital within any sector distinguished are the same. Distribution of earnings in proportion to asset values (the statistical procedure adopted) implements this assumption exactly only if ratios of net earnings to net asset values correctly measure rates of return. For a depreciable asset, the ratio of net earnings to net asset value necessarily increases in the course of its service life and can be equal to the rate of return over the whole service life (the desired figure) at only one date. My procedure implies an assumption that for the whole nonresidential stock this point is reached when the fraction of service life that is exhausted is that which actually has been exhausted. Most rate of return estimates are similarly based on earnings-asset ratios, with the curious exception, as I pointed out elsewhere, of those concerned with human capital [17, p. 142].

For any category of capital goods, the fraction of the total service life that will have been exhausted when the ratio of earnings to asset value actually equals the rate of return depends upon the length of total service life, the rate of return, the time pattern of the good's contribution to earnings, the time pattern of capital input, and the amount and time pattern of obsolescence. In the absence of obsolescence, the estimated time pattern of capital input can be used to calculate just when this point is reached for capital goods of any stated service life at any stipulated rate of return, and I have often made illustrative calculations of this type. I have even tried to correct comparisons of rates of return in different countries, obtained initially as earnings-asset ratios, to allow for differences among countries in the fraction of service lives exhausted [17, pp. 142–43]. In the course of such experimentation, I have satisfied myself that the error introduced into my weights by use of the usual assumption is minor.[39]

39. It appears usually to cause slight understatement of the weight attached to structures and equipment and overstatement of that assigned to land and inventories. Use of the double declining formula would yield much greater understatement of the weight assigned structures and equipment, but the offset is in the labor weight.

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By DALE W. JORGENSON and ZVI GRILICHES

Final Reply

In our paper, "The Explanation of Productivity Change" [60],[1] we showed that earlier estimates of total factor productivity by Edward F. Denison and other productivity analysts contained serious conceptual flaws. Most analysts weight total labor and total capital input by estimates of their marginal products to obtain a measure of total factor input. We argued that the same principle should have been applied consistently to the subcomponents of labor and capital input as well.

In our paper, "Issues in Growth Accounting: A Reply to Edward F. Denison," we demonstrate in much greater detail that capital input and total factor productivity measures employed by Denison in his monographs, *Sources of Economic Growth* . . . [26] and *Why Growth Rates Differ* [28], are permeated by internal contradictions. Although Denison agrees that subcomponents of capital input should be weighted by their marginal products, he fails to apply this principle in an internally consistent way.

The force of our criticism is easy to appreciate, even for someone who does not wish to enter into the details of the argument. Economic depreciation plays a crucial role in any measurement of capital input and total factor productivity. Depreciation depends on the decline in efficiency of capital goods. In Denison's two monographs two different assumptions about decline in efficiency are employed, but the same basic method for calculating depreciation, the straight-line method, is employed in both.[2] At a minimum it is obvious that if one of Denison's calculations is correct the other is wrong. In our reply to Denison we demonstrate that both sets of calculations are internally inconsistent.

Denison's paper ". . . Major Issues . . ." [25] is devoted to an examination of our procedures for estimating total factor productivity in "The Explanation of Productivity Change" [60]. All of Denison's valid objections to these procedures have been met and several major improvements have been made in our new estimates, based on those of Christensen and Jorgenson [19, 20].[3]

Specifically, capital input has been disaggregated so as to incorporate the effects of direct and indirect taxation in a more satisfactory way. Second, our estimate of the effects of changes in relative utilization has been revised downward. As before, our conclusion is that total factor input, not productivity change, predominates in the explanation of the growth of output.

In our discussion of quality change we distinguish between measures of "quality change" which make it equal to one or another version of the "residual" tautologically, and quality change estimated from current differences in marginal products. To us, this latter type is "measured" quality change, provided that it can in fact be measured with some precision from observed market prices and rents of different commodity groups, including different vintages, and we would wish to count it as part of input in the capital-using sector. This procedure will not eliminate productivity change by definition since it will result in a higher productivity growth in the capital-producing sector. It will only attribute it where it belongs.

Various other issues raised by Denison deal with the semantic problem of what to include in "input" and what to include in "productivity." Since at the aggregate level the idea of an input is at best rather vague while the idea of "productivity" does not hide anything more than the "residual" from all the other calculations, it has been our tendency to take out most of the measurable sources of growth (such as intersectoral shifts) from the wastebasket of the "residual" and include them perforce in our concept of input. We have no objection, however, to a more complex classification scheme.

The major portion of Denison's "Final Comments" is devoted to defending the procedures used in *Why Growth Rates Differ* [28].[4] To state our criticism of these procedures as succinctly as possible: We do not insist that Denison adopt our assumption of geometric decline in efficiency, let alone our depreciation rates; this is one way of solving the problem of maintaining internal consistency, but it is not the only solution. We simply urge him to adopt a single assumption about decline in efficiency and to employ this assumption in measuring both depreciation and capital input. Denison's procedures in *Why Growth Rates Differ* [28] employ one assumption for depreciation and another for capital input.

Denison's defense of the methods employed in *Why Growth Rates Differ* fails to meet the basic issue of inconsistency. Unlike Denison's paper, his accompanying "Final Comments" do not really advance the discussion of the methods of measuring total factor productivity further. We are prepared to leave this exchange of views with Denison at this point and to proceed with the work of continuing to improve our estimates in both scope and quality.

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1. All reference numbers are from the list of references given in our accompanying paper, "Issues in Growth Accounting: A Reply to Edward F. Denison."

2. Here we adopt Denison's interpretation of his estimates, based on replacement, as measures of depreciation. Denison's two "views" of depreciation in his "Final Comments," pages 104–107, are definitions of two distinct concepts—*replacement* as defined on page 86 of our accompanying paper and *depreciation* as defined on page 86. Th use of a single term for the two concepts is the source of Denison's error in the definition of net product and of inconsistencies in his accounting for depreciation and capital input. See our accompanying paper, "Issues in Growth Accounting: A Reply to Edward F. Denison," p. 86, for an elaboration of these points.

3. Denison's objections to our deflation of government and rest of the world product have already been met in a revised and extended set of estimates for the period 1929–1969; see: D. W. Jorgenson, "Measuring Economic Performance," in M. Moss (ed.), *The Measurement of Economic and Social Performance*, Studies in Income and Wealth, No. 37, New York, Columbia University Press, forthcoming. Preprints are available from the author.

4. See pages 99–109.

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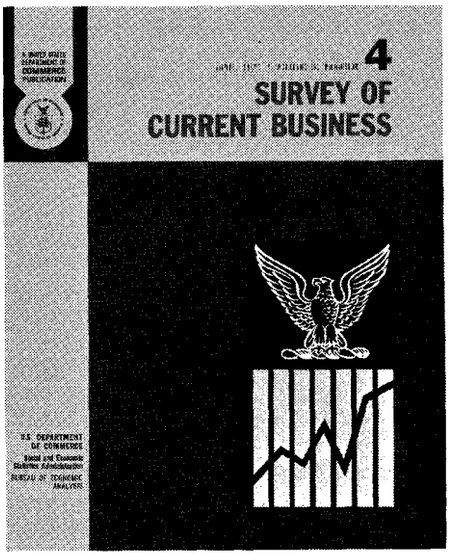

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