

An Examination of the Low Rates of Return of Foreign-Owned U.S. Companies

By Raymond J. Mataloni, Jr.

Mahnaz Fahim-Nader assisted in the development of the estimates presented in this article. This article also benefited significantly from comments by four reviewers from outside BEA—Harry Grubert, David Laster, Robert McCauley, and Deborah Swenson.

A LONGSTANDING QUESTION about foreign-owned U.S. companies is why their rates of return have been consistently below those of other U.S. companies.¹ Previous research by the Bureau of Economic Analysis (BEA) and others has examined this issue. This article builds upon these earlier efforts by providing new estimates of the rate of return for foreign-owned U.S. nonfinancial companies that are disaggregated by industry and valued in current-period prices for the years 1988–97. The new estimates, along with company-level estimates for foreign-owned companies and industry-level estimates for U.S.-owned nonfinancial U.S. companies, are used to examine factors that help explain the low rates of return. The article extends the previous research by providing the first detailed examination of industry-mix effects and by identifying and quantifying the importance of market share.

The rate of return measure used in this article is the return on assets (ROA), defined as the ratio of “profits from current production” plus interest paid to the average of beginning- and end-of-year total assets.² Profits from current production are profits that result from the production of goods and services in the current period. Both profits and assets are valued in prices of the current period. Profits reflect the value of inventory withdrawals and depreciation on a current-cost basis; they have been adjusted to remove the income from equity

investments in unconsolidated businesses and the expense associated with amortizing intangible assets. Total assets reflect the current cost of tangible assets; they have been adjusted to remove assets for which the return is not included in the numerator of the ROA ratio—namely, equity investments in unconsolidated businesses and amortizable intangible assets. (See the [technical note](#) for details on the construction of the ROA measure.)

The new ROA estimates for foreign-owned companies and U.S.-owned companies indicate the following:

- The new current-cost estimates show that the average ROA of foreign-owned companies in 1988–97 was 5.1 percent. In contrast, the historical-cost estimates show an average ROA of 5.7 percent.
- The ROA of all foreign-owned nonfinancial companies was consistently below that of U.S.-owned nonfinancial companies in 1988–97, but the gap narrowed over time, from nearly two percentage points in 1988 to one percentage point in 1997. The narrowing of the gap appears to be related to age effects: Acquiring or establishing a new business can add costs, such as startup costs, that disappear over time; additionally, experience can yield benefits, such as learning by doing, that accumulate over time.
- The average ROA's for foreign-owned companies less the average ROA for U.S.-owned companies ranged from –8.3 percentage points in rubber and miscellaneous plastics manufacturing to +10.2 percentage points in “other” manufacturing. The average ROA of foreign-owned companies in 1988–97 was below that of U.S.-owned companies in 22 of 30 nonfinancial industries. The pervasiveness of the negative gaps suggests that differences in the industrial distribution of operations are not a major reason for the all-industries gap. More formal analysis confirms that only a small portion of the gap was attributable to the

1. In this article, “foreign-owned U.S. companies” refer to U.S. affiliates of foreign companies as defined for BEA's surveys of foreign direct investment in the United States. A U.S. affiliate is a U.S. business enterprise that is owned 10 percent or more, directly or indirectly, by a foreign person.

2. This profitability measure differs in two respects from the measure for all domestic nonfinancial corporations that BEA presented in the June 1999 issue of the SURVEY OF CURRENT BUSINESS [21]. First, the numerator uses gross rather than net interest paid. Gross interest is used so that the numerator reflects the actual return to the investors who provide the debt financing, as well as those who provide the equity financing, of foreign-owned companies' total assets. Second, the denominator uses total assets rather than tangible assets. Total assets is used here because it is a more appropriate measure for examining a small subset of domestic companies—in this case, domestic companies that are foreign owned. When the profitability of all domestic nonfinancial corporations is measured, tangible assets is more appropriate because financial claims and liabilities largely cancel out; however, this is not the case when the profitability of a much smaller group of companies is measured. Furthermore, if only tangible assets were used for the denominator, the industry-level profitability measures would vary simply because the degree to which tangible assets are used in production varies across industries.

tendency for foreign-owned companies to be concentrated in low-profit industries.

- The median ROA of foreign-owned companies with a market share of 30 percent or more in 1992 was virtually identical to that of U.S.-owned companies, whereas the median ROA of those with a market share of less than 20 percent was 2 percentage points below that of U.S.-owned companies.
- A comparison of the ROA's of foreign-owned companies with different propensities to import from their foreign parent companies yields only weak and inconsistent evidence that foreign-owned companies shift profits out of the United States using transfer prices. Statistical tests indicate a significant negative relationship between foreign-owned companies' ROA and the intrafirm-import content of their sales in only 2 of the 10 years studied.

The first part of this article presents the new industry-level ROA estimates for foreign-owned companies and compares them with estimates for U.S.-owned companies. The second part examines the low ROA for foreign-owned companies using estimates for foreign-owned companies at both the industry and the company level. The technical note explains how the ROA estimates were computed,

describes the statistical methods used for analysis, and presents summary results of this analysis.

New ROA Estimates for 1988–97

This section examines the new industry-level ROA estimates for foreign-owned companies and the gap between the ROA's of foreign-owned and U.S.-owned companies by industry and over time. Previously, the industry-level profit and asset data needed to compute ROA estimates were available only on a historical-cost basis; that is, the valuations of assets and related expenses (mainly depreciation) were based on the prices of the assets at the time they were acquired. Because asset prices vary over time, the resulting historical-cost ROA estimates vary with the age of the assets. In the new estimates, the assets and associated depreciation charges have been adjusted to a current-cost basis; that is, they are consistently valued in current-period prices. The industry-level current-cost adjustments are based on aggregate (all-industries) current-cost adjustments that BEA makes for all foreign-owned companies combined and for all U.S. companies combined. These aggregate estimates were allocated to individual industries using the procedures described in the technical note.

Table 1.—ROA of Foreign-Owned U.S. Nonfinancial Companies, 1988–97

[Percent]

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1988–97 average
Nonfinancial industries	5.7	5.4	4.2	3.8	3.8	4.1	5.1	5.7	6.6	7.1	5.1
Agriculture, forestry, and fishing	2.0	3.4	6.0	3.8	1.5	-0.9	1.1	1.3	2.5	4.0	2.5
Mining, excluding oil and gas extraction	6.8	5.9	7.6	8.3	8.5	4.6	7.1	9.9	6.2	6.9	7.2
Construction	0.5	3.4	1.3	0.5	0.6	0.4	0.6	-0.9	0.4	1.3	0.8
Manufacturing	6.7	6.4	5.0	4.1	4.2	4.6	6.0	6.2	7.3	7.8	5.8
Food and kindred products	4.8	4.0	3.9	5.4	5.2	4.6	4.9	4.6	6.9	8.7	5.3
Textile mill products	8.3	5.4	4.2	3.2	6.8	7.2	7.9	8.2	6.4	7.3	6.5
Apparel and other textile products	3.0	2.1	0.8	3.5	5.2	6.5	5.0	0.3	7.9	7.9	4.2
Lumber, wood, furniture, and fixtures	9.2	7.2	9.4	3.1	6.4	11.0	11.5	8.0	8.7	5.5	8.0
Paper and allied products	12.7	10.5	8.6	6.9	4.1	4.1	5.5	9.7	9.2	5.2	7.6
Printing and publishing	5.3	3.9	5.1	4.3	5.7	6.8	7.8	6.0	7.1	6.6	5.9
Chemicals and allied products	9.0	9.7	7.7	6.4	6.2	6.9	7.8	6.7	7.9	7.2	7.6
Petroleum and coal products ¹	7.9	8.7	9.8	5.8	5.8	5.9	6.7	7.6	10.0	10.7	7.9
Rubber and miscellaneous plastic products	3.5	2.7	-0.2	-3.8	-0.4	1.6	4.4	3.8	5.1	5.4	2.2
Stone, clay, and glass products	5.4	3.8	-0.8	0.4	1.5	2.4	3.4	7.0	8.5	13.4	4.5
Primary metal industries	5.7	5.8	3.6	0.5	0.8	2.6	4.3	6.3	7.4	6.7	4.4
Fabricated metal products	7.6	7.0	3.5	4.1	4.0	2.9	0.6	4.9	6.5	7.1	4.8
Industrial machinery and equipment	5.7	3.9	-0.4	0.1	(*)	-0.7	4.8	3.4	4.8	6.3	2.8
Electronic and other electric equipment	1.4	1.0	-0.5	1.7	1.2	1.0	3.6	4.3	3.9	5.6	2.3
Motor vehicles and equipment	-5.2	-6.3	-1.0	-0.8	-4.0	1.2	5.9	5.5	2.1	7.3	0.5
Other transportation equipment	-3.6	5.2	0.7	0.4	2.3	1.1	2.1	0.6	6.5	8.3	2.4
Instruments and related products	4.9	5.5	7.1	8.7	8.6	8.1	8.1	8.9	9.9	9.3	7.9
Other ²	13.9	11.0	7.7	15.4	22.0	11.1	11.6	16.3	19.9	17.9	14.7
Transportation	10.2	4.6	-4.5	0.8	2.0	5.7	5.3	8.6	11.0	10.7	5.4
Communication and public utilities	(*)	1.6	6.4	3.7	6.3	5.0	8.3	11.4	14.4	8.7	6.6
Wholesale trade	4.0	4.5	3.8	3.9	4.0	3.9	4.6	5.4	5.4	6.4	4.6
Retail trade	7.3	4.6	4.9	6.7	3.1	3.9	7.2	8.2	7.6	8.0	6.2
Real estate	3.8	4.2	3.5	3.0	2.2	2.4	2.2	2.3	2.5	3.7	3.0
Services	4.2	4.3	4.0	2.2	3.1	3.7	2.6	2.2	3.6	5.7	3.5
Hotels and other lodging places	1.6	1.2	1.5	-0.1	-0.2	0.3	0.5	1.1	3.5	4.1	1.4
Business services	5.5	6.0	7.6	6.3	7.3	7.6	6.4	4.9	3.2	9.3	6.4
Motion pictures	1.8	2.7	3.2	0.6	3.5	5.1	3.8	2.8	3.2	2.4	2.9
Other	6.0	6.2	4.5	4.0	3.7	3.1	-0.2	-0.1	4.2	5.0	3.6

(*) Less than 0.05 (±).

1. Includes oil and gas extraction.

2. Other manufacturing comprises tobacco products, leather and leather products, and miscellaneous manufacturing industries.

ROA Return on assets

ROA by industry

The average ROA for foreign-owned nonfinancial companies was 5.1 percent in 1988–97. The average ROA's varied considerably among the major industries, ranging from 7.2 percent in mining to 0.8 percent in construction (table 1 and chart 1). In addition to mining, the ROA's were relatively high in communication and public utilities (6.6 percent) and retail trade (6.2 percent). In addition to construction, the ROA's were relatively low in agriculture, forestry, and fishing (2.5 percent), real estate (3.0 percent), and services (3.5 percent).

Among foreign-owned manufacturing companies, the average ROA was 5.8 percent in 1988–97. The ROA's varied considerably among the major manufacturing industries, ranging from 14.7 percent in "other" manufacturing to 0.5 percent in motor vehicles and equipment (table 1 and chart 2).³ In addition to "other" manufacturing, the ROA's were relatively high in lumber, wood, furniture, and fixtures (8.0 percent) and instruments and related products (7.9 percent). In addition to motor vehicles and equipment, the ROA's were relatively low in rubber and miscellaneous plastic products (2.2 percent), electronic

and other electric equipment (2.3 percent), and other transportation equipment (2.4 percent).

ROA gap by industry

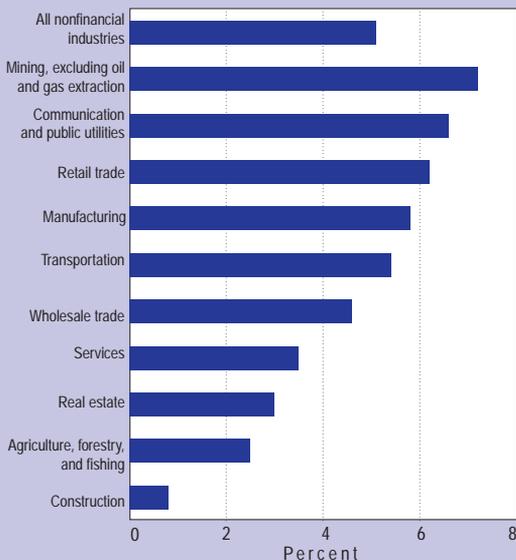
The average ROA for foreign-owned nonfinancial companies was 2.2 percentage points below that for U.S.-owned nonfinancial companies in 1988–97. The ROA gap (that is, the ROA of foreign-owned companies less the ROA of U.S.-owned companies) was negative in most major industries but was largest in construction (-7.5 percentage points) (table 2 and chart 3). The ROA gap was also large and negative in services (-7.2 percentage points) and wholesale trade (-4.2 percentage points). The ROA gap was positive in mining, excluding oil and gas extraction (4.5 percentage points) and transportation (1.3 percentage points).

In manufacturing, the average ROA gap was -1.1 percentage points in 1988–97. The ROA gap was negative in most manufacturing industries, but

3. "Other" manufacturing comprises tobacco products, leather and leather products, and miscellaneous manufacturing industries.

CHART 1

Average ROA of Foreign-Owned U.S. Nonfinancial Companies in 1988–97

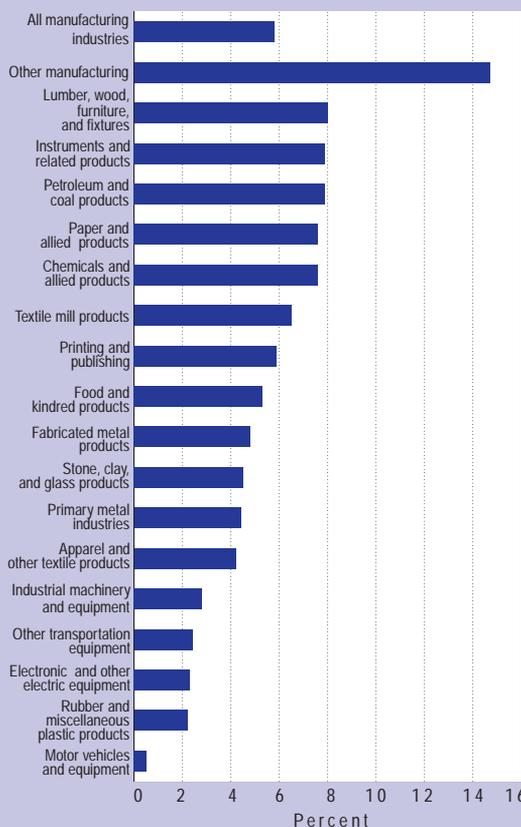


ROA Return on assets

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

CHART 2

Average ROA of Foreign-Owned U.S. Manufacturing Companies in 1988–97

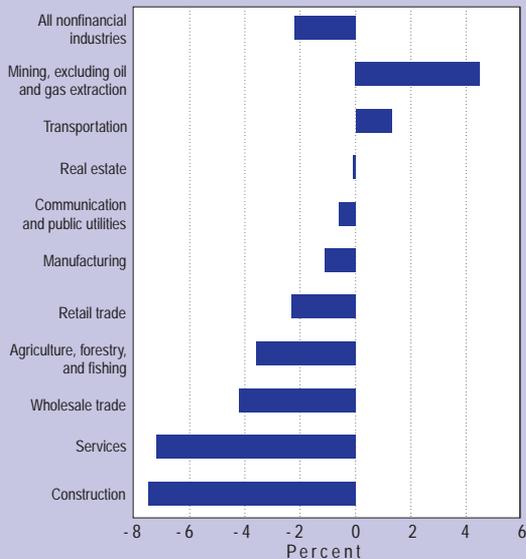


ROA Return on assets

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

CHART 3

Average ROA Gap of Foreign-Owned U.S. Nonfinancial Companies in 1988-97



ROA Return on assets

Note.—The ROA gap is defined as the ROA for all foreign-owned U.S. companies in an industry less the ROA for all U.S.-owned companies in that industry.

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

it varied from -8.3 percentage points in rubber and miscellaneous plastic products to 10.2 percentage points in "other" manufacturing (table 2 and chart 4).

Trends.—The negative ROA gap in all nonfinancial industries combined widened from -1.8 percentage points in 1988 to -3.1 percentage points in 1990; it was unchanged at -3.1 percentage points in 1991, and then it narrowed steadily to -1.0 percentage points in 1997 (table 2 and chart 5). In some major industries, the pattern of the ROA gap was consistent over time, suggesting that the factors underlying the gap were longstanding; for example, the ROA gap was consistently positive in mining and consistently negative in services. In other industries, including manufacturing, the negative ROA gap was eliminated over time, suggesting that factors underlying the gap were temporary.

Patterns in the ROA gap also differed across the major manufacturing industries. In petroleum and coal products, the ROA gap was consistently positive. In rubber and miscellaneous plastic products, it was consistently negative. In motor vehicles and equipment, it was initially quite negative, but it became slightly positive in some of the more recent years. In a few manufacturing industries, such as

Table 2.—ROA Gap of Foreign-Owned U.S. Nonfinancial Companies, 1988-97

[Percentage points]

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1988-97 average
Nonfinancial industries	-1.8	-2.1	-3.1	-3.1	-2.9	-2.6	-2.2	-1.9	-1.3	-1.0	-2.2
Agriculture, forestry, and fishing	-5.4	-3.7	-0.4	-1.4	-4.5	-6.3	-3.5	-4.3	-3.9	-2.5	-3.6
Mining, excluding oil and gas extraction	(*)	1.1	4.6	5.1	7.0	3.6	4.3	8.9	4.9	5.0	4.5
Construction	-8.3	-4.9	-6.6	-6.3	-5.3	-6.2	-7.2	-10.1	-10.0	-9.7	-7.5
Manufacturing	-0.8	-1.3	-2.5	-2.6	-1.8	-1.4	-0.6	-1.1	0.1	0.9	-1.1
Food and kindred products	-5.2	-9.2	-9.7	-8.0	-6.8	-5.2	-5.7	-6.8	-2.0	-0.6	-5.9
Textile mill products	0.5	-1.3	-3.9	-5.0	-3.3	-0.4	1.0	2.6	-1.2	-0.2	-1.1
Apparel and other textile products	-7.1	-9.2	-10.1	-7.5	-6.1	-3.9	-5.5	-8.4	-0.7	0.3	-5.8
Lumber, wood, furniture, and fixtures	-0.5	-2.3	2.2	-3.0	-1.0	2.0	1.3	-2.9	0.4	-2.9	-0.7
Paper and allied products	1.7	0.4	0.7	0.5	-0.9	-1.0	-0.7	0.3	1.9	-0.3	0.2
Printing and publishing	-6.7	-7.8	-5.2	-6.6	-4.8	-2.9	-4.2	-4.2	-5.6	-4.6	-5.3
Chemicals and allied products	1.3	2.6	0.9	-0.1	0.3	1.8	1.7	-1.0	1.0	0.2	0.9
Petroleum and coal products ¹	2.4	4.2	3.9	1.8	3.1	2.7	3.6	3.4	4.8	5.1	3.5
Rubber and miscellaneous plastic products	-4.5	-7.4	-9.7	-16.3	-11.0	-9.0	-5.7	-5.9	-6.7	-6.4	-8.3
Stone, clay, and glass products	-1.3	-4.8	-9.7	-7.9	-7.1	-5.7	-8.5	-5.9	-2.9	0.9	-5.3
Primary metal industries	-2.2	-2.1	-1.1	-3.1	-0.7	1.4	2.0	0.7	3.5	2.5	0.1
Fabricated metal products	-1.4	-1.9	-5.5	-3.7	-3.3	-6.1	-11.3	-6.4	-5.5	-5.5	-5.1
Industrial machinery and equipment	-2.4	-4.4	-9.2	-6.1	-6.4	-7.1	-1.5	-5.2	-3.9	-1.4	-4.8
Electronic and other electric equipment	-6.4	-7.8	-9.1	-6.3	-5.9	-6.7	-5.2	-3.8	-3.8	-1.7	-5.7
Motor vehicles and equipment	-11.0	-13.0	-6.1	-4.8	-8.2	-3.7	0.7	1.3	-3.5	2.3	-4.6
Other transportation equipment	-11.5	-1.3	-5.9	-7.2	-3.9	-5.4	-2.9	-4.8	-0.6	1.2	-4.2
Instruments and related products	-3.1	-1.4	-1.9	0.1	1.5	3.0	2.9	2.6	2.2	3.0	0.9
Other ²	7.9	6.0	2.7	11.3	18.3	7.2	7.9	12.0	15.8	13.2	10.2
Transportation	5.3	1.4	-7.8	-2.1	-0.6	2.3	0.6	3.8	5.3	4.4	1.3
Communication and public utilities	-6.7	-5.1	-0.3	-3.3	-0.5	-1.9	1.1	3.8	6.7	0.4	-0.6
Wholesale trade	-5.7	-5.3	-5.2	-5.2	-4.4	-3.9	-3.8	-2.4	-3.7	-2.3	-4.2
Retail trade	-0.7	-3.7	-3.0	-1.5	-5.1	-4.3	-1.2	0.1	-1.3	-2.0	-2.3
Real estate	-0.4	0.7	0.9	1.3	(*)	(*)	-0.7	-1.2	-1.3	-0.1	-0.1
Services	-5.6	-5.4	-6.2	-8.3	-7.7	-7.8	-9.3	-9.3	-7.7	-5.0	-7.2
Hotels and other lodging places	-3.4	-3.7	-2.4	-5.5	-7.2	-7.9	-8.5	-7.4	-3.9	-1.9	-5.2
Business services	-5.5	-4.5	-2.3	-3.3	-3.5	-4.5	-6.1	-7.4	-9.4	-3.5	-5.0
Motion pictures	-6.0	-2.6	0.3	-3.5	0.3	1.1	-1.9	-2.4	-2.3	-3.1	-2.0
Other	-4.5	-4.8	-8.1	-8.9	-8.6	-9.3	-12.9	-12.3	-7.8	-5.9	-8.3

NOTE: The ROA gap is defined as the ROA for all foreign-owned companies in an industry less the ROA for all U.S.-owned companies in that industry.

(*)Less than 0.05 (±).

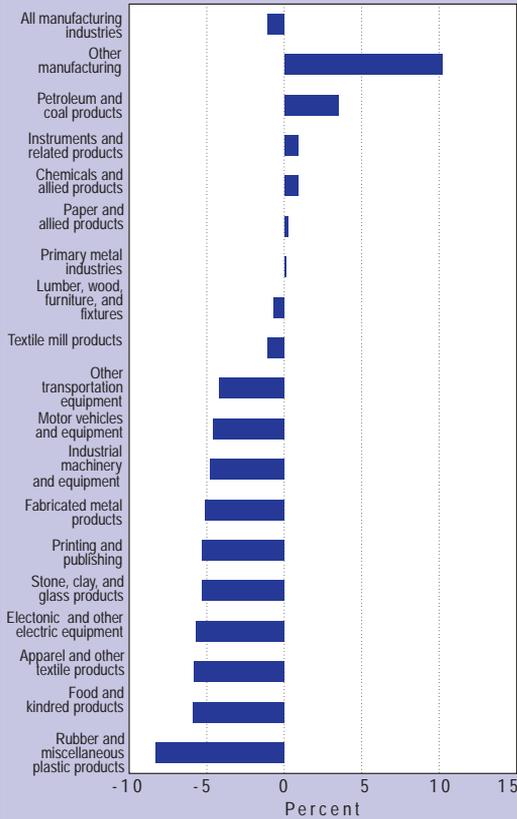
1. Includes oil and gas extraction.

2. Other manufacturing comprises tobacco products, leather and leather products, and miscellaneous manufacturing industries.

ROA Return on assets

CHART 4

Average ROA Gap of Foreign-Owned U.S. Manufacturing Companies in 1988–97



ROA Return on assets

Note.—The ROA gap is defined as the ROA for all foreign-owned U.S. companies in an industry less the ROA for all U.S.-owned companies in that industry.

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

bert [4]—have examined the low profitability of foreign-owned companies.

Landefeld, Lawson, and Weinberg examined current-cost estimates of the rate of return on foreign direct investment in the United States (FDIUS) and on all U.S. businesses at the all-industries level for 1982–91. Those estimates, along with other aggregate economic data, were used to evaluate the low rate of return on FDIUS.⁴ They presented evidence suggesting the following: High startup and restructuring costs related to recent acquisitions lower the profitability of foreign-owned companies, newly acquired foreign-owned companies tended to be those that had low or negative rates of return, and many foreign-owned companies had a tax-related incentive to shift profits from the United States to their home country using transfer prices.⁵ They also identified reasons for which foreign owners may be willing to accept a below-average rate of return, such as having a lower cost of capital in the home country or gaining a cost advantage by acquiring U.S. companies with home-country funds at a time when the purchasing power of the U.S. dollar was weak.

Laster and McCauley used industry-level estimates of the historical-cost return on investment and on sales for foreign-owned companies from BEA's direct investment surveys, and for all domestic companies from the Internal Revenue Service, for the years 1977–92. Their evidence suggested the following: The low rate of return of foreign-owned companies was largely due to a late-1980's surge in foreign acquisition activity, the new acquisitions were typically expensive and unprofitable (although their profitability grew over time) and heavy debt loads and (possibly) profit shifting using transfer prices further depressed the reported profits of these firms. They concluded that the profitability of foreign-owned companies should rebound as they reduce their acquisition activity, gain experience, and divest underperforming operations.

Grubert, Goodspeed, and Swenson performed regression analysis using company-level measures of the return on historical-cost assets and sales for foreign-controlled and domestically controlled corporations in 1980–87.⁶ Their results

4. Unlike the estimates presented here, the rate of return estimates used by Landefeld, Lawson, and Weinberg are based on data from BEA's international transactions accounts (ITAs). The major difference between the two sets of estimates is that the ITA estimates are adjusted for the percentage of foreign ownership.

5. A transfer price is the price charged by one company for a product or service supplied to a related company, such as the price that a foreign-owned company is charged by its foreign parent company.

6. Their analysis was based on corporate tax return data from the U.S. Department of the Treasury, Internal Revenue Service. The latest tabulated data,

chemicals, there was consistently almost no ROA gap.

The Low ROA of Foreign-Owned Companies

In this section, industry-level ROA estimates for foreign-owned and U.S.-owned companies along with estimates for individual foreign-owned companies are used to analyze the low ROA of foreign-owned companies. The section begins with a short review of previous research and then discusses the four factors that were examined in this study: Industry mix, market share, age effects, and intrafirm-import content.

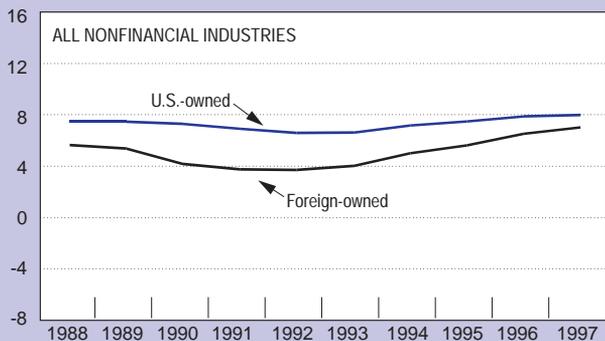
Previous research

Several studies—including Landefeld, Lawson, and Weinberg [8], Laster and McCauley [9], Grubert, Goodspeed, and Swenson [3], and Gru-

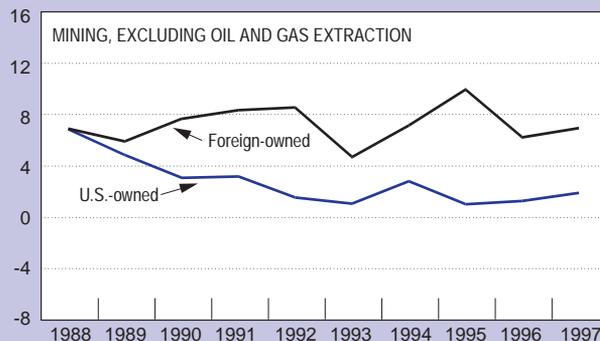
CHART 5

Average ROA of Foreign-Owned U.S. Nonfinancial Companies and U.S.-Owned Nonfinancial Companies in Selected Industries, 1988-97

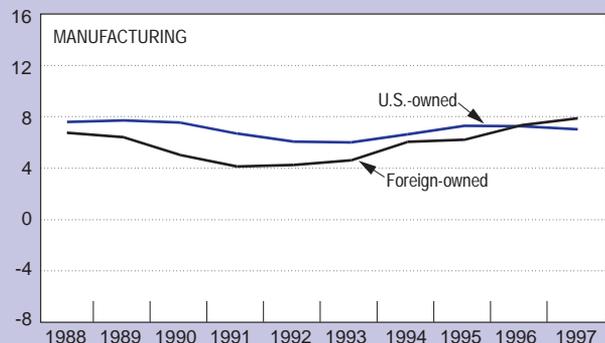
Percent



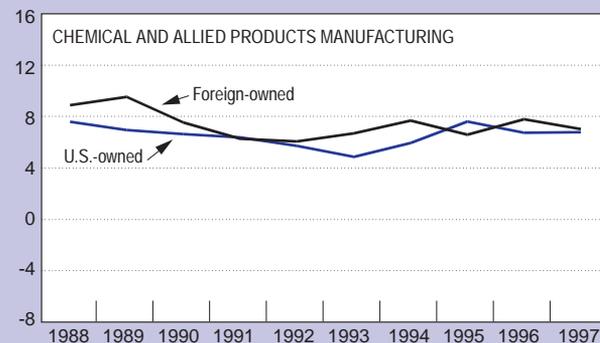
Percent



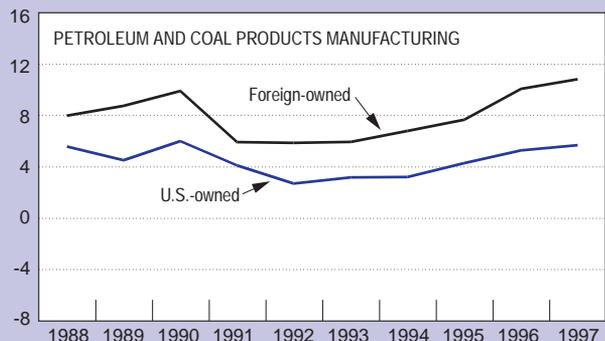
Percent



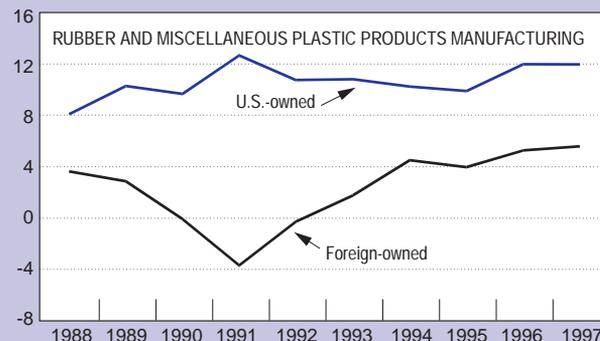
Percent



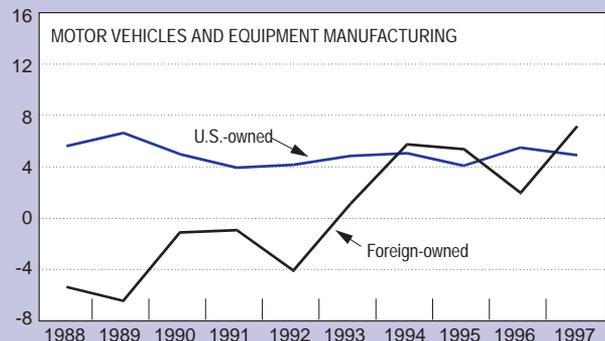
Percent



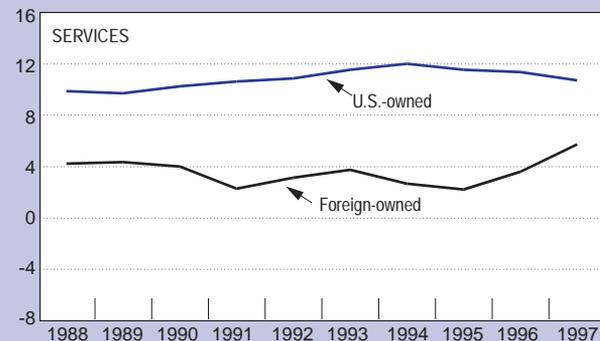
Percent



Percent



Percent



ROA Return on assets

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

demonstrated that age effects and the effects of exchange-rate changes were significant factors. Unlike Laster and McCauley, they found no evidence of the effects of heavy debt loads. They also found no significant tendency for newly acquired foreign-owned companies to be those with low or negative rates of return. They found that roughly half of the profitability gap remained unexplained. They presented statistical evidence suggesting that part of the unexplained profitability gap could be related to profit shifting using transfer prices.

Grubert used company-level estimates of the return on historical-cost assets and sales for foreign-controlled and domestically controlled U.S. corporations in 1987–93. Most of his analysis was based on a taxable-income-to-sales measure because of the problems associated with using historical-cost assets as a denominator. In addition to using total taxable income as a numerator, Grubert examined an alternative that approximated operating income by excluding receipts of dividends, interest, and royalties; he found that the profitability gap was much smaller using the alternative measure.

As in his earlier paper with Goodspeed and Swenson, Grubert found some evidence of age-related effects, but little evidence of exchange-rate effects (perhaps because the exchange value of the dollar was more stable in 1987–93 than in 1980–87). After controlling for a variety of factors, Grubert found that less than half (and perhaps as little as one-quarter) of the ROA gap remained unexplained. Profit shifting using transfer prices may underlie part of the unexplained difference, but Grubert presented evidence that it is not a major factor: He found that the profitability of foreign-controlled companies was similar to that of companies that were 20- to 50-percent foreign-owned even though the former group would be more likely to shift profits out of the United States using transfer prices.

Explanatory factors

This study uses the new current-cost industry-level estimates for foreign-owned and U.S.-owned companies and company-level estimates for foreign-owned companies to examine the role of age-related effects and intrafirm-import content in explaining the low ROA of foreign-owned companies. As explained above, the previous studies examined these factors using data at the all-

industries level or with only a very limited industry breakdown, or they used company-level data that were generally valued on a historical-cost basis. This study also examines industry-mix effects in more detail than in the earlier studies, and it examines market share, a factor not explicitly considered in the earlier studies.

In the analysis that follows, each of these factors is first examined in isolation, both for ease of exposition and because differences among some of the data sets used precluded a completely integrated approach to analysis. To determine whether the results differ when the explanatory factors are (to the extent possible) examined simultaneously, a multivariate regression analysis also was performed; it is discussed at the end of the section. Such an analysis would help to identify any cases in which explanatory factors are related to one another, which would make it difficult to sort out the independent effects of each factor. (For example, market share could potentially be associated with age, inasmuch as it might take a number of years to build market share.)

Industry mix.—A possible reason that foreign-owned companies have a lower ROA than U.S.-owned companies is that they are concentrated in low-profit industries. However, a systematic examination of the new industry-level estimates suggests industry mix is of only limited importance. The relatively low ROA's of foreign-owned companies have been widespread across industries: During 1988–97, foreign-owned companies had a lower average ROA than U.S.-owned companies in 22 of the 30 nonfinancial industries shown in [table 2](#). This result was pervasive over time and across industries.

To quantify the industry-mix effects, the ROA gap was statistically decomposed into three components: Industry-mix effects, within-industry gaps, and interaction effects ([table 3](#)).⁷ This computation indicated that only a small percentage of the gap was attributable to a tendency for foreign-owned companies to be concentrated in low-profit industries. Industry mix accounted for only 12 percent of the ROA gap, on average, in 1988–97.

These decompositions were carried out on industry estimates at both the 2-digit and 3-digit Standard Industrial Classification (SIC) level.⁸ At

7. The decomposition method is described in the technical note.

8. Although the 3-digit estimates are available only on a historical-cost basis, the industry patterns in the historical-cost and current-cost estimates are similar, so it is unlikely that using historical-cost data significantly biased the results.

covering foreign-controlled domestic corporations, appear in U.S. Department of the Treasury [24]. In these data, "control" is generally defined as ownership by a foreign person or entity, directly or indirectly, of 50 percent or more of a U.S. corporation's voting stock.

Table 3.—Decomposition of the ROA Gap

[Percentage points]

Year	ROA Gap	Industry-mix effects	Within-industry effects	Interaction effects
1988	-1.8	0.1	-3.1	1.2
1989	-2.1	-0.1	-3.3	1.3
1990	-3.1	-0.2	-3.1	0.2
1991	-3.1	-0.3	-3.1	0.3
1992	-2.9	-0.4	-2.8	0.3
1993	-2.6	-0.5	-3.0	0.9
1994	-2.2	-0.3	-2.3	0.4
1995	-1.9	-0.2	-1.2	-0.5
1996	-1.3	-0.2	-0.2	-0.9
1997	-1.0	-0.3	-0.5	-0.1

NOTE.—The ROA gap is defined as the ROA for all foreign-owned companies in an industry less the ROA for all U.S.-owned companies in that industry.
ROA Return on assets

both levels of detail, only small industry-mix effects were found.⁹

Notwithstanding the general unimportance of industry-mix effects, factors specific to particular industries may in some cases cause the ROAs of foreign-owned companies to be lower than those of U.S.-owned companies. For example, profits in some industries (such as lodging) are highly dependent on local business conditions, and foreign-owned companies' low ROA can be partly explained by the concentration of their operations in slow-growing areas of the United States. Detailed industry-by-area distributions of foreign-owned and U.S.-owned business establishments are available for 1992, and in that year, the ROA of foreign-owned companies in hotels and other lodging places was 7.2 percentage points below that of U.S.-owned lodging companies. The foreign-owned companies had a relatively large presence in some slow-growing lodging markets (such as California) and a relatively small presence in some fast-growing markets (such as Nevada).¹⁰

Market share.—One factor that was not investigated in the aforementioned studies is market share. However, more general studies of companies' profitability, such as that of Buzzell, Gale, and Sultan [2], have shown a positive relationship between market share and profitability. A large market share may be indicative of conditions, such as economies of scale and market power,

9. However, industry-mix effects may be more significant within some of the industries shown in table 2. For example, the large and negative ROA gap in rubber and miscellaneous plastic products appears to reflect foreign-owned companies' concentration in one of the less profitable segments of that industry—tire and inner tube manufacturing. The large and positive ROA gap in "other" manufacturing appears to reflect foreign-owned companies' concentration in one of the more profitable segments of that industry—tobacco product manufacturing.

10. The geographic distribution of foreign-owned companies is based on data for business establishments from the Census Bureau's 1992 Census of Manufactures through a joint project that linked BEA and Census Bureau data. The 1988–92 industry growth is based on average annual employment data by industry from the U.S. Department of Labor [22].

For a recent examination of the geographic distribution of foreign-owned U.S. businesses, see Johnson, Shannon, and Zeile [5].

that can enhance profitability.¹¹ It is also possible that high profitability can lead companies to expand their operations, such as through the acquisition of other companies, resulting in the observed relationship. Market share and profitability are probably, to some degree, mutually reinforcing, but the existing research suggests that the causality of this relationship runs mainly from market share to profitability.¹²

Industry patterns in the new ROA estimates provide some indication that the profitability of foreign-owned companies is related to their market shares. Industries in which the profitability of foreign-owned companies is relatively high (such as petroleum and chemical manufacturing) tend to be those in which the largest foreign-owned companies have a significant share of the total U.S. market for certain products. However, in some industries (such as stone, clay, and glass products manufacturing and rubber and miscellaneous plastic products manufacturing), the largest foreign-owned companies both are relatively less profitable and have a significant share of the total U.S. market for certain products. More definitive results can be obtained by performing the analysis at the company level.

To perform company-level analysis, ROA estimates were developed for 2,133 foreign-owned manufacturing companies for 1992 using procedures similar to those used to compute the industry-level estimates.¹³ The ROA gap for each foreign-owned company was calculated as the company's ROA minus the average ROA for U.S.-owned companies in the same industry. Market-share estimates for the foreign-owned companies were developed using detailed product-level shipments data for each company obtained from the Census Bureau's 1992 Census of Manufactures through a joint project that linked BEA and Census Bureau data.¹⁴

11. Microeconomic theory suggests, and industrial organization research has demonstrated, that concentration in an industry can allow the producers in that industry to restrict output and earn above-normal profits (economic rents). Although this research has usually dealt with explaining differences in profitability across industries, some researchers have extended the research to explain profitability differences within industries. Porter [13] and others have shown that the economic rents in an industry tend to be disproportionately distributed to those companies that most strongly possess the features that limit competition within the industry. For example, if the presence of heavily advertised national brands limits competition within an industry, then the companies that sell those brands will enjoy most of the economic rents, and those that sell generic brands may receive none at all. Companies that earn economic rents in this way are said to have "market power."

12. For a review of the literature on the relationship between market share and profitability, see Kohli, Venkatraman, and Grant [6].

13. The examination was restricted to manufacturing and to 1992 because market-share estimates were available only in that industry and only for that year.

14. Although the product-level data were not published, the BEA-Census Bureau data link project provided data on shipments by foreign-owned companies at the detailed 7-digit product level. Each company's market share for each

Table 4.—Market Share and Median ROA Gap for Foreign-Owned U.S. Manufacturing Companies, 1992

Market share (percent)	Median ROA gap (percentage points)	Number of companies
Less than 10.0	-2.0	1,639
10.0 to 19.9	-2.0	294
20.0 to 29.9	-1.0	127
30.0 to 39.9	(^c)	38
40.0 or more	(^c)	35

NOTE.—The ROA gap is defined as the ROA for a foreign-owned company less the ROA for all U.S.-owned companies in the same industry.
 (^a) Less than 0.05 (±)
 ROA Return on assets

Table 4 shows the median ROA gap for foreign-owned companies grouped by their average market share.¹⁵ For example, the 1,639 companies that had an average market share across all product lines of less than 10 percent had a median ROA gap of -2.0 percentage points. In general, as a foreign-owned company's market share increased, the gap between its ROA and the average ROA for U.S.-owned companies decreased. A regression of foreign-owned companies' ROA gap on their market share confirmed the statistical significance of this relationship.¹⁶ (See the **technical note** for summary results of the regression analysis.)

Age effects.—The age effects examined in this study include (1) the effects of acquiring or establishing a new business and (2) the benefit of experience. Foreign-owned companies may have a lower ROA than U.S.-owned companies because of factors related to the share of their operations that are newly acquired or established. These factors include high startup costs for newly established businesses, a possible tendency for acquired companies to be those that are relatively less profitable, and accounting changes resulting from mergers and acquisitions (see the box **"Accounting for Mergers and Acquisitions"**). The relationship between the newness of foreign-owned companies and the relative size of their negative ROA gap suggests that newness is an important factor (chart 6). The chart shows that, in relative terms, the negative ROA gap of foreign-owned companies tends to rise or fall with their degree of newness.

The profits of foreign-owned companies that have been newly acquired or established may be

product that it produces was derived by computing the ratio of the company's shipments of the product to total U.S. shipments of that product. Because foreign-owned companies tend to be large and diversified, and because only an overall ROA was available for each company, an average market share across all products for each company was computed using a weighted average based on the distribution by product of the company's shipments.

15. Companies with an ROA gap that exceeded 25 percentage points in absolute value were considered outliers and were excluded here and in all of the company-level analysis.

16. For the regression analysis in this study, significance is uniformly defined at the 1-percent level, unless otherwise noted.

dampened by high startup costs related to activities such as aggressive spending for capital equipment or advertising.¹⁷ In 1996, for example, foreign-owned nonfinancial companies that acquired or established a U.S. business in the preceding 2 years had an average capital-spending-to-sales ratio of 8.4 percent, compared with 5.1 percent for other foreign-owned nonfinancial companies.

Other studies identified additional factors related to the newness of foreign ownership. As noted earlier, some studies detected a tendency for newly acquired companies to be those that are relatively less profitable.¹⁸ Others have detected a tendency for foreign-owned companies to incur heavy debt burdens (and associated interest expenses) when they acquired or established other U.S. businesses. (The ROA estimates presented here are not directly affected by variations in debt burden, because they measure the return to holders of both equity and debt.)

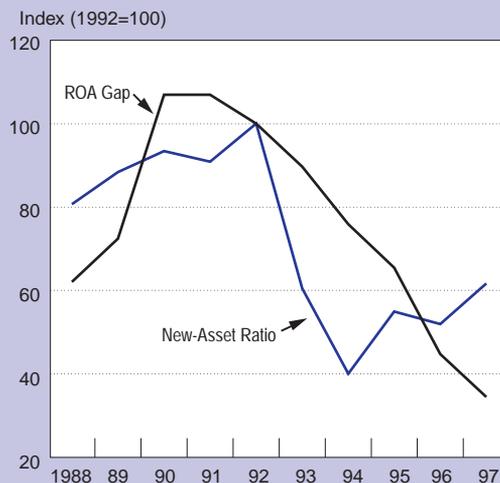
The industry-level estimates provide a mixed picture of the connection between the ROA gap and the newness of foreign-owned companies. Some

17. In the case of capital expenditures, profits would be reduced mainly by the associated depreciation charges.

18. Both Landefeld, Lawson, and Weinberg [8] and Laster and McCauley [9] used data from BEA's survey of new foreign direct investments in the United States to show that a large percentage of U.S. companies acquired by foreigners had below-average profitability.

CHART 6

Foreign-Owned U.S. Nonfinancial Companies: Indexes of the ROA Gap and the New-Asset Ratio, 1988-97



Notes.—The ROA gap is defined as the ROA for all foreign-owned U.S. companies in an industry less than the ROA for all U.S.-owned companies in that industry.

The new-asset ratio is defined as the ratio of the assets of U.S. companies acquired or established by foreign-owned U.S. companies in the preceding 2 years to the current-year assets of all foreign-owned U.S. companies.

ROA Return on assets

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

industries in which the profitability of foreign-owned companies was relatively high (such as petroleum manufacturing and chemical manufacturing) were those in which newly acquired or established businesses accounted for a relatively small share of the operations of foreign-owned companies. However, in some industries (such as food and kindred products manufacturing), newly acquired or established businesses accounted for a relatively small share of the operations of foreign-owned companies, but the profitability of foreign-owned companies was relatively low.

The relationship between the ROA gap and the newness of foreign ownership was examined in greater detail using company-level estimates covering 7,906 foreign-owned nonfinancial companies in 1989 and 10,223 foreign-owned nonfinancial companies in 1996. The newness of foreign ownership of a given company was measured by the ratio of (1) the assets of companies acquired or established by the given company in the preceding 2 years—as reported on BEA's survey of new foreign direct investments in the United States—to (2) the current-year assets of the given company.¹⁹ This

19. BEA's survey of new foreign direct investments covers outlays by foreign direct investors to acquire or establish affiliates in the United States. For newly acquired companies, asset values reported on the survey are as of the end of the most recent financial year preceding acquisition; if assets are to be revalued after

measure is referred to hereafter as the "new-asset ratio."

Table 5 shows the average ROA gap for foreign-owned companies grouped by their new-asset ratios. For example, in 1989, companies with a "high" new-asset ratio (25 percent or more) had an average ROA gap nearly twice as large (-3.0 percent) as that of companies with a "low" new-asset ratio (less than 25 percent). The differences between the mean ROA's for the low and high new-

acquisition, they are reported after revaluation. For newly acquired companies, asset values are projections for the end of the first full year of operations. A two-year lag was chosen for the newness measure because it was judged long enough to include transactions that could have had an impact on rate of return, but short enough to preclude dissipation of the factors related to newness. Comparisons of two-year and three-year lags in earlier work showed little difference in results.

Table 5.—Average ROA Gap for Foreign-Owned U.S. Nonfinancial Companies by New-Asset Ratio, 1989 and 1996

[Percentage points]

Year	Low new-asset ratio	High new-asset ratio
1989	-1.7	-3.0
1996	-2.3	-3.2

NOTES.—The new-asset ratio is the ratio of the assets of companies acquired or established by the given company in the preceding 2 years to the current-year assets of the given company. A new-asset ratio less than 25 percent is considered "low," and one that is 25 percent or more is considered "high."

The ROA gap is defined as the ROA for a foreign-owned company less the ROA for all U.S.-owned companies in the same industry.
ROA Return on assets

Accounting for Mergers and Acquisitions

Business combinations (mergers and acquisitions) may result in accounting changes that distort return on assets (ROA) comparisons across companies and across time. U.S. generally accepted accounting principles currently provide two methods for accounting for business combinations—the "purchase" method and the "pooling-of-interests" method. In the purchase method, one company is identified as the buyer and records the value of the company being acquired in its financial statements at the price it actually paid. In the pooling-of-interests method, the two combining companies add together the historical-cost values of their net assets.

The effect of a business combination on the combined companies' ROA depends on the method used. The purchase method will often result in substantial changes in the ROA of the combined companies because the purchased company's assets are revalued to current prices. In addition, any premium paid for the purchased company beyond the fair-market value of its assets is recorded as "goodwill," which is treated as an amortizable intangible asset. The annual amortization of goodwill is a charge against income and thus reduces the ROA. In contrast, the pooling-of-interests method generally does not affect the ROA of the combined companies, because the transaction generally does not result in any charges against income and because the combining companies' assets are carried over to the new combined company at historical cost.

Companies generally prefer the pooling-of-interests method because it does not disrupt comparisons of financial results across companies or across time.¹

This study tried to remove some of the effects of business combinations on the ROA estimates. Specifically, an estimate for annual amortization of intangible assets (chiefly, goodwill) was removed from the numerator, and an estimate for the stock of amortizable intangible assets was removed from the denominator (see the technical note for details). These adjustments mitigated, but did not completely remove, potential inconsistencies over time in the ROA estimates. For example, special allowance was not made for other intangible assets that may have been restated at market value after a business combination.

Another potential effect of business combinations on the ROA estimates is the usually higher depreciation charges that result when assets are purchased for an amount greater than their value at historical cost. However, the ROA estimates presented here should not be affected, because all companies' fixed assets (and the associated depreciation charges) have been revalued to current prices.

1. However, in mid-1999, the U.S. Financial Accounting Standards Board (FASB) announced that it would eliminate the pooling-of-interests method for business combinations beginning late in 2000. The faults with this method that the FASB cited included lack of conformity with international accounting standards and inconsistency with the treatment for other acquired assets.

asset ratio categories were found to be statistically significant.²⁰

A second age-related effect is the benefit of experience. Foreign-owned companies may initially have a lower ROA than U.S.-owned companies because they are relatively less mature and have a greater need for improvements that will be made in their operations over time. These improvements may include reaching a higher level of capacity utilization, restructuring or shedding unprofitable operations, and learning by doing. Earlier research demonstrated the benefits of experience on a company's ROA. For example, Lupo, Gilbert, and Liliestedt [10] examined company-level data for 4,507 foreign manufacturing affiliates of U.S. multinational companies and found that the average ROA for the affiliates increased steadily with age, at least for the first 10 years. As mentioned earlier, Grubert, Goodspeed, and Swenson [3] and Laster and McCauley [9] found a similar result in their research.

This study examined the relationship between a foreign-owned company's age and its ROA gap using data for a panel of 749 foreign-owned manufacturing companies that existed throughout 1988–97. The panel was restricted to manufacturing companies because some of the benefits of experience (such as higher capacity utilization) are expected to be strongest for companies in that industry. For analytical purposes, the age of a given company was measured as the number of years that the affiliate was in the panel.²¹ To test for the presence of a relationship between age and the ROA gap, panel-data regressions were performed on the company-level data.

A significant relationship between a company's age and its ROA gap was detected for all foreign-owned manufacturing companies in the panel and for companies in 11 of the 18 manufacturing industries shown in tables 1 and 2. For all man-

Table 6.—Median ROA Gap for a Matched Sample of Foreign-Owned U.S. Companies in All Manufacturing Industries and in Motor Vehicles and Equipment Manufacturing, 1988–97

[Percentage points]

	All manufacturing industries	Motor vehicles and equipment
1988	-2.7	-6.5
1989	-2.6	-6.4
1990	-3.5	-2.2
1991	-3.0	-3.9
1992	-2.0	-1.0
1993	-1.4	-0.7
1994	-0.3	1.5
1995	-1.9	3.5
1996	-0.2	-1.8
1997	0.1	3.0

NOTE.—The ROA gap is defined as the ROA for a foreign-owned company less the ROA for all U.S.-owned companies in the same industry.
ROA Return on assets

ufacturing industries combined, the median ROA gap, which was -2.7 percentage points in 1988, had been completely eliminated by 1997 (table 6). Among individual industries, a particularly strong relationship between age and the ROA gap was found in motor vehicles and equipment manufacturing: The median ROA gap was -6.5 percentage points in 1988, but a positive 3.0 percentage points in 1997. (See the technical note for summary results of the regression analysis.)

Intrafirm-import content.—Some analysts speculate that foreign-owned companies have actually made higher profits than as measured by the BEA data but then have shifted some of them out of the United States using transfer prices. Although tax regulations generally require that intrafirm transactions be at “arms-length” prices, intercountry differences in tax rates create incentives to deviate from this standard, particularly for trade in nonstandardized goods and services for which market-based reference prices are lacking.²² It was not possible to directly test for profit shifting using transfer prices. However, the greatest opportunities to shift profits using transfer prices exist for foreign-owned companies with a high percentage of their sales accounted for by intrafirm imports. Thus, any relationship detected between the share of sales accounted for by intrafirm imports and the ROA gap may provide indirect evidence of profit shifting using transfer prices.

The industry-level estimates indicated no clear relationship. To investigate the relationship at a more detailed level, company-level estimates for foreign-owned companies in manufacturing and wholesale trade in 1988–97 were used.

20. A sample inference between two population means was used to test the statistical significance of these differences; the procedure is described in the technical note.

An extension of the analysis of the effects of newness would measure newness in U.S.-owned companies and its impact on the ROA gap for the foreign-owned companies. Using readily available data, a crude measure of newness was developed for U.S. parent companies in manufacturing using data from BEA's surveys of U.S. direct investment abroad. In contrast to the findings for foreign-owned companies, U.S. parent companies in manufacturing with a high degree of newness had a higher ROA than those with a low degree of newness. This difference may reflect the types of companies acquired: Foreign-owned companies may tend to acquire relatively less profitable companies, whereas U.S.-owned companies may tend to acquire companies that are relatively more profitable. Further work is needed to confirm and interpret these preliminary results and to investigate whether they apply to U.S.-owned companies in general.

21. This measure of age is limited in two ways. First, the companies were not of uniform age in the first year of the panel (1988). Second, the companies in the panel may have acquired or established other businesses during the period, an activity that would have subjected them to new rounds of profit-reducing “newness.” Therefore, any benefit of experience detected for these companies must have been strong enough to offset the effects of these data limitations.

22. An “arm's-length” price is the price that would be charged between unrelated parties.

Table 7.—Average Intrafirm-Import Content of Sales and Median ROA Gap for Foreign-Owned Manufacturing and Wholesale Trade Companies, 1988–97

Intrafirm-import content of sales (percent)	Median ROA gap (percentage points)	Number of companies
Less than 10.0	-3.0	1,744
10.0 to 29.9	-2.6	672
30.0 to 49.9	-3.1	575
50.0 to 69.9	-3.4	492
70.0 or more	-4.0	390

NOTE.—The ROA gap is defined as the ROA for a foreign-owned company less the ROA for all U.S.-owned companies in the same industry.
ROA: Return on assets

Table 7 shows the median ROA gap for foreign-owned companies grouped by the intrafirm-import content of their sales. For example, the 1,744 companies in the first group had an intrafirm-import content of sales of less than 10 percent and a median ROA gap of -3.0 percentage points. From the table, there does not appear to be a strong relationship between the two variables. Regressions of the two variables detected a statistically significant relationship in only 2 of the 10 years studied. However, these 2 years were at the end of the period, when the profitability of foreign-owned firms was highest and the incentives to shift profits thus possibly the greatest.²³ (See the [technical note](#) for summary results of the regression analysis.)

The regression equation was also estimated annually by country for foreign-owned companies from five major investing countries: Canada, France, Germany, Japan, and the United Kingdom. Effective tax rates varied considerably across these countries, and the incentive to shift profits from the United States would have been strongest for parent companies in countries such as the United Kingdom, where the tax rates on business profits were low relative to the rates in the United States.²⁴ However, when the regression equations

23. To see if imports might affect profitability in other ways, such as by influencing the cost of inputs, the relationship between the *total* import content of sales and the ROA gap was also tested. However, as was the case for intrafirm imports, the relationship was found to be statistically significant in only 2 of the 10 years studied. In light of the results of the analysis of intrafirm imports, this result was to be expected because intrafirm imports accounted for 80 percent, on average, of total imports of goods by foreign-owned companies during the period.

In addition to intrafirm imports, the relationship between foreign-owned companies' ROAs and their intrafirm exports was tested. However, the regression analysis provided no evidence that foreign-owned companies with larger intrafirm export-to-sales ratios have larger ROA gaps. The opportunity for foreign-owned companies to use exports for profit shifting is probably limited. Their intrafirm exports are significantly smaller than their intrafirm imports, and the exports are more likely to consist of standard goods for which arm's-length prices are readily available. The only previous study to examine explicitly the relationship between trade and profits was Laster and McCauley [9]; their findings were based primarily on tests using imports, but they also examined the relationship between profits and exports and, like this study, found no correlation.

24. Data for majority-owned foreign affiliates of U.S. multinational companies suggest that effective tax rates for the five foreign investing countries varied considerably and that tax rates in the United Kingdom were particularly

were estimated for the individual countries, the coefficients were insignificant in all but 1 of the 50 country-by-year regressions.

Combined effects.—The preceding analysis showed that, when taken separately, industry mix, market share, newness, and the benefit of experience are each (to varying degrees) associated with the ROA gap of foreign-owned companies, and that intrafirm-import content of sales is generally not. To determine whether a particular factor still independently does or does not contribute to differences in the ROA gaps once the influence of each of the other factors is taken into account, the measures of market share, newness, and intrafirm-import content were included as independent variables in a multivariate regression equation in which the ROA gap was the dependent variable. The equation was estimated using data for 2,133 foreign-owned manufacturing companies in 1992.²⁵

It was not necessary to include a variable for industry in the equation, because the manner in which the data are constructed implicitly controls for industry effects; that is, for each foreign-owned company, the gap is computed as the ROA for the company less the average ROA for U.S.-owned companies in the same industry. It was not possible to include a variable for the benefit of experience, because that variable is tested in a dynamic, rather than a static, framework. That is, the effect of experience was tested using time-series data; however, data limitations made it necessary to base the estimation of the multivariate regression equation on data for a single year.

The regression results confirmed that, even after allowing for the influence of the other measures, market share and newness were each significantly correlated with differences in the ROA gaps, and that intrafirm-import content was not.

As noted earlier, there could be relationships between some of the explanatory variables that, if present, might influence the results of the regression analysis; in particular, such relationships would tend to make it difficult to discern the independent effect of each variable. Statistical tests performed in conjunction with the multivariate analysis suggest that such relationships were not significant. (See the [technical note](#) for summary results of the regression analysis.)

low relative to those in the United States. For a study of corporate tax rates in the member countries of the Organisation for Economic Co-Operation and Development, see KPMG [7].

25. The estimation was restricted to manufacturing and to 1992 because market-share estimates were available only in that industry and only in that year.

Technical Note

This note explains how the ROA estimates were computed, describes the statistical methods used for analysis, and presents summary results of the regression analysis.

Computation of the ROA estimates

The ROA estimates for foreign-owned nonfinancial companies and U.S.-owned nonfinancial companies were computed as the ratio of profits plus interest paid to the average of beginning- and end-of-year total assets.²⁶ (Tables 8 and 9 summarize the derivation of the numerator and denominator of the ROA estimates.) Profits are the national income and product accounts (NIPA's) item "profits from current production," which measures profits before deduction of income taxes and excluding nonoperating items such as capital gains and losses and income from equity investments. Profits from current production reflect the value of inventory withdrawals and depreciation on a current-cost basis. Interest paid is gross interest paid (that is, interest receipts are not netted against interest payments). Total assets consist of

26. The data for U.S.-owned companies is restricted to corporations because the source data used are available only for those companies. In 1997, foreign-owned corporations accounted for 95 percent of the gross product (value added) of all foreign-owned companies.

Table 8.—Derivation of the Numerator of the ROA Estimates for Nonfinancial Companies for 1997

[Millions of dollars]

Foreign-owned companies		
1	Profit-type return ¹	45,635
2	Plus: CCAAdj for consistent accounting at historical cost	2,233
3	CCAAdj for current cost	433
4	Expensed petroleum and natural gas E&D expenditures	766
5	Amortization of intangible assets	4,309
6	Effect of recognition of software as fixed investment	829
7	Monetary interest paid	40,452
8	Equals: Numerator	94,657
All U.S. companies		
9	Corporate profits with inventory valuation adjustment, NIPA's ²	510,927
10	Plus: CCAAdj for consistent accounting at historical cost ³	114,934
11	CCAAdj for current cost ³	-63,092
12	Monetary interest paid ⁴	378,018
13	Equals: Numerator	940,787
U.S.-owned companies		
14	Numerator (line 13 less line 8)	846,130

1. As published in Zeile (1999), 36. Includes an inventory valuation adjustment.
 2. As published in NIPA table 6.16C. In the NIPA's, petroleum and natural gas exploration and development expenditures, business purchases of software, and business own-account software production are regarded as fixed investment. Also, amortization of intangible assets is not recognized as an expense.

3. As published in NIPA table 8.15.
 4. Consistent, in concept, with data in NIPA table 8.20. The estimates presented here are preliminary and have since been revised.

NOTE.—See the technical note for more information.
 CCAAdj Capital consumption adjustment
 E&D Exploration and development
 NIPA's National Income and Product Accounts
 ROA Return on assets

both tangible and intangible assets but exclude assets for which the return is not included in the numerator of the ROA ratio. Reproducible tangible assets are valued at current cost—that is, at the price that would have been paid for them if they had been purchased new in the period to which the estimates refer.

Most of the information used to compute the ROA's for foreign-owned companies is available from BEA's surveys of foreign direct investment in the United States, and most of the information used for U.S.-owned companies is available from the NIPA's. However, some of the data used to compute the ROA's for both groups of companies had to be obtained from other sources or estimated. Most of the estimation involved allocating estimates at the all-industries level to individual industries; these estimates were allocated to individual companies using identical methods. These allocations required assumptions that may have resulted in the understatement or overstatement of some of the ROA components for some industries or companies. However, it is unlikely that these allocations had a material impact on the analysis, because the allocated items' contribution to the ROA estimates was small relative to the variation in the estimates across industries and to the size of the gaps between the estimates for foreign- and U.S.-owned companies. Checks using alternative methods to allocate the estimated data across industries confirmed that the ROA patterns for foreign- and U.S.-owned companies were not

Table 9.—Derivation of the Denominator of the ROA Estimates for Nonfinancial Companies for 1997

[Millions of dollars]

	1996	1997	
Foreign-owned companies			
1	Current-cost net plant and equipment	484,327	505,971
2	Plus: Current-cost inventories	164,995	169,513
3	Other assets	830,418	898,848
4	Less: Amortizable intangible assets	86,261	90,149
5	Equity investment in unconsolidated businesses	97,828	106,197
6	Equals: Current-cost assets	1,295,651	1,377,986
7	Denominator¹	1,336,819	
All U.S. companies			
8	Current-cost net plant and equipment	4,249,578	4,481,868
9	Plus: Current-cost inventories	1,145,500	1,206,699
10	Other assets	7,745,510	8,248,757
11	Less: Amortizable intangible assets	683,108	727,655
12	Equity investment in unconsolidated businesses	963,974	986,543
13	Equals: Current-cost assets	11,493,506	12,223,126
14	Denominator¹	11,858,316	
U.S.-owned companies			
15	Denominator (line 14 less line 7)	10,521,498	

1. Equals the average of current-year and prior-year current-cost assets.

NOTES.—See the technical note for more information. Assets are valued at yearend.
 ROA Return on assets

significantly affected by the method used for the allocations.

Foreign-owned companies

Profits.—Profits from current production for foreign-owned companies were estimated by adjusting the existing estimates of the companies' "profit-type return" (PTR) to place depreciation charges on a consistent accounting basis that reflects geometric depreciation patterns and to value them at current costs. The PTR estimates include an adjustment to place inventories, but not depreciation, on a current-cost basis.²⁷ To remove inconsistencies in the valuation of depreciation, a capital consumption adjustment (CCAdj) was computed for foreign-owned companies. In addition, to be consistent with profits from current production, the PTR of foreign-owned companies was adjusted to make it more consistent with the NIPA treatment of expensed petroleum and natural gas exploration charges, amortization of intangible assets, and business purchases of computer software.²⁸

The profit estimates for foreign-owned companies required a CCAdj because depreciation reported on the direct investment surveys is valued at historical cost.²⁹ The CCAdj, which is the difference between the historical-cost and the current-cost value of depreciation charges, comprises two parts: One part adjusts depreciation charges used by businesses in financial or tax accounting so that they are on a consistent historical-cost accounting basis, and the other part adjusts those charges to a current-cost basis.³⁰

27. BEA estimates the PTR of foreign-owned companies from financial and operating data reported in its annual and benchmark surveys of foreign direct investment in the United States. These data provide a picture of the overall operations of foreign-owned companies, and include balance sheets and income statements, employment and compensation of employees, trade in goods, research and development expenditures, sources of finance, and selected data by State. The PTR estimates are based primarily on data from the income statement and are computed as net income (before the deduction of income taxes or depletion charges), excluding capital gains and losses, income from equity investments, and other nonoperating income, and they also include an inventory valuation adjustment. For a summary of the most recent estimates—covering 1997—see Zeile [25]. For more detailed estimates, see U.S. Department of Commerce [18].

28. The NIPA profit measure is primarily based on tabulations of business tax return data by the Internal Revenue Service (IRS). NIPA table 8.25 shows the relationship between NIPA profit measures and the corresponding measures published by the IRS. For the most recent estimates, see U.S. Department of Commerce [20].

29. The data collected in the direct investment surveys are required to be reported as they would have been in the financial statements of the foreign-owned companies and generally reflect U.S. generally accepted accounting principles (GAAP). Under GAAP, depreciable assets and their related depreciation charges are usually valued at historical cost, and depreciation charges generally follow a straight-line (rather than a geometric) pattern.

30. For more information about these adjustments, see page M-6 of U.S. Department of Commerce [19] and page 2 of U.S. Department of Commerce [16].

The CCAdj estimates for the PTR of foreign-owned companies were based on CCAdj estimates that BEA has computed for income on foreign direct investment in the United States as shown in the international transactions accounts (ITAs).³¹ The ITA estimates are based on (1) estimates of historical-cost depreciation from data collected in annual and benchmark surveys and (2) estimates of current-cost depreciation computed by BEA using a perpetual-inventory model that takes into account the service lives and depreciation rates of the assets.³² Because direct investment income in the ITAs reflects the foreign parent company's share in the earnings of their U.S. affiliates, the CCAdj estimates used in the ITAs are adjusted for percentage of foreign ownership. The CCAdj estimates are made only at the all-industries level.³³

The CCAdj estimates from the ITAs were used to adjust the PTR of foreign-owned companies. Because PTR reflects the total earnings of foreign-owned companies, not just the foreign parents' share, the two CCAdj components were modified to remove the adjustment for percentage of foreign ownership. The modified adjustment for consistent accounting at historical cost was allocated to individual industries in proportion to the industries' respective shares in the reported depreciation charges in that year; this procedure assumes that the composition of the fixed assets and the relationship between financial-statement-based and consistent-historical-cost depreciation charges is the same across industries. The adjustment for current cost was allocated to individual industries according to industry-level estimates of the ratio of historical-cost to current-cost depreciation for all U.S. companies from BEA's wealth estimates.

The adjustment for current cost may have been overstated or understated in some industries because the industrial distribution of the ratio of historical-cost to current-cost depreciation for all U.S. companies from the BEA wealth estimates is based on data for establishments, which are classified by the principal product or service produced at each establishment; in contrast, the distribution of the depreciation charges for foreign-owned com-

31. BEA collects data on direct investment income, along with data on other transactions and positions between foreign parent companies and their U.S. affiliates needed for preparation of the ITAs and NIPAs, in quarterly surveys of foreign direct investment in the United States. (Parallel surveys are conducted for U.S. direct investment abroad.) Unlike the data from the annual and benchmark surveys described in footnote 27, which cover the overall operations of foreign-owned companies, the data from the quarterly surveys cover only transactions and positions between foreign parent companies and their U.S. affiliates.

32. For a description of the perpetual-inventory model, see pages M-4 to M-6 of U.S. Department of Commerce [17].

33. The CCAdj estimates, which extend back to 1982, were introduced in Murad [12], pp. 72-73.

panies is based on data collected for enterprises (companies), which are classified by the principal product or service produced by all of their establishments combined.

Profits of foreign-owned companies were also adjusted to include three items that are treated as expenses in the computation of PTR but not in the computation of NIPA profits: Expenditures for petroleum and natural gas exploration and development, amortization of intangible assets, and purchases of software.³⁴ The estimates of amortization of intangible assets were computed in three steps: First, the stock of amortizable intangible assets was estimated from balance sheet data for the companies reported on the direct investment surveys and for all U.S. corporations from the Internal Revenue Service's *Corporate Source Book* [23] (the estimation procedure is described in the section "Total assets")³⁵; second, annual amortization charges were computed based on these stock estimates and on an assumed amortization pattern (using amortization rules prescribed by U.S. generally accepted accounting principles); and finally, profits for foreign-owned companies were adjusted to reflect BEA's new treatment of software in the profit estimates for all domestic corporations.³⁶

These adjustments make the estimates of profits from current production (and profit-type return) for foreign-owned companies as comparable as possible with their counterparts in the NIPAs.

34. Data on expenditures of foreign-owned companies for petroleum and natural gas exploration and development are collected in BEA's annual and benchmark surveys of foreign direct investment in the United States.

In the NIPAs, expenditures for mining exploration, shafts, and wells are treated as fixed investment and, accordingly, the NIPA profits measures reflect the depreciation associated with the investments rather than the expenditures themselves. Because the data are unavailable to measure the depreciation associated with the investments by foreign-owned companies, the PTR of the foreign-owned companies could not be adjusted to reflect the depreciation.

35. The estimates for 1997 were mainly based on data from the Census Bureau's *Quarterly Financial Report* [14] because 1997 data were not available from the *Corporate Source Book*.

36. In the NIPAs, business purchases of software and business own-account software production are regarded as fixed investment. Business incomes (proprietors' income and corporate profits) are increased by the elimination of the deductions for the purchases of software and by the addition of the value of the production of own-account software as a receipt. These effects are partly offset by the deduction of the consumption of fixed capital (depreciation) on both purchased software and own-account software production. (For details, see Moulton, Parker, and Seskin [11].)

In the reports to BEA, for the period covered by this study, foreign-owned companies are believed to have treated software purchases and development of own-account software primarily as current expenses rather than fixed investment. (Until recently, there were no authoritative accounting guidelines on how companies should treat these software items in their financial reports. Beginning in 1998, the Accounting Standards Executive Committee of the American Institute of Certified Public Accountants (AICPA) has advised all of its members to treat them as fixed investment (see AICPA [1] for details).

Accordingly, it was necessary to adjust the profits of foreign-owned companies to make the treatment of software consistent with that in the NIPAs. The adjustment was estimated in two steps: First, the overall adjustment for all foreign-owned nonfinancial companies was derived based on the data for all U.S. corporations from the NIPAs on the software-related effects on profits and on the foreign-owned companies' share of corporate gross domestic product; second, the adjustment for foreign-owned companies was allocated by industry based on the industry distribution of total U.S. expenditures for computer and data processing services from the 1992 input-output accounts [15].

However, one minor difference could not be eliminated. For the NIPA profits measures, accounting provisions for losses related to bad debts are not treated as an expense, whereas such provisions are treated as an expense for foreign-owned companies' PTR.

Total assets.—Current-cost assets of foreign-owned companies were estimated by applying several adjustments to the financial-accounting-based total assets data for foreign-owned companies. First, the reported values for net plant and equipment and for inventories for all foreign-owned companies were revalued to current prices using ratios of historical-cost to current-cost net plant and equipment and inventories. These adjustment ratios are generated by the perpetual inventory model used to compute the CCA_{adj} and inventory valuation adjustment for direct investment income in the ITAs. Industry-level current-cost estimates were derived by applying the all-industries ITA adjustment ratios to the reported historical-cost data for each industry. This procedure implicitly assumes that the ratios of historical- to current-cost tangible assets are the same for each industry. Assets other than plant and equipment and inventories did not have to be adjusted, because those assets, which are mostly financial assets, are usually valued at (or near) current cost in financial accounting.³⁷

Second, the value of equity investments in unconsolidated businesses was subtracted from total assets for consistency with the profit estimates (which exclude income from such investments).

Third, an estimate of amortizable intangible assets was subtracted from total assets. The estimate was derived by multiplying the ratio of amortizable intangible assets to "other noncurrent assets" for all U.S. companies from the *Corporate Source Book* by reported data on foreign-owned companies' "other noncurrent assets."³⁸ This adjustment was made to improve consistency with the profit measure (which, as noted above, excludes the amortization of intangible assets) and to lessen the impact of variations in the level of acquisition-related amortizable intangible assets on changes in the estimated ROAs. (See the section "Age effects" in the text for details.)

37. It would have also been desirable to revalue holdings of land to current-period prices, but this was not done, because the necessary price data were unavailable. Because land's share of the total assets of both foreign-owned and U.S.-owned companies is very small, any adjustment probably would not have had a material impact on the ROA estimates.

38. "Other noncurrent assets" are all noncurrent assets except (1) equity investments involving 20 percent or more equity ownership and (2) net property, plant, and equipment.

U.S.-owned companies

Most of the data used to compute industry-level ROA's for all U.S. nonfinancial companies are available from the NIPAs and from the IRS *Corporate Source Book*. The derivation of those ROA estimates is explained below. Once the ROA estimates for all nonfinancial U.S. companies were computed, estimates for nonfinancial U.S.-owned companies were derived by subtracting the estimates for foreign-owned nonfinancial companies.

The NIPAs provide most of the data used to compute the numerator of the ROA ratios. They provide estimates of profits from current production for all U.S. companies but not by industry, because industry-level estimates of the CCA_{adj} are not available. They also provide industry-level estimates of interest paid.

Profits.—Industry-level estimates of profits from current production for all U.S. companies were derived by computing and applying a CCA_{adj} to the historical-cost industry-level estimates from the NIPAs. To compute industry-level CCA_{adj}'s, the aggregate adjustments from the NIPAs were allocated to individual industries. These allocations were made using the same techniques used for the estimates for foreign-owned companies; that is, the adjustment for consistent accounting at historical cost was allocated by industry using annual industry-level data on historical-cost depreciation from the *Corporate Source Book*. The adjustment for current cost was allocated by industry using industry-level estimates of the ratio of historical-cost to current-cost depreciation for all U.S. companies from BEA's wealth estimates. Because the data used to calculate the ratios are for business establishments and the profits data are for companies, the adjustment for current cost may be understated or overstated in some industries.

Total assets.—The *Corporate Source Book* provides the industry-level asset data to compute industry-level ROA estimates for all U.S. companies for this analysis. These data are at historical cost, so adjustments had to be made to derive estimates in current-period prices. Specifically, the industry-level estimates of net plant and equipment and of inventories for all nonfinancial U.S. corporations from the *Corporate Source Book* were revalued from historical cost to current prices using industry-level ratios of historical-cost assets to current-cost assets from BEA's wealth estimates. To make the denominator more reflective of the companies' own operations, the resulting estimates of current-

cost assets were adjusted to remove an estimate of the value of equity investments in unconsolidated businesses.³⁹ Finally, amortizable intangible assets from the *Corporate Source Book* were subtracted from total assets.

An adjustment could not be made for the potential difference in the levels of consolidation underlying the asset and profit data for all U.S. corporations. The level of consolidation of the NIPA profit data reflects the profits and related revenue and expense items reported on the IRS forms that are used in the estimation of NIPA profits by industry. Companies are required to report total assets and other balance sheet items to IRS on their income tax forms, and, when doing so, tend to follow U.S. generally accepted accounting principles (GAAP). Under GAAP, companies must consolidate subsidiaries in which they directly or indirectly control a majority interest (over 50 percent). In contrast, the IRS allows U.S. corporations to consolidate subsidiaries in which they control an 80-percent interest when reporting their profit data. If differences in the level of consolidation caused a company's profit data and assets data to appear in different industries, then the resulting ROA estimates may be understated or overstated for some industries.

Identification of industry-mix effects

The ROA gap was decomposed statistically into industry-mix, within-industry, and interaction effects. First, the ROA for all industries may be expressed as a weighted average of the ROA's in individual industries; the weight for any given industry is the industry's share of total assets. Thus, the average ROA for U.S.-owned companies can be expressed as

$$ROA^u = \sum_{i=1}^{30} s_i^u ROA_i^u,$$

and the average ROA of foreign-owned companies can be expressed as

$$ROA^f = \sum_{i=1}^{30} s_i^f ROA_i^f,$$

where ROA is the average return on assets for the 30 industries, ROA_i is the average return on assets for industry i , and s_i is i th industry's share of the total assets of companies in the 30 industries.

39. Because the *Corporate Source Book* did not provide the necessary balance sheet detail, this estimate was derived from ratios for U.S. multinational companies that were calculated from data collected in BEA surveys of U.S. direct investment abroad.

Variables with the superscript *f* denote data for foreign-owned companies, and variables with the superscript *u* denote data for U.S.-owned companies. The ROA gap can then be decomposed algebraically as

$$ROA^f - ROA^u = \sum_{i=1}^{30} ROA_i^u (s_i^f - s_i^u) + \sum_{i=1}^{30} (ROA_i^f - ROA_i^u) s_i^u + \sum_{i=1}^{30} (ROA_i^f - ROA_i^u) (s_i^f - s_i^u).$$

The first term on the right side of the equation measures the effects of differences in industry mix; it is the ROA gap that would have resulted if, in each industry, ROAs were the same for both foreign-owned companies and U.S.-owned companies and if the differences in the industrial distribution of assets were as observed. The second term on the right side measures the effects of within-industry ROA gaps; it is the ROA gap that would have resulted if both foreign-owned and U.S.-owned companies had the same distribution of assets by industry and if the ROA gaps in each industry were as observed. The third term reflects the interaction between these two effects.

Sample inference between two population means

The statistical significance of the differences between the average ROA gaps for foreign-owned companies with a “high” new-asset ratio and those with a “low” new-asset ratio was tested using a sample inference between two population means (see below). A test statistic was derived based on summary statistics for the ROA gaps for foreign-owned companies in the high and low new-asset-ratio classes. Because the number of observations was large and the observations were assumed to be normally distributed, the value of the test statistic was then checked against a critical t-statistic for the 1-percent confidence level. The following formula was used to calculate the test statistic:

$$z = \frac{(\overline{GAP}_H - \overline{GAP}_L)}{\sqrt{\frac{\sigma_H^2}{n_H} + \frac{\sigma_L^2}{n_L}}}$$

where \overline{GAP} is the average ROA gap, σ^2 is the variance of the ROA gaps, and *n* is the number of observations. Variables with the subscript *H*

denote data for companies with a high new-asset ratio (25 percent or more), and variables with a subscript *L* denote data for companies with a low new-asset ratio (less than 25 percent). The choice of 25 percent as the threshold for the high and low new-asset ratios was based on patterns detected in less aggregated classes.

Regression analysis

The statistical significance of market share, the benefit of experience, and the intrafirm-import content of sales in explaining the low ROAs of foreign-owned companies was separately tested using univariate regression analysis of company-level data. (Companies with an ROA gap that exceeded 25 percentage points in absolute value were considered outliers and were excluded from the analysis.) The dependent variable in each of the regression equations is the company’s ROA gap, which is the company’s ROA less the average ROA of U.S.-owned companies in the same indus-

Table 10.—Regression Results
The equations are of the form: *GAP* = *a* + *bX*

	Number of observations	Estimated coefficients		t-statistic	R ²
		a	b		
	(1)	(2)	(3)	(4)	(5)
Market share					
All manufacturing industries	2,133	-3.1	0.07	3.29**	0.005
Benefit of experience					
All manufacturing industries	20,830	-2.2	0.07	5.13**	0.001
Food and kindred products	740	-7.9	0.68	8.94**	0.107
Textile mill products	200	-1.4	0.20	1.47	0.011
Apparel and other textile products	100	-1.0	-0.29	-1.28	0.011
Lumber, wood, furniture, and fixtures	160	-1.2	-0.02	-0.12	(t)
Paper and allied products	200	-5.0	0.49	3.39**	0.060
Printing and publishing	210	-5.7	0.28	1.86	0.011
Chemicals and allied products	820	-1.4	0.25	3.58**	0.017
Petroleum and coal products	100	-1.0	0.70	3.60**	0.127
Rubber and miscellaneous plastic products	460	-5.1	0.21	2.20*	0.005
Stone, clay, and glass products	480	-5.9	0.34	3.25**	0.024
Primary metal industries	650	-1.9	0.47	5.34**	0.047
Fabricated metal products	540	-1.7	0.06	0.57	(t)
Industrial machinery and equipment	1,250	-2.4	0.40	6.40**	0.035
Electronic and other electric equipment	720	-5.1	0.46	5.87**	0.051
Motor vehicles and equipment	270	-7.8	1.16	8.13**	0.215
Other transportation equipment	120	1.2	-0.25	-0.94	0.006
Instruments and related products	270	-2.3	0.56	4.12**	0.065
Other	200	-2.0	0.60	3.71**	0.035
Intrafirm-import content of sales					
1988	3,067	-2.8	-0.01	-1.81	0.001
1989	3,257	-3.0	(t)	0.20	(t)
1990	3,522	-4.0	0.01	0.92	0.001
1991	3,709	-3.7	0.01	1.40	(t)
1992	3,241	-2.6	-0.01	-1.42	(t)
1993	4,350	-2.1	-0.01	-0.83	(t)
1994	4,361	-1.2	-0.02	-2.76**	0.015
1995	4,428	-2.2	(t)	-0.69	(t)
1996	4,466	-1.7	-0.03	-4.72**	0.005
1997	4,339	0.6	-0.02	-2.52*	0.002

**Significant at the 1-percent level.
*Significant at the 5-percent level.
(t) In column 3, less than 0.005 (±); in column 5, less than 0.0005 (±).
NOTE.—The dependent variable in each equation is the ROA gap. See the text for a description of the independent variables (X).

try. The estimated equations and their summary statistics are presented in table 10.

For the market-share and intrafirm-import equations, the number of observations is the number of companies included in the regression. The benefit of experience was tested using a panel data regression covering the years 1988–97; thus, there were 10 observations for each company. In table 10, a is the intercept term, and b is the coefficient of the independent variable.

The independent variables are as follows: For market share, the average market share of the company across all of its products; for the benefit of experience, the number of years that the company is in the panel (1 through 10); and for intrafirm-import content of sales, the percentage of the company's sales that was accounted for by intrafirm imports of goods.

In addition to the univariate analysis, multivariate regression analysis of the effects of market share, newness, and intrafirm-import content was also performed to determine whether the results differ when several explanatory variables are examined simultaneously. (It was not possible to include a variable for the benefit of experience, because that variable is tested in a dynamic, rather than a static, framework.) Using 2,133 foreign-owned manufacturing companies in 1992 as observations, the estimation yielded the following results:

$$GAP = -2.90 + .07MS - .03NEW + .01IMPORT$$

$$(3.42) \quad (-3.30) \quad (0.30)$$

$$R^2 = .010,$$

where GAP , MS , NEW , and $IMPORT$ are measures of the ROA gap, market share, newness, and intrafirm-import content of sales, respectively. The t-statistics for the independent variables, which appear in parentheses, indicate that the coefficients for market share and newness are statistically significant at the 1-percent level, but the coefficient for the intrafirm-import content of sales is not.

There could be relationships between the explanatory variables (multicollinearity) that influence the results of the regression analysis; in particular, such relationships would tend to make it difficult to discern the independent effect of each variable. Two factors suggest the absence of multicollinearity in this case: (1) the strength of the t-statistics for the significant coefficients and (2) the virtual absence of collinearity between the estimated coefficients as indicated by a correlation matrix.

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