

Integration of Micro and Macro Data on Consumer Income and Expenditures

March 22, 2013

Clinton P. McCully

Bureau of Economic Analysis

Macro estimates of household income and expenditures from the Bureau of Economic Analysis measure aggregate and per capita averages, but provide no information on the distribution of income, which is important in the measurement of economic well-being. Micro estimates of household income and expenditures have information on income distribution and other household breakdowns, but are confined to the measurement of cash income and direct household expenditures, and suffer from problems of nonreporting, underreporting, and underrepresentation of high-income households. Integrated estimates of household income and expenditures provide estimates of income distribution consistent with the more accurate and broadly-defined macro values, which include third-party payments, such as those by employers and government for health care, and account for the effects of income taxes. Integrated estimates of household disposable income show a lesser degree of income inequality than do micro estimates from the Current Population Survey Annual Social and Economic Supplement, largely because of the inclusion of in-kind government social benefits, primarily for health care, that disproportionately benefit lower-income households, and of the exclusion from income of personal income taxes, which are paid disproportionately by high-income households. Changes between 2006 and 2010 show a small narrowing in income discrepancies, reflecting declines in self-employment and property income of the top quintile and increases in government social benefits and lower taxes for the lowest quintile.

Note: National Income and Product Accounts (NIPA) data cited in this report reflect published estimates prior to the revised estimates for 2009 and 2010 released in July 2012.

Kevin J. Furlong of BEA's NIWD Research Group made a major contribution to the development of the integrated estimates and contributed the technical appendix on the statistical matching technique.

1. Introduction

There has been increasing recognition in recent years of the importance of the distribution of income as an indicator of economic well-being, amid concerns about the widening of income disparities. Macro estimates of household income and expenditures in the National Income and Product Accounts (NIPAs) produced by the Bureau of Economic Analysis (BEA) measure aggregates and per capita averages, but these estimates are limited as measures of social and economic progress because they contain no information on the distribution of income or other household income breakdowns such as by age and by household type. Micro estimates of household money income and expenditures from the Census Bureau's Current Population Survey Annual Social and Economic Supplement (CPS-ASEC) and from the Bureau of Labor Statistics' Consumer Expenditure Survey (CE) provide distributional information, including measures of median household income, but income and expenditures are more narrowly defined than in the NIPAs and there are issues with underreporting, nonreporting, and the underrepresentation of high-income households.

The macro and micro data have provided conflicting signals in recent years about changes in the economic status of U.S. households. Macro estimates of real per capita disposable personal income (DPI) showed moderate increases from 2000 to 2008, followed by a sharp decline in 2009 and a small increase in 2010 that left it at about the 2006 level, as shown on Figure 1. Real median household money income derived from CPS-ASEC was little changed between 2000 and 2007, and has since steadily declined. Real per capita DPI was 12 percent higher in 2010 compared to 2000, while real median income declined by 7 percent, for a cumulative difference of 19 percentage points over the ten-year period.

Consumer expenditure data have shown similar differences between the BEA estimates and those based on the CE. These differences have been the source of much discussion and debate. The faster growth in the national accounts measures, which rely mainly on business surveys, tax information, and administrative data, have been attributed to a number of factors, including:

- Inclusion of in-kind supplements to wages and salaries in the NIPA estimates, which have grown faster than wage and salary income.
- Inclusion of in-kind government social benefits such as Medicare and Medicaid in the NIPA estimates, which have grown very rapidly in recent years.
- Better coverage of high income individuals, whose incomes have been growing faster than other groups, in National accounts than in household surveys.
- Overstatement by NIPA data of the condition of most households through the use of average rather than median or quintile data.

Integration of the micro and macro estimates would reconcile these differences and provide valuable information that none of the sources by themselves can provide. Integrated estimates would combine the more accurate and more broadly defined NIPA estimates of household income and expenditures with the distributional information contained in the micro estimates.¹ Controlling the

¹ BEA and its predecessor agency, the Office of Business Economics, periodically published estimates of the size distribution of national accounts personal income in the U.S. from the 1950s to the 1970s using CPS, Internal Revenue Service, and Federal Reserve Board data, and such estimates were published as part of the National Income and Product Accounts from 1959 to 1964. More recently, the Expert Group on Disparities in National Accounts,

detailed component estimates in the micro sources to the macro values would account for the varying degrees of underreporting in the micro components. Inclusion of third-party payments and imputations from the macro estimates would account for the 30 percent of personal consumption expenditures not captured in the out-of-pocket expenditures from the CE (McCully, 43). Third-party payments are particularly important for health care, where the majority of care is financed by employer-sponsored health insurance and by government programs such as Medicare and Medicaid rather than by out-of-pocket expenditures captured in the CE. The integration of the micro and macro estimates is consistent with recommendations made in the “Report by the Commission on the Measurement of Economic Performance and Social Progress,” which stated that “distributional measures should be compatible in scope with average measures from the national accounts” (Stiglitz I.43).

This paper compares the micro and macro measures of income and expenditures and describes the process of deriving the integrated estimates, which are developed for the years 2006 through 2010. The results of the integration are discussed, and the distribution of household income is compared to results from the CPS-ASEC and the Internal Revenue Service (IRS). The paper concludes with a discussion of the issues raised by the integration and the direction of future research.

2. Micro and Macro Income and Consumption Measures

Micro Sources.—CPS-ASEC collects data on income, while the CE collects data on both income and expenditures. CPS-ASEC and the CE surveys are nationwide household surveys designed to represent the U.S. civilian noninstitutional population. There are differences between the surveys in the unit of measure, and significant differences in frequency and design.² CPS-ASEC is an interview survey conducted annually to collect data on household money income and health insurance coverage for the previous calendar year.

The CE consists of an Interview Survey and of a Diary Survey. The Interview Survey collects data on income and on expenditures that are large, such as for property and motor vehicles, or that occur on a fairly regular basis, such as utility or insurance payments. The Diary Survey collects data on small, frequently purchased items which are difficult to recall. Though there are items unique to the Interview Survey and to the Diary Survey, there is considerable overlap in the coverage of the two surveys. The published CE estimates combine data from the Interview and Diary surveys. When data are covered in both surveys, the more reliable of the two based on statistical criteria are used.³

sponsored by the Organization for Economic Cooperation and Development (OECD) and Eurostat, has been working to develop internationally comparable estimates of the breakdown of household income and consumption on a national accounts basis, and Fixler and Johnson have done work to account for the distribution of income in the U.S. National Accounts.

² The unit of measure in the CE is the consumer unit, and households in some instances have more than one consumer unit based on the criteria of financial independence. The differences are small, however (about 2 percent), and BLS uses the term households in its *Handbook of Methods* chapter about the CE, so households are used in this paper in describing the CE.

³ Details on the conduct of the CPS-ASEC and CE surveys are in Technical Appendix A.

Macro sources.--The sources used for the NIPA estimates of personal income and outlays are many and diverse, but can be characterized in general as being based on reports by businesses and governments. Business data are collected administratively such as from tax records for business income, from trade sources such as motor vehicle industry publications for motor vehicle sales, in sample surveys such as the Census Bureau surveys of retail trade and service industries, and in economic censuses conducted at five-year intervals by the Census Bureau. Estimates of government social benefits included in personal income come from Federal agencies and from state and local governments as reported in annual Census Bureau surveys of government finances. Estimates of Social Security and Medicare taxes are based on data from the Social Security Administration, estimates of Federal income taxes are based on data from the IRS, and estimates of state and local taxes are based on annual Census Bureau surveys of government finance. Use of data from CPS-ASEC and CE is very limited: data on self-employment income from the CPS are used to develop adjustments for tax return nonfilers in the NIPA estimates of proprietors income, and in personal consumption expenditures (PCE), CE data for categories such as motor vehicle leasing are used, constituting less than one-half of one percent of the total PCE value.

NIPA estimates are generally considered more accurate than aggregate values derived from household surveys (Attanasio, Bee, Bosworth, Roemer, Ruser). Reports from businesses collected in economic censuses, sample surveys, and administratively are more reliable than household surveys, which for the CE Interview Survey and CPS-ASEC have issues with recalling income and expenditures and are subject to deliberate underreporting of certain items. For the CE Diary Survey, there are issues of what is sometimes called “diary fatigue,” which refers to the drop-off in recording of expenditures over time, evidenced by a persistent pattern of lower reported expenditures for the second of the one-week surveys compared to the first (BLS 1983, Stephens). Businesses are required to account for all of their receipts and expenditures on an ongoing basis. NIPA estimates are not considered “the truth” because the data on which they are based are subject to nonsampling error such as underreporting of income and, in many instances, to sampling error as well. However, NIPA expenditure estimates are periodically benchmarked to estimates based on the economic censuses, which are not subject to sampling error, and estimates are adjusted for misreporting and undercoverage, particularly for business income. Micro estimates of income and expenditures are generally lower than macro estimates, often by significant amounts.

For the overall economy, NIPA estimates of gross domestic product (GDP) are conceptually identical to gross domestic income (GDI), which measures the incomes generated and the costs incurred in generating GDP. The GDP and GDI measures are derived independently and as such provide a means of verifying the validity of each measure. Differences between the two, known as the statistical discrepancy, have ranged from minus two percent to plus two percent of GDP over time.

Coverage—The civilian noninstitutional population is covered in both the CPS-ASEC and CE. Personal income and outlays (PI&O) estimates in the NIPAs cover the income and expenditures of those defined as U.S. residents in the national accounts, which includes nonprofit institutions serving households (NPISHs), the institutionalized population, federal civilian and military personnel stationed abroad, and persons whose usual place of residence is the U.S. who are private employees working

abroad for a period of less than one year.⁴ Excluded from the NIPA definition of residents are foreign nationals who work and reside in the U.S. for part of the year, foreign nationals employed by international organizations, and foreign nationals studying in the U.S. Also, NIPA estimates include the income and expenditures of those who died during the preceding year, which are not captured in CPS-ASEC, which is an annual survey collecting income data from households for the previous calendar year. Excluding NPISHs income and outlays from the PI&O and accounting for transfers between households and NPISHs gives a measure of household income and outlays (HI&O), which will be referenced during the remainder of the paper and used for the integration of the micro and macro estimates.⁵

3. Integration Steps

The first step in the integration process is the merging of the micro datasets for income from CPS-ASEC and for income and expenditures from the CE. Following the merging of the data sets, the integration steps for both income and expenditures are as follows:

- Adjusting the scope of the macro estimates to match the civilian noninstitutional population covered in the micro sources
- Matching the macro and micro component estimates
- Determining indicators for non-comparable macro components
- Calculating macro-to-micro ratios for each matched component
- Scaling household-level matched components in the micro data by the macro-to-micro ratios
- Using indicators to distribute unmatched macro values to households
- Classifying households by income group, main source of income, and household type using the scaled and distributed household-level estimates.

Micro datasets merging.--A dataset combining CPS-ASEC and CE household-level data was constructed using a procedure which linked household units in CPS-ASEC to units in the CE through the use of “common” variables that exist in both surveys. This process is known as “statistical matching” and it was necessary because neither the CPS-ASEC source nor CE contained all the information necessary for the analysis, either for income or for consumption. The synthetic data created through this procedure contained all income components necessary to construct household-level income and outlays.

In total, twenty “common” variables were identified in the CPS and the CE. These variables were used in the unconstrained statistical matching procedure to link the two surveys.

Common Income Variables:

- Wages and salaries
- Nonfarm income
- Farm income
- Social Security and Railroad Retirement benefits

⁴ The inclusion of NPISHs in PI&O is treated as a scope difference rather than as a definitional difference.

⁵ Separate estimates of household and NPISHs income and outlays are published annually in NIPA Table 2.9.

- Supplemental Security Income
- Unemployment compensation
- Workers' compensation
- Welfare
- Pensions
- Alimony received
- Child support received
- Food Stamps

Common Demographic Variables:

- Household size
- Number of children
- Number of persons older than 65
- Marital status of reference person
- Education level of reference person
- Location in a metropolitan statistical area with a population greater than 1 million
- Race of reference person
- Housing tenure (rent, own, no cash rent)

A distance function based on the differences in the common variables in the two datasets was used to match records from the CPS-ASEC and CE. The matching was “unconstrained” in that a given record could be used multiple times. Details on the procedure are in Technical Appendix B.

4. Income Integration

Definitions.--Money income from CPS-ASEC is essentially a measure of cash income from the following sources:

- Wages and salaries
- Self-employment income
- Rental income from leasing of residential properties
- Royalties
- Interest and dividends
- Government transfers
- Transfers from households and other private sources
- Pensions⁶

Household income in the NIPAs includes, with the exception of transfers from households and pension income, these forms of cash income, but is a broader measure of income in that it includes the following imputations and third-party payments:

⁶ See DeNavas-Walt, Appendix A, for listing of components of money income and Census Bureau 1998, Appendix A for definitions of income components.

- Employer contributions to employee pension and insurance funds
- In-kind government social benefits
- Imputed interest received by depositors and insurance policyholders
- Interest and dividends received by entities holding household assets
- The imputed rental income of owner-occupied housing
- Current transfers from business
- In-kind income provided to employees
- Farm products consumed on farms
- Margins on owner-built housing

In addition, NIPA household income subtracts employee and self-employed contributions for social insurance, which is not done in the case of money income.⁷

Employer contributions to employee pension and insurance funds include contributions to private and publicly-administered retirement plans and to group health and life insurance, workers' compensation, and supplemental unemployment (NIPA Table 6.11D). In-kind government social benefits include Medicare, Medicaid, other state and local government medical care, Supplemental Nutrition Assistance Program (SNAP) benefits, Women's Infants and Children's (WIC) food benefits, energy assistance, and part of education benefits.⁸ Though not included in money income, employer contributions for health insurance and in-kind government social benefits for Medicare, Medicaid, Food Stamps, and energy assistance are measured in CPS-ASEC for use in alternate income estimates.

Imputed interest is received from banks and other depository institutions, from regulated investment companies, from life insurance carriers, and from property-casualty insurance companies. Imputed interest received by depositors at commercial banks and other depository institutions is income attributed to depositors to pay for services furnished without payment, such as for bookkeeping or check clearing. It is equal for commercial banks to the difference between what is known as a "reference rate"—essentially a riskless interest rate such as on U.S. government securities—and the interest rate paid on deposits applied to the value of deposits held by households. For other depository institutions, the difference between the interest rate received and that paid on deposits is used. Imputed interest received by regulated investment company (RIC) shareholders is income attributed to shareholders to pay for RIC services, as measured by their expenses, which are primarily for portfolio management. Imputed interest received by life insurance policyholders measures the life insurers' income receipts on policy reserves, which are deemed to belong to households. Imputed interest received by property-casualty insurance policyholders is measured by income receipts on what are known as "technical reserves", which are reserves on unearned premiums and unpaid losses, and which are treated as supplements to premiums paid by policyholders.

Interest and dividends in the NIPAs include the property income of pension plans. Dividends also include S corporation income reported on Schedule E of the federal individual income tax return

⁷ Employer contributions for social insurance (primarily Social Security and Medicare) are included in supplements to wages and salaries in compensation of employees, but are subtracted in deriving household income. See NIPA Table 2.1 and Table 3.6.

⁸ SNAP was formerly known as Food Stamps, which is the term still used in the CPS-ASEC estimates.

(BEA September 2011).⁹ S corporation income equals passive and nonpassive gains less passive and nonpassive losses and certain expenses. Since this income is not dividends for tax-reporting purposes, it is likely that it is not reported as such in CPS-ASEC, though it may be reported as part of self-employment income. Similarly, interest income received by nonfinancial sole proprietorships and partnerships is not included in interest reported on federal income tax returns, and may be reported as part of self-employment income in CPS-ASEC. Interest and dividends in the NIPAs also include property income of individual retirement arrangements (IRAs) and Keogh and other self-employed plans. This property income is not reported on individual income tax returns and is therefore unlikely to be included in interest and dividends reported in CPS-ASEC.

To derive disposable household income, household current taxes are subtracted from household income. The great majority of these taxes are Federal and state income taxes, and other taxes include motor vehicle licenses, personal property taxes, and hunting, fishing, and other personal licenses. They do not include estate and gift taxes, which are classified in the NIPAs as capital transfers. Federal and state income taxes are estimated in CPS-ASEC; though they are not a subtraction in deriving money income, they are subtractions in alternate income definitions used by CPS-ASEC in determining the effects of benefits and taxes on income and poverty.

Scope Adjustments.—Scope adjustments to household income are shown on Table 1. The *institutionalized adjustment* removes the income of those living in institutionalized group quarters, including correctional institutions, nursing homes, mental hospitals, hospitals or wards for the chronically ill and for those who have no usual home elsewhere, and institutions for the mentally retarded, physically handicapped, and drug/alcohol abusers. Cash income of the institutionalized population is estimated using income of the institutionalized and total U.S. income from the 2000 Census of Population and Housing 5 % Microdata Sample. Income shares for the following categories were calculated from the Census data:

- Wages and salaries
- Self-employment
- Interest, dividends, rental income, royalty income, income from estates & trusts
- Social Security and Railroad Retirement
- Supplemental Security Income
- Public assistance
- Other income, including veterans benefits, unemployment compensation, child support, and alimony.¹⁰

The income shares from the 2000 Census were applied to the appropriate household income categories. The wages and salaries share was applied to the components of compensation of employees, including employer contributions for employee pension and insurance funds and for government social insurance (the latter not included in household income). The self-employment income share was applied

⁹ S corporations allow income and expenses to pass through to the shareholders, who are responsible for any resulting tax liability (Luttrell 2006).

¹⁰ Retirement income for the institutionalized and for the total population are also available from the 2000 Census, but are not used in the scope adjustments because NIPA household income does not include non-Social Security retirement income.

to farm and nonfarm proprietors' income. Interest, dividends, and related income shares were applied to household interest income and dividend income. Social Security, Railroad Retirement, and Supplemental Security Income shares were applied to the respective government social benefits categories. The public assistance share was applied to the family assistance and general assistance categories of government social benefits. The other income share was applied to workers' compensation, unemployment compensation, other government social benefits except Medicare and Medicaid, and current transfer receipts from business and from nonprofit institutions. Income shares ranged from less than 1 percent for wages and salaries and self-employment income to 9.4 percent for public assistance. Adjustments for institutionalized cash income were \$85.3 billion in 2010, 0.7 percent of household income. Medicare and Medicaid benefits for nursing home residents, which are not included in the 2000 Census income, totaled \$78.1 billion in 2010, 0.6 percent of household income, so that the total institutional adjustment to household income was \$163.4 billion, 1.3 percent of household income. Personal current taxes, disposable household income, and household outlays were also reduced by 1.3 percent.

The *decedent adjustment* removes the income of those who died during the reference year. Cash income of decedents was estimated using mortality rates by age, sex, and race, applied using Monte Carlo simulations to CPS databases for 2006 to 2009 matched on sex and race combinations to estimate decedents and their income. The weighted sum of the income variables was divided by 2 to represent decedent income for the year. Adjustments for decedent cash income were \$53.1 billion in 2010, 0.4 percent of household income.

Estimates of in-kind social benefits received by decedents from the Medicare and Medicaid programs are based on the results of studies which have estimated the share of Medicare and Medicaid expenditures for persons in the last year of life (Hoover, Riley). The first study, based on data from the 1992-1996 Medicare Beneficiary Study, showed 25 percent of Medicare Expenditures and 26 percent of Medicaid expenditures were for those in the last year of life. The more recent study also shows that expenditures for those in the last year of life account for 25 percent of all Medicare spending. Percentages were adjusted to 24 percent for Medicare and 18 percent for Medicaid to account for nursing home care captured in the institutionalized adjustment. These benefits totaled \$195.5 billion in 2010, 1.6 percent of household income, so that the total decedent adjustment was \$248.6 billion, 2.0 percent of household income. Personal current taxes, disposable household income, and household outlays were also reduced 2.0 percent.

The following income items of U.S. government civilian and military personnel stationed abroad were removed:

- Wage and salary disbursements
- Supplements to wages and salaries
- Dividends, interest, and rent on federal retirement plans
- Less: Contributions for government social insurance.

These adjustments are the same as those made in BEA's state personal income estimates, and are calculated as the difference between NIPA estimates for those income components and the state personal

income components (BEA October 2011).¹¹ Earnings of private U.S. residents employed abroad for a period of less than one year, from unpublished data in BEA's International Transactions Accounts, are also excluded. The 2010 adjustments for federal workers were \$27.1 billion in 2010, and for private workers \$1.1 billion. Personal taxes are estimated as the difference between state personal current taxes and NIPA personal current taxes.

The *adjustment for domestic military personnel living on post* removes the following income components: wages and salaries, employer contributions for government social insurance, employer contributions for military retirement, employer contributions for group life insurance, and interest income on military retirement. The wages and salaries of domestic military personnel living on post are estimated as the product of the number of personnel and an average rate of pay. Estimates of the number of military personnel living on post are based on counts of these personnel from the 2000 and 2010 Decennial Censuses of Population and Housing, calculated as a percentage of total active duty military personnel, with the percentage interpolated between 2000 and 2010 and applied to the total number of military personnel in each year. Data on total active duty military personnel are from the Department of Defense's Personnel and Military Casualty Statistics. Average pay was estimated using pay scale data from the Department of Defense's Defense Finance and Accounting Service. Average wages and salaries equaled basic monthly pay and basic allowance for subsistence for military pay grade E-4, the pay grade for enlisted personnel believed to reflect the average pay grade of personnel living on post.

Employer contributions for social insurance for domestic military personnel living on post were estimated using the Social Security/Medicare tax rate. Employer contributions for military retirement were estimated using military retirement contributions as a percentage of total military wages and salaries and applying this percentage to estimated wages and salaries for military living on post. Contributions for government social insurance, a subtraction in deriving household income, were calculated as twice the employer contributions for government social insurance. Personal current taxes, a subtraction in deriving disposable household income, were estimated by applying the overall tax rate on household income to basic pay.

Adjustments for foreign workers studying at colleges and universities in the U.S., foreign professionals temporarily residing in the U.S., and foreign temporary agricultural and nonagricultural workers in the U.S. add their compensation, and are based on unpublished detail from the U.S. International Transactions accounts. Income of these groups was \$12.7 billion in 2010 (shown on Table 1 as a negative \$12.7 billion scope adjustment).

The scope adjustments reduced 2010 household income by 3.6 percent, equal to \$443.0 billion. The reduction to disposable household income was also 3.6 percent, equal to \$401.4 billion. Adjustments to Medicare and Medicaid for the institutionalized and decedents were \$273.6 billion, 62 percent of the total household income adjustment. Other institutionalized and decedent adjustments were \$138.4 billion, while net residency adjustments and the adjustment for domestic military living on post were each \$15.5 billion.

¹¹ The values used in this paper are slightly different from those published in October 2011, based on more up-to-date data.

Matches and indicators.--The integration of scope-adjusted macro income estimates with micro estimates required the identification of micro series that matched the macro series as defined in the NIPAs as closely as possible. For NIPA series which could not be matched to micro variables, indicators were developed from the micro data to distribute the macro values. Most cash income included in household income was matched to CPS-ASEC series. Series were treated as matches if they referred to the same type of income, even if there were significant differences in coverage and measurement. An example of an indicator is the use of participants in a government program to distribute the government social benefits for that program. "Coverage ratios" were calculated as the micro values divided by the scope-adjusted macro values. Table 2 shows scope-adjusted NIPA values for major household income series, with micro values and coverage ratios for matched categories and identification of categories using indicators; in most instances, matching was done at a more detailed level than shown in the table.

For *compensation of employees*, wages and salaries matched definitionally and had very high coverage ratios: 2010 CPS wages and salaries were 97 percent of the NIPA value. For supplements to wages and salaries, data on payroll taxes and on employer contributions for health insurance collected in CPS-ASEC for use in alternative measures of income were matched to the two largest components. The health insurance contributions are a direct match, while the payroll taxes paid by employees for Social Security and Medicare (FICA) were assumed to be the same as employer payments and matched to employer contributions for old age, survivors, disability, and hospital insurance.¹² For military medical insurance, which provides coverage to dependents of active duty military personnel at nonmilitary facilities, the number of family households with one or more members in the armed forces and participating in military health care was used as the indicator. For supplemental unemployment benefits, CPS-ASEC benefits received were used as the indicator. Wages and salaries were used as indicators for the remaining components. For employer contributions to pension plans, wages and salaries of those participating in employer-sponsored pension plans were used. Private wages and salaries were used as the indicator for employer contributions to private workers' compensation, and total wages and salaries were used as indicators for group life insurance and for government social insurance contributions other than Social Security and Medicare and military medical insurance. These social insurance contributions consist primarily of unemployment insurance and state workers' compensation.

For *proprietors' income*, farm and nonfarm proprietors' income were matched to their respective self-employment counterparts in CPS-ASEC. The measures of income from self-employment differ definitionally and have low coverage ratios: CPS-ASEC self-employment income is 35 percent of the NIPA value in 2010, with a dollar difference of \$664.0 billion. The low self-employment ratio is affected by significant adjustments made in the NIPAs. CPS-ASEC nonfarm self-employment income is expected to be consistent with that reported on individual income tax returns, and for 2009, nonfarm self-employment income in CPS-ASEC was \$337.5 billion, 78 percent of nonfarm proprietorship and partnership income of \$431.9 billion reported to the IRS.¹³ Nonfarm proprietors' income reported in the NIPAs was \$902.0 billion in 2009. The NIPA estimates use the IRS data as a starting point, but make substantial adjustments to align the estimates with NIPA definitions, to account for entities not captured in the IRS data, and to account for misreporting (NIPA Table 7.14). The largest NIPA adjustments were

¹² The employer and employee tax rates were the same through 2010, the latest year covered in this study.

¹³ Comparisons are made for 2009 because at the time of the published 2010 NIPA estimates discussed in this paper (prior to the July 2012 revised estimates for 2009 and 2010), 2010 IRS were not yet available.

\$444.1 billion for misreporting and a capital consumption adjustment of \$155.2 billion. The capital consumption adjustment changes depreciation from a tax-reported basis to a current replacement cost basis.

Rental income of households is measured in the NIPAs as rental income on tenant-occupied dwellings, royalties, and the imputed rental income of owner-occupied housing. The CPS-ASEC series for rents, royalties, estates or trusts is matched to the sum of tenant-occupied dwellings income and royalties, with a coverage ratio of 61 percent. The match is clearly not exact because of the inclusion of estate and trust income in the CPS-ASEC series, which in the NIPAs are primarily included in income receipts on assets. The NIPA value for the imputed rental income of owner-occupied housing, which has no CPS-ASEC counterpart, was derived by subtracting expenses from the gross rental value of housing, including intermediate expenses, property taxes, net interest, and consumption of fixed capital. A match was constructed using data from the CE Interview Survey, including the rental equivalence of owned homes and expenses for insurance, maintenance and repairs, closing costs, mortgage interest, and property taxes. Homeowners' insurance premiums were used as indicators for insurance net of losses and for net insurance settlements, each a part of intermediate expenses in the NIPA estimates.¹⁴ Maintenance and repair expenditures and closing costs, also included in intermediate expenses, were matched exactly, as were property taxes. Mortgage interest reported in the CE was used as an indicator for net interest and for borrower services included in intermediate expenses. Net interest and borrower services sum to mortgage interest paid; in the NIPAs, part of the nominal mortgage interest paid is deemed to be payments for services provided to borrowers. Consumption of fixed capital, with no CE match, used owners' equivalent rent as an indicator.

For *income receipts on assets*, household interest and dividend income were broken out into monetary interest received by publicly administered government employee retirement plans, monetary interest received by private noninsured pension plans, other monetary interest, imputed interest by type of financial institution, and dividend income. Because household monetary interest and dividend income in the NIPAs are estimated as residuals, and because only interest received by publicly administered government employees retirement plans is reported separately, separately identifying interest and dividends received by entities holding household assets from income received directly by households is difficult. For monetary interest, only interest received by employer-sponsored pension plans (for government and private employees) was estimated separately. Scope-adjusted monetary interest was \$503.9 billion in 2010, of which pension plan interest was \$172.7 billion; the remaining \$331.2 billion in interest includes that received directly by households and by nonfinancial sole proprietorships and partnerships, fiduciaries, IRAs and other tax-deferred savings accounts. The remaining interest income was matched to CPS-ASEC interest, and all of NIPA dividends were matched to CPS-ASEC dividends, though a portion of NIPA dividends was received by pension plans. For publicly administered government employee pension plans and for private pension plans, wages and salaries of government workers and of private workers participating in pension plans were used as indicators.

For imputed interest, indicators were used in all instances. For depository institutions, interest was distributed using the value of savings and checking accounts held by consumer units from the CE. For RICs, interest received by private pension plans used the wages and salaries of private employee

¹⁴ Net insurance settlements measure the difference between actual and expected losses.

pension plan participants from CPS-ASEC, while for other interest received from RICs, the market value of all securities held from the CE Interview Survey was used. For imputed interest received from life insurance carriers, premiums for life, endowment, annuities, and other insurance policies providing death benefits from the CE Interview Survey were used. For property-casualty insurance companies, premiums for vehicle insurance and homeowners' insurance from the CE Interview Survey were used as the indicator.

Government social benefits were separated into cash and in-kind benefits. Almost all of the cash benefits were matched to CPS-ASEC variables, including Social Security, railroad retirement, unemployment insurance, Supplemental Security Income, refundable tax credits, temporary disability insurance, family and general assistance, and veterans' pensions and disability. Medicare and Medicaid, the largest of the in-kind benefits, were matched to the "person market value" of each of these programs in CPS-ASEC, which measures the average government cost per recipient and is akin to the insurance cost of coverage. SNAP benefits were matched to the CPS-ASEC food stamps value. For other in-kind social benefits, including energy assistance, other state and local medical care, Women's Infants and Children's (WIC) food benefits, and dependent and retiree military medical insurance, benefits were distributed using the number of participants by household. Government social benefits which are a combination of cash and in-kind benefits, including veterans' education and training benefits, workers' compensation, and educational assistance, were matched to the cash benefits in CPS-ASEC.

Other current transfer receipts include receipts from business and from NPISHs, and alimony and child support payments from other households. Receipts from business, which include payments by insurance to persons and business losses due to fraud and theft, have no counterpart in CPS-ASEC. Insurance reimbursements from the CE for stolen or total loss vehicles were used as an indicator, though the link is weak, in that payments from commercial motor vehicle policies are only a portion of the transfer receipts from business, and reimbursements reported in the CES are probably overwhelmingly from private passenger policies rather than from commercial policies. Current transfer receipts from business were \$24.2 billion in 2010, 0.2 percent of total household income. For current transfer receipts from NPISHs, the matched CPS-ASEC series was private educational assistance, though this is only a partial match, since transfers from educational institutions account for only part of receipts from NPISHs. Receipts from NPISHs were \$78.9 billion in 2010, 0.7 percent of total household income. For alimony and child support, the CPS-ASEC values were used directly, and equaled \$31.4 billion in 2010, 0.3 percent of household income.

For *contributions for government social insurance*, a subtraction in deriving household income, the employer contributions are the same as for compensation of employees. Payroll taxes from CPS-ASEC, used for the employer contributions match, are nearly an exact match for the NIPA employee contributions; FICA contributions accounted for 98 percent of the \$405.0 billion in NIPA employee contributions for 2010. The indicator used for self-employed contributions was CPS-ASEC farm and nonfarm self-employment income. For contributions for Medicare supplementary medical insurance, CE values for Medicare payments and for Medicare Prescription Drug premiums were matched to the NIPA values.

For *household current taxes*, CPS-ASEC taxes after credits for federal income taxes and for state and local income taxes were matched to the NIPA values. For motor vehicle licenses, CE values for state

and local registration and for drivers licenses were matched to the NIPA values. For other taxes, including hunting, fishing, and other personal licenses, CE fees for participant sports were used as the indicator, though the link is weak, in that sporting licenses are a relatively small part of the overall fees for participant sports.

Overall, coverage ratios for comparable series were high for wages and salaries and other employment-related variables, for rental income, for government social benefits, for supplementary medical insurance (Medicare) contributions, and for taxes. They were much lower for proprietors' income, for household income receipts on assets, and for current transfer receipts from nonprofit institutions.

5. Expenditures Integration

Definitions.--Household outlays in the NIPAs consist of household consumption expenditures, household interest payments, and household current transfer payments. Household consumption expenditures (HCE) consist of direct household expenditures for goods and services, expenditures financed by government social benefits, imputed expenditures, and expenses of financial institutions holding household assets.

Most direct household expenditures are comparable to CE consumer expenditures. A significant exception is financial services. Securities commissions, portfolio management and investment advice services, penalty fees on bank and credit card accounts, and trust, fiduciary, and custody activity fees are not captured in CE consumer expenditures.¹⁵ Expenditures financed by government, such as for health care, education, and energy assistance, are not captured in the CE, but have their exact counterparts in the government social benefits included in household income. Food expenditures financed by the SNAP (food stamp) program are included in CE food expenditures, though not separately identified. Imputed expenditures which have no counterparts in CE consumer expenditures include the following:

- Employer contributions for group health insurance and workers' compensation
- Gross rental value of owner-occupied housing¹⁶
- Financial services furnished without payment to depositors and borrowers
- Premium supplements for property and casualty insurance
- Food products produced and consumed on farms

Financial services furnished without payment to depositors have their counterparts in household imputed interest received by commercial bank, savings institution, and credit union depositors and by shareholders in regulated investment companies. Borrower services are those provided on non-mortgage loans from commercial banks, and are that part of monetary interest paid that are payments for services; household interest payments in household outlays are net of the value of these services. Employer contributions for health insurance, which have their counterpart in household income, are captured in two parts of HCE: benefit payments are included in health expenditures, and premiums net of benefits are

¹⁵ Late fees paid on credit cards and other credit sources are reported on the CE Interview Survey, but are not reported separately from finance charges and interest.

¹⁶ In NIPA 7.12, the imputed rental value is net of the intermediate expenses and investment in owner-occupied residential structures and the imputation also nets out investment in owner-occupied residential structures.

included in health insurance. The net cost of private workers' compensation is included in HCE for health insurance, while medical benefit payments are included in HCE for health; cash payments for private workers' compensation are included in CPS-ASEC money income. Premium supplements for property and casualty insurance have their counterpart in imputed interest received by property-casualty insurance policyholders in household income. Farm products produced and consumed on farms measures the gross value of farm own-consumption; the value net of intermediate inputs is included in household income. The values of food and lodging furnished to employees, which are imputed values in HCE, have their counterparts in imputed wages and salaries in household income, and these are captured in the CE as "food as pay" and "rent as pay."

Household interest payments in NIPA household outlays are non-mortgage monetary interest payments net of borrower services. The CE Interview Survey captures monetary interest payments, late fees, and other penalty fees in consumer expenditures. Household current transfer payments consist of payments to government, contributions to nonprofit institutions, and net transfers to the rest of the world. Payments to government consist of contributions, fees, and fines paid to Federal, state, and local governments. Contributions are captured in CE consumer expenditures, though contributions to nonprofit institutions and to government (such as public universities) are not separately identified. Net transfers to the rest of the world consist of U.S. households' transfers to foreign residents less foreign transfers to U.S. resident households. U.S. households' transfers to foreign residents are probably included in "other cash gifts" in CE consumer expenditures, though there is no differentiation between gifts sent to resident households and those sent to nonresident households. Transfers by foreign residents to U.S. households are very small.

Scope adjustments.—Adjustments to overall expenditures were generally made first, followed by allocations of the adjustments to individual expenditure categories. For the *institutional adjustment*, the household outlays' components--consumption expenditures, interest, and current transfer payments--were assumed to be in the same proportions to the adjustments to disposable household income as for the overall values. For the *decedent adjustment*, household outlays were assumed to be equal to DHI. For *U.S. government civilian and military personnel stationed abroad* and for *civilian workers temporarily stationed abroad*, their expenditures were removed from HCE. For *foreign students and workers* in the U.S., these expenditures, which are a subtraction in the calculation of total HCE, were added back in. Consumption expenditures and interest payments for *domestic military living on post* were assumed to be in the same proportions to the DHI adjustment as for the overall values.

Allocations of the HCE adjustments to individual categories varied by type of adjustment. For the *institutional adjustment*, the Medicare and Medicaid adjustments were allocated entirely to HCE for nursing homes. The remaining adjustment was allocated to other categories in proportion to their shares of HCE excluding nursing homes. For the *decedent adjustment*, the Medicare and Medicaid adjustments were allocated to HCE health, medical and hospitalization insurance, and social services. The remaining adjustment was allocated to other categories in proportion to their shares of HCE excluding all Medicare and Medicaid expenditures. For *U.S. government and private workers abroad*, no allocation was necessary, because these are separate estimates within HCE. For *domestic military living on post*, categories on which expenditures were unlikely, such as housing and health care, were first excluded and then the expenditures were allocated proportionately to the remaining categories. For *foreign students in the U.S* and for *foreign nationals working in the U.S.*, there is no need to allocate to individual categories,

because their expenditures are already included in those categories (in HCE, the total value of their expenditures is removed).

Scope adjustments to household outlays were 3.3 percent for 2010, equal to \$345.3 billion, as shown in Table 1. As with household income, the largest contributors to the scope adjustment were Medicare and Medicaid payments, which significantly affected health, insurance, and social services expenditures. For Medicare and Medicaid, expenditure adjustments exactly match income adjustments.

Matches and indicators.--For household consumption expenditures, near or exact matches from the CE data were made for the great majority of direct household expenditures. For a number of HCE categories, in order to align expenditures with the CE values, adjustments had to be made to account for expenditures by residents while out of the country and to exclude expenditures by nonresidents traveling in the U.S. This was done primarily using data from the U.S. Travel and Tourism Satellite Accounts.

For the *imputed rental value of owner-occupied housing*, the CE rental equivalence of owned dwellings is an exact match.

For *health care*, CPS-ASEC values for employer contributions for health insurance were used as indicators for health benefits paid by employer-paid health insurance. For health benefits paid by employee and self-paid insurance, the CE values for health insurance premiums paid were used as indicators. For Medicare, Medicaid, and other state and local medical care, the CPS-ASEC values were used as indicators. Out-of-pocket and other expenditures were matched to CE values.

For *motor vehicles and recreational vehicles*, sales were netted from CE values and trade-in values were added to net expenditures to align them with NIPA values.

For *motor vehicle maintenance and repair*, NIPA values were disaggregated into motor vehicle body repair and other motor vehicle maintenance and repair. CE motor vehicle insurance premiums were used as the indicator for motor vehicle body repair, while CE expenditures for motor vehicle maintenance and repair were matched to other motor vehicle maintenance and repair.

Post-secondary education includes higher education and commercial and vocational schools. The CPS-ASEC values used for government social benefits were matched to the portion of the NIPA expenditures financed by government. CE values for tuition expenditures were matched to the remaining NIPA expenditures.

Financial services has no CE matches, so indicators from CPS-ASEC or CE were used in all instances. For financial services furnished without payment by depository institutions and by regulated investment companies, the indicators are the values of deposits and of securities holdings from the CE, the same indicators used for imputed interest income in household income. For pension fund expenses, wages and salaries of those participating in employer-sponsored pension plans from CPS-ASEC were used, the same indicator as that used for employer contributions to pension plans in household income. For financial service charges and fees, an indicator consisting of safe deposit box rental, checking account fees, credit card membership fees, and finance charges excluding mortgages and vehicles—which includes late charges—from the CE was used. For securities commissions, an indicator consisting of the sum of the purchase price of securities including brokerage fees and the sale price of securities net of

brokerage fees from the CES was used as an indicator. For portfolio management, investment advice, trust, fiduciary, and custody activities, the market value of all securities held was used as an indicator.

For *insurance*, indicators were used in most instances. For life insurance, which is measured by the expenses of insurers and the profits of stock life insurance companies in the NIPAs, premiums for life, endowment, annuities, and other insurance policies providing death benefits from the CE were used as an indicator. Household insurance, which is insurance on household contents and is net of losses, was disaggregated into two parts: net tenants' insurance and net homeowners' insurance on household contents. Premiums for tenants' insurance from the CE were used as the indicator for the former, and premiums for homeowners insurance were used for the latter; coverage for household contents is generally a portion of homeowners insurance. Medical care and hospitalization insurance, which is measured as premiums net of benefits, was disaggregated into five parts: employer-paid insurance, employee and self-paid insurance, Medicare, Medicaid, and other state and local medical care. Employer-paid premiums from CPS-ASEC was used as the indicator for employer-paid insurance, and CE health insurance premiums (excluding Medicare supplement premiums) were used as the indicator for employee and self-paid insurance. The person market values of Medicare and of Medicaid from CPS-ASEC were used as indicators for the respective parts of medical and hospitalization insurance, and the indicator for other state and local medical insurance was the number of children by household enrolled in the SCHIP program from CPS-ASEC. For income loss insurance and for private workers' compensation, wages and private wages, respectively, from CPS-ASEC were used as indicators. For motor vehicle insurance, premiums for auto insurance and auto repair service policies were used as an indicator.

For *social services and religious activities*, indicators were used in most instances. For child care, CE other expenses for day care centers and nursery schools, including tuition, and expenditures for babysitting and child care were used as an indicator. This is considered an indicator because nursery school expenditures are classified with education expenditures in the NIPAs. Social assistance was broken down into Medicare, Medicaid, other state and local medical care, and out-of-pocket and other expenditures. The person market values for Medicare and Medicaid from CPS-ASEC were used as indicators for the respective components, and the number of children by household enrolled in the SCHIP program from CPS-ASEC used as the indicator of other state and local medical care. The remaining social assistance expenditures and expenditures for social advocacy and civic and social organizations, religious organizations, and foundations and grantmaking and giving services were distributed evenly to all households because of the lack of indicators. These expenditures equaled \$68.1 billion in 2010, 0.7 percent of household consumption expenditures.

For *professional and other services*, wages and salaries from CPS-ASEC were used as an indicator for two series: employment agency services and professional association dues. Expenditures for these categories were less than 0.1 percent of HCE in 2010. Labor organization dues were distributed using labor union members by households.

Non-mortgage interest payments from the CE were the indicators for both monetary interest paid and imputed interest paid, which is a negative value which removes borrower services from monetary interest. For transfers to government, which consists largely of gifts such as those to higher education institutions, the CE indicator is cash contributions to educational institutions. This is a somewhat weak indicator, in that the CE value includes gifts to private educational institutions, and household current

transfers includes other items, such as fines. The CE indicator for household transfer payments to the rest of the world is the CE series other cash gifts. The indicator for transfers to NPISHs is the combination of CE cash contributions to religious organizations, charities, educational institutions, and political organizations. CE alimony and child support expenditures are used directly.

Coverage ratios for household outlays shown on Table 3 were generally lower than those for household income. For comparable categories, the overall coverage ratio was 66 percent, compared to 77 percent for comparable income categories. The coverage ratio was highest for housing, utilities, and fuels, where the micro values slightly exceeded the scope-adjusted NIPA values. The coverage ratios for transportation and communication were 80 percent and 73 percent, respectively, while coverage ratios for the remaining categories were significantly lower.

6. Household Breakdowns

The household-level integrated income and outlays values were broken down along three dimensions:

- Quintiles of disposable income
- Household type
- Main source of income

Quintiles of income were based on “equivalized disposable income,” which adjusts for differences in household size and composition. Equivalized disposable income for each household was calculated for each household by dividing their disposable income by the number of consumption units in the household. Households were then grouped in quintiles based on their equivalized income. The number of consumption units for each household was calculated using the Oxford (sometimes called the OECD) modified scale, in which a weight of 1.0 is given for the household head, a weight of 0.5 for each additional adult household member, and a weight of 0.3 for each child. The weighting reflects how households share resources and take advantage of economies of scale. It has similarities to the three-parameter scale used to produce equivalence-adjusted income in CPS-ASEC. For quintiles, income shares by primary source of income were broken down as follows:

- Earned income
- Property income
- Government social benefits and other transfers

Earned income combines employee compensation and self-employment income and nets out employer, employee, and self-employed contributions for government social insurance. Government social benefits and other transfers equal transfers and other income less contributions for Medicare supplementary medical insurance.

Household types were the following:

- Single up to 65
- Single greater than 65
- Single with children under 18
- Two adults up to 65

- Two adults with at least one greater than 65
- Two adults with children under 18
- Other household types

The “other” household type includes children 18 or older living with parents.

The *main sources of income* distinguished were:

- Employee compensation
- Self-employment income
- Property income
- Transfers and other income

Property income includes rental income, interest, and dividends. Transfers and other income include government social benefits and transfers from NPISHs, businesses, and other households.

7. Results

Income Quintiles.--The share of disposable household income accounted for by the lowest quintile increased from 4.9 percent in 2006 to 5.4 percent in 2010, while the share accounted for by the highest quintile decreased from 48.4 percent to 47.1 percent; the shares accounted for by the other quintiles showed little change (Table 4). For all income groups during this period, there was a significant increase in the share of income accounted for by government social benefits and other transfers, and corresponding decreases in the shares accounted for by earned income and property income. The shift in sources of income was especially pronounced for the three lowest quintiles. In particular, the share of income accounted for by earned income for the lowest quintile fell by 7.7 percentage points from 2006 to 2010, and the share accounted for by government social benefits and other transfers increased by 8.4 percentage points.

For 2010, the share of disposable household income accounted for by earned income increased from 51.8 percent in the lowest quintile to 74.0 percent in the 4th quintile, while the earned income share of the highest quintile was somewhat lower at 69.1 percent. The shares of household income accounted for by transfers and by property income move in opposite directions: the share accounted for by transfers fell progressively through the income quintiles from 45.6 percent for the lowest quintile to 7.0 percent for the highest quintile, while property income shares rose with income, ranging from 2.5 percent for the lowest quintile to 23.9 percent for the highest quintile.

The consumption shares by income quintile show much less dispersion than does income (Table 5). Mean expenditures per household for the highest quintile were a bit more than twice as high for the top quintile as for the lowest quintile, versus a disposable household income ratio of nearly 9 to 1. The largest differences in consumption between the lowest and highest quintiles were for education and for financial services and insurance. Mean expenditures for food and beverages purchased for home use showed only modest differences between the lowest and highest quintiles, while mean expenditures for food services and accommodations were 135 percent higher for the highest quintile compared to the

lowest quintile. Mean expenditures for health ranged from \$8,352 for the lowest quintile to \$18,682 for the highest quintile. Within quintiles, the shares of expenditures accounted for by food, clothing, and housing and utilities decreased in moving from the lowest to the highest quintile, while the share accounted for by financial services and insurance increased steadily.

Household type.--The share of disposable household income accounted for by households with children fell by 3.0 percentage points from 2006 to 2010, from 31.1 percent to 28.1 percent (Table 6). Their real mean disposable household income fell, while the mean income of households with at least one member over 65 increased significantly. The earned income shares of disposable household income fell and the government social benefits and other transfers shares rose between 2006 and 2010 for all of the household types except for single households over 65. Property income shares of income fell for all household types except two adults with children between 2006 and 2010.

Mean expenditures were highest for households with two adults and at least one more than 65, followed by households with two adults and children (Table 7). The consumption shares accounted for by health expenditures were highest for households with at least one members older than 65. These household types also had the highest shares of consumption accounted for by housing, utilities, and fuels and by financial services and insurance.

Main Source of Income.--The share of income accounted for by households in which government social benefits and other transfers were the main source of income increased by 3.3 percentage points between 2006 and 2010, to 12.8 percent, while the income shares accounted for by households whose main source of income was earned income and property income each fell (Table 8). Mean disposable income was highest for households whose main source of income was self-employment income or property income, and lowest for households whose main source of income was transfers and other sources. Real mean disposable household income fell between 2006 and 2010 for households where self-employment income was the largest source, while it rose for each of the other groups, including a 13.0 percent increase for households whose main source of income was property income.

Mean consumption expenditures were highest for households where property income was the main source of income, and lowest for those whose principal source was government social benefits and other transfers (Table 9). Expenditures for the transfers group exceeded their disposable income, while the opposite was true for all other groups. A disproportionate share of health expenditures were accounted for by the group whose primary source was government social benefits and other transfers, and for this group, health expenditures were the highest share of consumption. For this group, 82.2 percent of their health expenditures were accounted for by in-kind government social benefits, including Medicare, Medicaid, State Children's Health Insurance Program (SCHIP), and other state and local medical care.

8. Comparison to Other Measures

The income distribution measures on a NIPA basis may be compared to the CPS-ASEC measures and also to measures produced by the IRS in their Statistics of Income (SOI) data. Differences between the measures reflect both definitional and measurement differences. Among the definitional differences are the following:

- The NIPA estimates are after tax, while money income and IRS adjusted gross income (AGI) measures are pre-tax.
- The NIPA estimates include both cash and in-kind social benefits, while money income only includes cash benefits and AGI excludes the great majority of social benefits.
- AGI includes capital gains (and losses), excluded from NIPA income and money income.
- Money income and AGI include pension and annuity income and IRA distributions, which are excluded from the NIPA measure.
- NIPA estimates and money income measure the distribution of household income, while IRS estimates measure the distribution of income by tax-filing unit.

Income taxes have some redistributive effects, so that after-tax income will be more evenly distributed than pre-tax income. An indication of this is that the 50 percent of taxpayers with the lowest AGIs, accounting for 12.8 percent of total AGI in 2009, paid only 2.3 percent of the income taxes. Similarly, government social benefits are received disproportionately by those in the lower income ranges. In 2010, the 40 percent of households with the lowest disposable income accounted for 40 percent of all social benefits, even though they accounted for 16 percent of total disposable income. Capital gains, of course, work in the opposite direction. In 2009, the 12 percent of taxpayers with AGIs of \$100,000 or more accounted for 94 percent of all capital gains. Capital gains declined precipitously from \$779.5 billion in 2006 to \$231.5 billion in 2009. The use of the number of taxpayers in the IRS data has the effect of lowering the share of AGI accounted for by those in the lowest income groups, because many of those reporting low incomes are in the same households as higher income filers. Often, those reporting low incomes are the children of those reporting much higher incomes. Consolidation of these into single households with the higher-earning parents would reduce the number of low income reporters and raise the share of income reported by the lowest quintile.

Table 10 shows the distributions for 2006, 2009, and 2010. For the lowest quintile, the NIPA shares of income are significantly higher than the CPS-ASEC and IRS shares.¹⁷ Compared to CPS-ASEC, much of the difference is accounted for by the presence of in-kind social benefits in the NIPA estimates and by the effects of income taxes on the distribution. Compared to a money income measure which excludes taxes and adds noncash government social benefits, the difference is much smaller. The rapid growth in in-kind social benefits between 2006 and 2010 contributed to the growth in the shares of the two lowest quintiles, while the shares in CPS-ASEC money income and equivalence-adjusted money income declined over this period. For the highest quintile, there are large differences between the NIPA and CPS-ASEC shares and the IRS shares. This is clearly related to the inclusion of capital gains (net of

¹⁷ There are no published IRS estimates of AGI by quintiles. The quintile distribution of AGI was estimated using IRS data on the number of returns and AGI by income size class. These estimates are based on only those returns with positive AGI. (The IRS does produce AGI distributions by cumulative percentiles.)

losses) in the IRS measure. The 4.3 percentage point drop in the highest quintile share of income in the IRS data between 2006 and 2009 is primarily accounted for by the very large drop in capital gains income.

9. Issues and Future Directions

The results presented in this paper are based on NIPA definitions and measures of income and expenditures. Strict application of the NIPA definitions in deriving estimates of income distribution yields some anomalous results, which are addressed below, along with consideration of the use of IRS data on individual income tax returns.

Pensions.--In the NIPAs, employer contributions to pension plans and interest and dividends earned on pension plan assets are part of household income. Pension payments are not recognized in the NIPAs because they are treated as withdrawals from assets owned by households. Pension payments and IRA and self-employed retirement plan withdrawals are part of money income in the CPS-ASEC estimates, and taxable pensions and annuities and IRA distributions are part of AGI in the IRS estimates. A consequence of the NIPA treatment of pensions in developing estimates of income distribution is that households with pension income, who use that income to provide funds for their expenditures, have expenditures that exceed their income, often by large amounts. Disposable (after-tax) income is negative in some instances, when taxes exceed income from other sources, and the income estimates do not reflect the households' economic circumstances. As a result, such households are often placed into the lowest income quintile. Payments from collective pension plans are significant: they equaled \$836.4 billion in 2010, 7.5 percent of disposable household income. For purposes of measuring income distribution, the NIPA treatment should be changed, so that payments from collective pension funds are accounted for as part of household income and pension plan contributions and earnings excluded. This is consistent with the treatment in the 2008 *System of National Accounts*, where collective pension fund payments are treated as social benefits.¹⁸

Capital Gains Taxes.--In the NIPAs, capital gains (net of losses) are not included in household income, but capital gains taxes are included in the federal and state income taxes netted against household income to derive disposable household income. At the micro level, this means that households with significant capital gains income may record low or even negative disposable income, in many instances placing them in the lowest income quintile. If possible, capital gains taxes should be removed from income taxes in deriving the income distribution estimates.

IRS Data.--The IRS data on individual income tax returns from the SOI program have a number of elements in common with NIPA household income, including wages and salaries, proprietors' income, interest and dividends including S corporation income, rents and royalties, Social Security benefits, and unemployment compensation. A motivation for using the data is that the IRS data better capture high-income households than do the CPS-ASEC data, which is especially important for estimates of property

¹⁸ In earlier estimates of the distribution of personal income (BEA 1973), employer contributions to pension, health, and welfare funds were excluded from personal income and private pension and annuity payments were added to personal income to derive "family personal income" used for the income distribution estimates.

income and proprietors' income. There are two primary issues with the use of IRS data in deriving NIPA-based estimates of income distribution: timeliness and reporting unit differences.

The most recent IRS public-use microdata on individual income tax returns are for 2008. Data for 2009 and 2010 by source of income and AGI bracket have been published by IRS. The reporting unit for the IRS data is the tax-filing unit rather than the household. A household may have more than one tax filer, and conversely, some households have no tax filers. The number of tax-filing units in 2010 was 142.9 million, versus 118.7 million households covered in CPS-ASEC. An IRS study of data for 1993 showed that the consolidation of tax filers into households overwhelmingly affected those tax returns reporting the lowest AGI (Sailer). Of the 115 million returns filed that year, 9 million were filed by dependents of other taxpayers, and the overwhelming majority of these taxpayers reports AGIs of less than \$10,000.

To use the IRS data, some means would have to be found to consolidate taxpayer units into households so that the IRS data could be statistically matched to the CPS-ASEC/CE data set. Alternatively, it may be possible using tax status and family- and person-level CPS-ASEC data to construct a data set that could be statistically matched with the IRS taxpayer-unit data, although in this case the matched data would then have to be converted back into household units. If the taxpayer-household issue can be resolved, a means of carrying forward estimates from the last year of IRS public-use data would have to be found, using the CPS-ASEC/CE data set alone or in combination with published IRS data by income bracket.

Figure 1 Micro and Macro Income

Real income: 2000 = 100

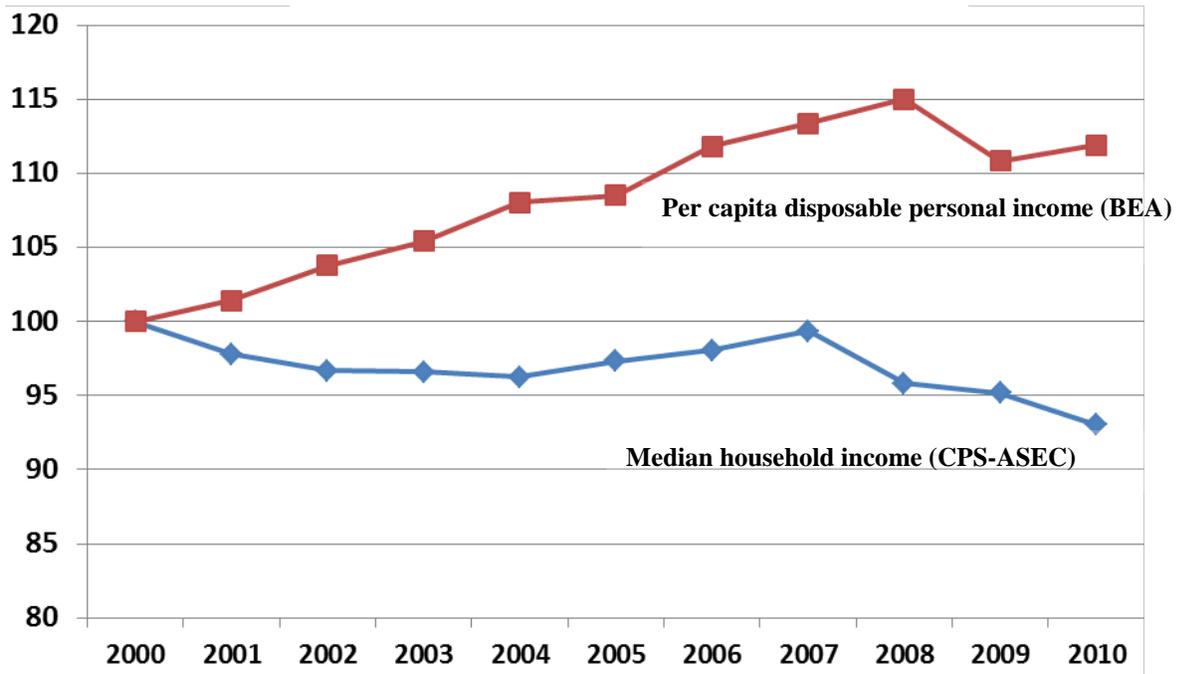


Table 1. Scope Adjustments to Household Income and Outlays by Type and Component			
(Billions of dollars)			
Label	2010		
	Published #	Scope Adjustments	Scope-Adjusted
Household income	12,400.1	443.0	11,957.1
Compensation of employees, received	7,971.4	80.7	7,890.6
Proprietors' income with inventory valuation and capital consumption adjustments	1,036.4	9.2	1,027.2
Rental income of households with capital consumption adjustment	343.6	7.4	336.2
Household income receipts on assets	1,678.4	37.1	1,641.3
Household current transfer receipts	2,357.2	318.5	2,038.7
Government social benefits	2,221.1	316.8	1,904.3
Other household current transfer receipts	136.1	1.7	134.5
Less: Contributions for government social insurance, domestic	986.8	9.8	977.0
Less: Household current taxes	1,193.9	41.6	1,152.2
Equals: Disposable household income	11,206.3	401.4	10,804.9
Less: Household outlays	10,547.9	345.3	10,202.5
Household consumption expenditures	9,965.3	326.1	9,639.2
Household interest payments	173.4	6.2	167.2
Household transfer payments	409.2	13.0	396.2
Equals: Household saving	658.4	56.1	602.3
Household saving as a percentage of household disposable income	5.9%	-	5.6%
Scope Adjustments to Household Income by Type	.....	443.0	.....
Institutionalized	.....	163.4	.....
Medicare & Medicaid	.....	78.1	.....
Other	.....	85.3	.....
Decedents	.....	248.6	.....
Medicare & Medicaid	.....	195.5	.....
Other	.....	53.1	.....
U.S. residents not physically present in U.S.	.....	28.2	.....
Federal civilian and military personnel stationed abroad	.....	27.1	.....
Wages of private U.S. residents abroad	.....	1.1	.....
Domestic military living on post	.....	15.5	.....
Foreign students and foreign temporary workers in U.S.	.....	-12.7	.....
Addendum:			
Medicare and Medicaid	.....	273.6	.....

Differs from values published in NIPA Table 2.9 by amount of alimony and child support received (income) and paid (outlays)

Table 2. Household Income and Micro Matches & Indicators, 2010

NIPA Series	NIPA Scope-Adjusted Values	Micro Matches		
		Source	Value	Ratio to Adjusted NIPA Value
Household income	11,957.1	.....	.....	.....
Compensation of employees, received	7,890.6	.....	.....	.....
Wage and salary disbursements	6,353.7	CPS	6,137.4	0.966
Supplements to wages and salaries	1,537.0	.....	.....	.....
Employer contributions for employee pension and insurance funds	1,068.7	.....	.....	.....
Group health insurance	553.4	CPS	402.0	0.726
Other	515.3	CPS	I	.....
Employer contributions for government social insurance	468.2	.....	.....	.....
Old-age, survivors, disability, and hospital insurance	394.5	CPS	458.9	1.163
Other	73.8	CPS	I	.....
Proprietors' income	1,027.2	CPS	363.2	0.354
Rental income of households with capital consumption adjustment	336.2	.....	.....	.....
Tenant-occupied housing & royalties	111.1	CPS	68.3	0.614
Imputed rental income for owner-occupied housing	225.1	CEI	310.7	1.380
Household income receipts on assets	1,641.3	.....	.....	.....
Household interest income	950.4	.....	.....	.....
Monetary interest	503.9	.....	.....	.....
Monetary interest received by pensions plans	172.7	CPS	I	.....
Monetary interest received by households	331.2	CPS	159.7	0.482
Imputed interest received by households	446.5	CEI	I	.....
Household dividend income	690.8	CPS	96.6	0.140
Household current transfer receipts	2,038.7	.....	.....	.....
Government social benefits	1,904.3	.....	.....	.....
Benefits from social insurance funds	1,196.3	.....	.....	.....
Social security and railroad retirement	665.1	CPS	581.0	0.873
Medicare	366.1	CPS	320.8	0.876
Unemployment insurance	136.9	CPS	99.1	0.724
Other benefits from social insurance funds	28.1	CPS	I	.....
Other government social benefits	708.0	.....	498.9	0.705
Medicaid	299.0	CPS	202.1	0.676
Other	409.0	CPS	296.8	0.726
Other household current transfer receipts	134.5	.....	.....	.....
From business (net)	24.2	CEI	I	.....
From nonprofit insitutions	78.9	CPS	19.2	0.244
From other households	31.4	CPS	31.4	1.000
Less: Contributions for government social insurance, domestic	977.0	.....	.....	.....
Employer and employee social contributions	873.2	CPS	917.8	1.051
Self-employed contributions	46.6	CPS	I	.....
Supplementary medical insurance (Medicare)	57.2	CEI	50.2	0.878
Less: Household current taxes	1,152.2	.....	1,170.9	1.016
Federal and state and local income taxes	1,122.7	CPS	1,144.9	1.020
Licenses and personal property taxes	29.5	CEI, CED	26.0	0.878
Equals: Disposable household income	10,804.9	.....	.....	.....
Addendum: Matched household income items	9,590.8	.....	7,408.3	0.772
CPS Current Population Survey Annual Social and Economic Supplement	CED Consumer Expenditure Diary Survey			
CEI Consumer Expenditure Interview Survey	I Indicator			

NOTE: CPS-ASEC and CE series may be combinations of variables.

Table 3. Household Outlays and Micro Matches & Indicators, 2010

NIPA Series	NIPA Scope- Adjusted Values	Micro Matches		
		Source	Value	Ratio to Adjusted NIPA Value
Household outlays	10202.5	.....	.....	.....
Household Consumption Expenditures	9639.2	.....	.....	.....
Food and beverages purchased for off-premises consumption	756.5	CED	465.9	0.616
Clothing, footwear, and related services	345.5	CEI, CED	174.5	0.505
Housing, utilities, and fuels	1906.6	CEI	1952.9	1.024
Furnishings, household equipment, and routine household maintenance	411.1	CEI, CED	238.7	0.581
Health	1770.3	.....	.....	.....
Health insurance	800.7	CPS, CEI	.....	.....
Medicare, Medicaid, and other state and local health Care	586.3	CPS	.....	.....
Out-of-pocket and other expenditures	383.3	CEI, CED	163.1	0.426
Transportation	1000.6	CEI, CED	729.6	0.729
Communication	235.4	CEI, CED	189.2	0.804
Recreation	904.1	CEI, CED	367.0	0.406
Education	247.4	CEI, CPS	134.5	0.544
Food services and accommodations	610.6	CEI, CED	363.5	0.595
Financial services and insurance	776.5	CEI, CPS	.....	.....
Other goods and services	674.6	.....	.....	.....
Personal care and personal items	277.8	CEI, CED	112.7	0.406
Social services and religious activities	141.2	CEI, CPS	.....	.....
Professional and other services	162.5	CEI, CPS	46.1	0.284
Tobacco	93.1	CED(I)	43.8	0.471
Household interest payments	167.2	CEI	32.5	0.195
Household transfer payments	396.2	CEI	205.0	0.517
Addendum: Matched household outlays items	7897.9	.....	5219.0	0.661
Note: Matches may have been made at a more detailed level than shown in the table				
CED	Consumer Expenditure Diary Survey			
CEI	Consumer Expenditure Interview Survey			
CED(I)	Consumer Expenditure Diary and Interview Survey			
CPS	Current Population Survey Annual Social and Economic Supplement			
XM	Exact match			
PM	Partial match			
I	Indicator			
E	Evenly distributed to all households			

Table 4. Income Quintiles

	2006	2010	Change
Shares of disposable household income of quintiles			
Lowest	4.9	5.4	0.5
Second	10.1	10.5	0.4
Third	14.8	15.0	0.2
Fourth	21.8	22.0	0.2
Highest	48.4	47.1	(1.3)
Mean disposable household income of quintiles			
Lowest	20,110	24,424	4,314
Second	41,798	47,742	5,944
Third	61,345	68,254	6,910
Fourth	90,253	100,193	9,940
Highest	200,521	214,330	13,810
Overall	82,805	90,989	8,184
Mean disposable household income of quintiles in 2010 dollars			
Lowest	21,808	24,424	2,616
Second	45,328	47,742	2,414
Third	66,525	68,254	1,729
Fourth	97,874	100,193	2,318
Highest	217,454	214,330	(3,124)
Overall	89,798	90,989	1,191
Earned income shares by quintile			
Lowest	59.6	51.8	(7.7)
Second	60.6	53.7	(6.8)
Third	69.5	63.0	(6.4)
Fourth	77.1	74.0	(3.1)
Highest	70.1	69.1	(1.0)
Overall	70.1	66.9	(3.2)
Property income share by quintile			
Lowest	3.2	2.5	(0.7)
Second	7.8	7.4	(0.4)
Third	10.2	9.7	(0.5)
Fourth	12.4	12.1	(0.3)
Highest	24.5	23.9	(0.6)
Overall	17.2	16.5	(0.6)
Government social benefits/other transfers share by quintile			
Lowest	37.2	45.6	8.4
Second	31.7	38.9	7.3
Third	20.3	27.2	6.9
Fourth	10.5	14.0	3.4
Highest	5.4	7.0	1.5
Overall	12.7	16.6	3.8

Table 5. Household Consumption Expenditures by Income Quintiles						
	2010					Overall
	Lowest	Second	Third	Fourth	Highest	
	(Billions of dollars)					
Total	1354.8	1567.7	1824.4	2139.8	2752.5	9639.2
Food and beverages purchased for off-premises consumption	140.8	146.1	141.9	157.5	170.1	756.5
Clothing, footwear, and related services	61.8	62.4	61.0	64.6	95.6	345.5
Housing, utilities, and fuels	286.4	329.4	376.2	427.1	487.6	1906.6
Furnishings, household equipment, and routine household maintenance	58.3	61.1	70.7	94.1	126.9	411.1
Health	198.4	333.3	391.5	403.4	443.7	1770.3
Transportation	139.2	157.9	189.8	245.0	268.7	1000.6
Communication	39.3	45.3	47.4	52.1	51.3	235.4
Recreation	146.5	128.8	155.2	211.7	261.9	904.1
Education	25.5	19.1	27.7	49.0	126.1	247.4
Food services and accommodations	83.8	87.6	106.8	135.1	197.4	610.6
Financial services and insurance	66.6	83.1	117.0	156.8	353.0	776.5
Other goods and services	108.2	113.7	139.2	143.4	170.1	674.6
	Mean expenditures per household					
Total	57,049	66,004	76,822	90,097	115,893	81,173
Food and beverages purchased for off-premises consumption	5,930	6,152	5,977	6,632	7,161	6,371
Clothing, footwear, and related services	2,603	2,628	2,571	2,718	4,027	2,909
Housing, utilities, and fuels	12,060	13,867	15,840	17,982	20,529	16,056
Furnishings, household equipment, and routine household maintenance	2,454	2,571	2,978	3,963	5,343	3,462
Health	8,352	14,034	16,486	16,985	18,682	14,908
Transportation	5,862	6,647	7,993	10,316	11,314	8,427
Communication	1,655	1,909	1,996	2,192	2,161	1,983
Recreation	6,169	5,424	6,534	8,914	11,027	7,614
Education	1,074	803	1,166	2,064	5,309	2,083
Food services and accommodations	3,530	3,687	4,496	5,689	8,310	5,142
Financial services and insurance	2,806	3,497	4,925	6,602	14,865	6,539
Other goods and services	4,555	4,786	5,861	6,040	7,163	5,681
	Share of consumption by quintile					
Total	14.1	16.3	18.9	22.2	28.6	100.0
Food and beverages purchased for off-premises consumption	18.6	19.3	18.8	20.8	22.5	100.0
Clothing, footwear, and related services	17.9	18.1	17.7	18.7	27.7	100.0
Housing, utilities, and fuels	15.0	17.3	19.7	22.4	25.6	100.0
Furnishings, household equipment, and routine household maintenance	14.2	14.9	17.2	22.9	30.9	100.0
Health	11.2	18.8	22.1	22.8	25.1	100.0
Transportation	13.9	15.8	19.0	24.5	26.9	100.0
Communication	16.7	19.3	20.1	22.1	21.8	100.0
Recreation	16.2	14.2	17.2	23.4	29.0	100.0
Education	10.3	7.7	11.2	19.8	51.0	100.0
Food services and accommodations	13.7	14.3	17.5	22.1	32.3	100.0
Financial services and insurance	8.6	10.7	15.1	20.2	45.5	100.0
Other goods and services	16.0	16.9	20.6	21.3	25.2	100.0
	Consumption shares within quintiles					
Total	100.0	100.0	100.0	100.0	100.0	100.0
Food and beverages purchased for off-premises consumption	10.4	9.3	7.8	7.4	6.2	7.8
Clothing, footwear, and related services	4.6	4.0	3.3	3.0	3.5	3.6
Housing, utilities, and fuels	21.1	21.0	20.6	20.0	17.7	19.8
Furnishings, household equipment, and routine household maintenance	4.3	3.9	3.9	4.4	4.6	4.3
Health	14.6	21.3	21.5	18.9	16.1	18.4
Transportation	10.3	10.1	10.4	11.4	9.8	10.4
Communication	2.9	2.9	2.6	2.4	1.9	2.4
Recreation	10.8	8.2	8.5	9.9	9.5	9.4
Education	1.9	1.2	1.5	2.3	4.6	2.6
Food services and accommodations	6.2	5.6	5.9	6.3	7.2	6.3
Financial services and insurance	4.9	5.3	6.4	7.3	12.8	8.1
Other goods and services	8.0	7.3	7.6	6.7	6.2	7.0

Table 6. Disposable Household Income by Household Type

	2006	2010	Change
Shares of disposable household income			
Single up to 65	10.3	10.4	0.1
Single older than 65	4.3	4.8	0.5
Single w/ children	3.4	3.1	(0.3)
Two adults up to 65	24.0	24.6	0.6
Two adults at least one more than 65	9.3	9.6	0.3
Two adults w/ children	27.7	25.0	(2.7)
Other	21.0	22.4	1.4
Mean disposable household income			
Single up to 65	48,774	52,616	3,841
Single older than 65	36,605	46,105	9,500
Single w/ children	48,704	51,993	3,288
Two adults up to 65	92,202	101,771	9,570
Two adults at least one more than 65	81,665	99,932	18,267
Two adults w/ children	106,256	112,817	6,562
Other	113,297	127,091	13,794
Overall	82,805	90,989	8,184
Mean disposable household income in 2010 dollars			
Single up to 65	52,893	52,616	(277)
Single older than 65	39,696	46,105	6,408
Single w/ children	52,817	51,993	(825)
Two adults up to 65	99,988	101,771	1,783
Two adults at least one more than 65	88,561	99,932	11,370
Two adults w/ children	115,229	112,817	(2,411)
Other	122,864	127,091	4,227
Overall	89,798	90,989	1,192
Earned income shares of total disposable household income			
Single up to 65	74.5	72.7	(1.8)
Single older than 65	10.9	13.6	2.7
Single w/ children	65.0	58.2	(6.8)
Two adults up to 65	76.2	74.8	(1.3)
Two adults at least one more than 65	24.9	22.9	(2.1)
Two adults w/ children	83.1	79.4	(3.7)
Other	75.5	71.5	(4.0)
Overall	70.1	66.9	(3.2)
Property income shares of total disposable household income			
Single up to 65	16.0	14.1	(2.0)
Single older than 65	39.5	37.7	(1.8)
Single w/ children	7.7	7.0	(0.7)
Two adults up to 65	17.3	14.9	(2.5)
Two adults at least one more than 65	39.7	39.6	(0.1)
Two adults w/ children	10.8	11.4	0.5
Other	13.2	12.7	(0.5)
Overall	17.2	16.5	(0.6)
Government social benefits/other transfers shares of total disposable household income			
Single up to 65	9.5	13.2	3.7
Single older than 65	49.6	48.7	(0.9)
Single w/ children	27.3	34.8	7.5
Two adults up to 65	6.5	10.3	3.8
Two adults at least one more than 65	35.4	37.6	2.2
Two adults w/ children	6.1	9.2	3.1
Other	11.3	15.7	4.4
Overall	12.7	16.6	3.8

Table 7. Household Consumption Expenditures by Household Type

	2010						Other	Overall
	Single up to 65	Single older than 65	Single w/ children	Two adults up to 65	Two adults at least one more than 65	Two adults w/ children		
	(Billions of dollars)							
Total	1330.9	580.2	377.4	2029.5	1113.7	2381.2	1826.2	9639.2
Food and beverages purchased for off-premises consumption	78.4	37.4	30.1	156.1	81.8	203.5	169.3	756.5
Clothing, footwear, and related services	35.7	10.6	19.4	70.4	28.2	110.3	70.8	345.5
Housing, utilities, and fuels	271.8	140.8	75.5	387.0	232.6	441.4	357.6	1906.6
Furnishings, household equipment, and routine household maintenance	45.0	23.0	13.8	92.4	54.6	108.5	73.7	411.1
Health	246.5	155.0	76.3	347.0	233.9	398.7	313.1	1770.3
Transportation	122.3	33.7	39.2	234.6	95.1	267.3	208.4	1000.6
Communication	31.6	12.0	11.7	49.8	24.6	55.9	49.8	235.4
Recreation	150.1	38.5	33.6	185.1	98.1	243.1	155.5	904.1
Education	38.4	5.3	7.4	51.9	6.2	67.0	71.1	247.4
Food services and accommodations	97.1	22.8	18.1	148.2	57.3	150.7	116.4	610.6
Financial services and insurance	104.0	64.9	18.0	177.3	133.0	157.9	121.2	776.5
Other goods and services	110.0	36.1	34.2	129.5	68.4	177.0	119.4	674.6
	Mean expenditures per household							
Total	62,061	51,276	58,149	77,557	107,243	99,533	96,013	81,173
Food and beverages purchased for off-premises consumption	3,656	3,302	4,631	5,966	7,874	8,506	8,902	6,371
Clothing, footwear, and related services	1,663	940	2,993	2,691	2,719	4,609	3,724	2,909
Housing, utilities, and fuels	12,673	12,441	11,638	14,789	22,397	18,448	18,798	16,056
Furnishings, household equipment, and routine household maintenance	2,096	2,037	2,130	3,532	5,259	4,536	3,872	3,462
Health	11,494	13,696	11,757	13,259	22,520	16,664	16,459	14,908
Transportation	5,702	2,982	6,037	8,966	9,160	11,171	10,957	8,427
Communication	1,473	1,060	1,805	1,905	2,365	2,339	2,617	1,983
Recreation	7,000	3,405	5,181	7,073	9,445	10,162	8,177	7,614
Education	1,793	470	1,141	1,984	594	2,801	3,738	2,083
Food services and accommodations	4,529	2,018	2,786	5,665	5,516	6,297	6,120	5,142
Financial services and insurance	4,851	5,733	2,780	6,777	12,811	6,602	6,373	6,539
Other goods and services	5,130	3,192	5,270	4,950	6,583	7,400	6,275	5,681
	Share of consumption by household type							
Total	13.8	6.0	3.9	21.1	11.6	24.7	18.9	100.0
Food and beverages purchased for off-premises consumption	10.4	4.9	4.0	20.6	10.8	26.9	22.4	100.0
Clothing, footwear, and related services	10.3	3.1	5.6	20.4	8.2	31.9	20.5	100.0
Housing, utilities, and fuels	14.3	7.4	4.0	20.3	12.2	23.1	18.8	100.0
Furnishings, household equipment, and routine household maintenance	10.9	5.6	3.4	22.5	13.3	26.4	17.9	100.0
Health	13.9	8.8	4.3	19.6	13.2	22.5	17.7	100.0
Transportation	12.2	3.4	3.9	23.4	9.5	26.7	20.8	100.0
Communication	13.4	5.1	5.0	21.2	10.4	23.8	21.1	100.0
Recreation	16.6	4.3	3.7	20.5	10.8	26.9	17.2	100.0
Education	15.5	2.2	3.0	21.0	2.5	27.1	28.7	100.0
Food services and accommodations	15.9	3.7	3.0	24.3	9.4	24.7	19.1	100.0
Financial services and insurance	13.4	8.4	2.3	22.8	17.1	20.3	15.6	100.0
Other goods and services	16.3	5.4	5.1	19.2	10.1	26.2	17.7	100.0
	Consumption shares for each household type							
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food and beverages purchased for off-premises consumption	5.9	6.4	8.0	7.7	7.3	8.5	9.3	7.8
Clothing, footwear, and related services	2.7	1.8	5.1	3.5	2.5	4.6	3.9	3.6
Housing, utilities, and fuels	20.4	24.3	20.0	19.1	20.9	18.5	19.6	19.8
Furnishings, household equipment, and routine household maintenance	3.4	4.0	3.7	4.6	4.9	4.6	4.0	4.3
Health	18.5	26.7	20.2	17.1	21.0	16.7	17.1	18.4
Transportation	9.2	5.8	10.4	11.6	8.5	11.2	11.4	10.4
Communication	2.4	2.1	3.1	2.5	2.2	2.3	2.7	2.4
Recreation	11.3	6.6	8.9	9.1	8.8	10.2	8.5	9.4
Education	2.9	0.9	2.0	2.6	0.6	2.8	3.9	2.6
Food services and accommodations	7.3	3.9	4.8	7.3	5.1	6.3	6.4	6.3
Financial services and insurance	7.8	11.2	4.8	8.7	11.9	6.6	6.6	8.1
Other goods and services	8.3	6.2	9.1	6.4	6.1	7.4	6.5	7.0

Table 8. Household Income by Main Source of Income

	2006	2010	Change
Shares of household disposable income	100.0	100.0	.....
Compensation of employees	68.3	67.6	(0.6)
Self-employment income	11.1	9.0	(2.1)
Property Income	11.1	10.5	(0.6)
Transfers and other	9.6	12.8	3.3
Mean disposable dousehold income (dollars)	82,805	90,989	8,184
Compensation of employees	84,737	96,189	11,452
Self-employment income	182,491	189,606	7,115
Property Income	129,638	158,862	29,223
Transfers and other	38,472	46,853	8,381
Mean disposable household income in 2010 dollars	89,798	90,989	1,191
Compensation of employees	91,893	96,189	4,296
Self-employment income	197,902	189,606	(8,296)
Property Income	140,586	158,862	18,276
Transfers and other	41,721	46,853	5,133

Table 9. Household Consumption Expenditures by Main Source of Income					
	2010				
	Compensation of employees	Self-employment income	Property Income	Transfers and other	Total
	(Billions of dollars)				
Total	6665.4	365.1	690.0	1918.7	9639.2
Food and beverages purchased for off-premises consumption	535.6	30.4	40.0	150.5	756.5
Clothing, footwear, and related services	264.0	15.8	16.1	49.5	345.5
Housing, utilities, and fuels	1337.0	68.9	135.7	365.0	1906.6
Furnishings, household equipment, and routine household maintenance	290.6	16.4	35.1	68.9	411.1
Health	1061.7	62.3	117.2	529.2	1770.3
Transportation	762.6	35.6	59.6	142.8	1000.6
Communication	173.3	7.7	12.8	41.6	235.4
Recreation	646.4	38.3	55.0	164.4	904.1
Education	168.2	8.6	7.3	63.3	247.4
Food services and accommodations	469.9	21.5	38.2	81.0	610.6
Financial services and insurance	483.9	29.8	135.9	127.0	776.5
Other goods and services	472.2	29.7	37.1	135.6	674.6
	Mean expenditures per household				
Total	90,056	68,635	93,095	59,952	81,173
Food and beverages purchased for off-premises consumption	7,237	5,720	5,394	4,702	6,371
Clothing, footwear, and related services	3,567	2,979	2,177	1,546	2,909
Housing, utilities, and fuels	18,064	12,957	18,307	11,404	16,056
Furnishings, household equipment, and routine household maintenance	3,926	3,092	4,742	2,153	3,462
Health	14,345	11,704	15,808	16,535	14,908
Transportation	10,304	6,690	8,044	4,462	8,427
Communication	2,342	1,456	1,724	1,299	1,983
Recreation	8,734	7,191	7,424	5,136	7,614
Education	2,272	1,609	989	1,979	2,083
Food services and accommodations	6,349	4,046	5,155	2,531	5,142
Financial services and insurance	6,537	5,601	18,329	3,967	6,539
Other goods and services	6,380	5,589	5,003	4,237	5,681
	Share of consumption by main source of income				
Total	69.1	3.8	7.2	19.9	100.0
Food and beverages purchased for off-premises consumption	70.8	4.0	5.3	19.9	100.0
Clothing, footwear, and related services	76.4	4.6	4.7	14.3	100.0
Housing, utilities, and fuels	70.1	3.6	7.1	19.1	100.0
Furnishings, household equipment, and routine household maintenance	70.7	4.0	8.6	16.8	100.0
Health	60.0	3.5	6.6	29.9	100.0
Transportation	76.2	3.6	6.0	14.3	100.0
Communication	73.6	3.3	5.4	17.7	100.0
Recreation	71.5	4.2	6.1	18.2	100.0
Education	68.0	3.5	3.0	25.6	100.0
Food services and accommodations	77.0	3.5	6.3	13.3	100.0
Financial services and insurance	62.3	3.8	17.5	16.4	100.0
Other goods and services	70.0	4.4	5.5	20.1	100.0
	Consumption shares for each main source of income type				
Total	100.0	100.0	100.0	100.0	100.0
Food and beverages purchased for off-premises consumption	8.0	8.3	5.8	7.8	7.8
Clothing, footwear, and related services	4.0	4.3	2.3	2.6	3.6
Housing, utilities, and fuels	20.1	18.9	19.7	19.0	19.8
Furnishings, household equipment, and routine household maintenance	4.4	4.5	5.1	3.6	4.3
Health	15.9	17.1	17.0	27.6	18.4
Transportation	11.4	9.7	8.6	7.4	10.4
Communication	2.6	2.1	1.9	2.2	2.4
Recreation	9.7	10.5	8.0	8.6	9.4
Education	2.5	2.3	1.1	3.3	2.6
Food services and accommodations	7.0	5.9	5.5	4.2	6.3
Financial services and insurance	7.3	8.2	19.7	6.6	8.1
Other goods and services	7.1	8.1	5.4	7.1	7.0

Table 10. Estimates of Income Distribution

(Percent of total)

	National accounts disposable household income (DHI)	CPS-ASEC Measures			Internal Revenue Service (IRS) adjusted gross income #	DHI Differences With Other Measures			
		Money income	Equivalence-adjusted money income	Money income less taxes plus noncash transfers		Money income	Equivalence-adjusted money income	Money income less taxes plus noncash transfers	IRS Adjusted Gross Income
2006									
Lowest quintile	4.9	3.4	3.7	___	2.0	1.5	1.2	___	2.9
Second quintile	10.1	8.6	9.4	___	4.7	1.5	0.7	___	5.4
Middle quintile	14.8	14.5	15.0	___	10.8	0.3	-0.2	___	4.0
Fourth quintile	21.8	22.9	22.5	___	19.0	-1.1	-0.7	___	2.8
Highest quintile	48.4	50.5	49.4	___	63.6	-2.1	-1.0	___	-15.2
2009									
Lowest quintile	5.1	3.4	3.4	4.6	2.2	1.7	1.7	0.5	2.9
Second quintile	10.4	8.6	9.2	10.8	6.4	1.8	1.2	-0.4	4.0
Middle quintile	15.1	14.6	15.0	16.3	11.6	0.5	0.1	-1.2	3.5
Fourth quintile	22.0	23.2	22.9	23.9	20.5	-1.2	-0.9	-1.9	1.5
Highest quintile	47.4	50.3	49.4	44.4	59.3	-2.9	-2.0	3.0	-11.9
2010 *									
Lowest quintile	5.4	3.3	3.3	___	___	2.1	2.1	___	___
Second quintile	10.5	8.5	9.2	___	___	2.0	1.3	___	___
Middle quintile	15	14.6	15.1	___	___	0.4	-0.1	___	___
Fourth quintile	22	23.4	23.2	___	___	-1.4	-1.2	___	___
Highest quintile	47.1	50.2	49.3	___	___	-3.1	-2.2	___	___
2006-2009 Change									
Lowest quintile	0.2	0.0	-0.3	___	0.2	0.2	0.5	___	0.0
Second quintile	0.3	0.0	-0.2	___	1.7	0.3	0.5	___	-1.4
Middle quintile	0.3	0.1	0.0	___	0.8	0.2	0.3	___	-0.5
Fourth quintile	0.2	0.3	0.4	___	1.5	-0.1	-0.2	___	-1.3
Highest quintile	-1.0	-0.2	0.0	___	-4.3	-0.8	-1.0	___	3.3
2006-2010 Change									
Lowest quintile	0.5	-0.1	-0.4	___	___	0.6	0.9	___	___
Second quintile	0.4	-0.1	-0.2	___	___	0.5	0.6	___	___
Middle quintile	0.2	0.1	0.1	___	___	0.1	0.1	___	___
Fourth quintile	0.2	0.5	0.7	___	___	-0.3	-0.5	___	___
Highest quintile	-1.3	-0.3	-0.1	___	___	-1.0	-1.2	___	___
# Returns with positive adjusted gross income.									

References

Attanasio, Orazio P., Erich Battistin, and Andrew Leicester. "From Micro to Macro, from Poor to Rich: Consumption and Income in the UK and the US." Prepared for the National Poverty Center Conference, The Well-Being of Families and Children as Measured by Consumption Behavior, Washington, DC, 2006; <<http://www.homepages.ucl.ac.uk/~uctpjrt/Files/Attanasio-Battistin-Leicester.pdf>>.

Bee, Adam, Bruce D. Meyer, and James X. Sullivan. "The Validity of Consumption Data: Are the Consumer Expenditure Interview and Diary Surveys Informative?" Prepared for Conference on Improving Measures of Consumer Expenditures sponsored by Conference for Research in Income and Wealth and National Bureau of Economic Research, Washington, DC, December 2-3, 2011; <<http://www.nber.org/chapters/c12662.pdf>>.

Bosworth, Barry. "Price Deflators, the Trust Fund Forecast, and Social Security Solvency." WP 2010-12, Center for Retirement Research at Boston College, 2010; <<http://crr.bc.edu/working-papers/price-deflators-the-trust-fund-forecast-and-social-security-solvency/>>.

Bryan, Justin. "Individual Income Tax Returns, 2009." *Statistics of Income (SOI) Bulletin—Fall 2011*. Internal Revenue Service, 2011; <http://www.irs.gov/file_source/pub/irs-soi/11infallbulincome.pdf>.

Bryan, Justin. "Individual Income Tax Returns, 2010." *Statistics of Income (SOI) Bulletin—Fall 2012*. Internal Revenue Service, 2012; <http://www.irs.gov/file_source/PUP/taxstats/productsandpubs/12infallbulincome.pdf>.

DeNavas-Walt, Carmen, Bernadette D. Proctor, and Jessica C. Smith. Current Population Reports, P60-239, *Income, Poverty, and Health Insurance Coverage in the United States: 2010*. U.S. Census Bureau, September 2011; <<http://www.census.gov/prod/2011pubs/p60-239.pdf>>.

European Commission, International Monetary Fund, Organisation for Economic Cooperation and Development, United Nations, World Bank. *System of National Accounts 2008*. New York, 2009; <<http://unstats.un.org/unsd/nationalaccount/img/pdf.gif>>.

Fixler, Dennis and David Johnson. "Accounting for the Distribution of Income in the U.S. National Accounts." Prepared for NBER Conference on Research in Income and Wealth: Measuring Economic Sustainability & Progress, August 6-8 2012, Boston; <http://www.nber.org/confer/2012/CRIWF12/Fixler_Johnson.pdf>.

Goldsmith, Selma M. "Changes in the Size Distribution of Income." *American Economic Review*, Vol. 47, No. 2, Papers and Proceedings of the Sixty-eighth Annual Meeting of the American Economic Association (May, 1957): 504-518.

Hoover, Donald R. Stephen Crystal, Rizie Kumar, Usha Sambamoorthi, and Joel C. Cantor. “Medical Expenditures during the Last Year of Life: Findings from the 1992–1996 Medicare Current Beneficiary Survey.” *Health Services Research*. HSR 37:6 (December 2002); <<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1464043/>>.

Internal Revenue Service. “Individual Income Tax” tables. <<http://www.irs.gov/uac/Tax-Stats-2>>.

Luttrell, Kelly. “S Corporation Returns, 2003.” *Statistics of Income (SOI) Bulletin—Spring 2006*. Internal Revenue Service, 2006; <http://www.irs.gov/file_source/pub/irs-soi/03scorp.pdf>.

McCully, Clinton. “Trends in Consumer Spending and Personal Saving, 1959-2009.” *Survey of Current Business*, 91:6 (June 2011); <http://www.bea.gov/scb/pdf/2011/06%20June/0611_pce.pdf>.

Passero, William, Thesia I. Garner, Clinton McCully. “Understanding the Relationship: CE Survey and PCE.” Prepared for Conference on Improving Measures of Consumer Expenditures sponsored by Conference for Research in Income and Wealth and National Bureau of Economic Research, Washington, DC, December 2-3, 2011; <<http://www.nber.org/chapters/c12659.pdf>>.

Roemer, Marc I. “Assessing the Quality of the March Current Population Survey and the Survey of Income and Program Participation Income Estimates, 1990 – 1996.” U.S. Bureau of the Census, June 2000; <<http://www.census.gov/hhes/www/income/publications/assess1.pdf>>.

Riley, Gerald F. and James D. Lubitz. “Long-Term Trends in Medicare Payments in the Last Year of Life.” *Health Services Research*. HSR 45:2 (April 2010); <<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2838161/>>.

Ruser, John, Adrienne Pilot, Charles Nelson. “Alternative Measures of Household Income: BEA Personal Income, CPS Money Income, and Beyond.” U.S. Bureau of Economic Analysis and U.S. Census Bureau. Prepared for Federal Economic Statistics Advisory Committee, November 2004; <<http://www.bea.gov/about/pdf/AlternativemeasuresHHincomeFESAC121404.pdf>>.

Sailer, Peter and Michael Weber, “Household and Individual Income Data from Tax Returns.” Internal Revenue Service, 1997; <http://www.irs.gov/file_source/pub/irs-soi/petasa98.pdf>.

Stephens, Melvin, Jr. “3rd of the Month: Do Social Security Recipients Smooth Consumption Between Checks?” *American Economic Review* 93(1): 406-422, 2003.

Stiglitz, Joseph E., Amartya Sen, and Jean-Paul Fitoussi, “Report by the Commission on the Measurement of Economic Performance and Social Progress.” Commission on the Measurement of Economic Performance and Social Progress, September 2009 ; <http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf>.

U.S. Bureau of Economic Analysis (BEA), Regional Income Division. *State Personal Income and Employment Methodology*. U.S. Department of Commerce, Bureau of Economic Analysis, September 2011; <<http://www.bea.gov/regional/pdf/spi2010.pdf>>.

U.S. Bureau of Economic Analysis (BEA), Regional Income Division. “Regional Quarterly Report.” *Survey of Current Business* 91 (October 2011);
<http://www.bea.gov/scb/pdf/2011/10%20October/1011_regreport.pdf>.

U.S. Bureau of Economic Analysis (BEA). *Size Distribution of Family Personal Income: Methodology and Estimates for 1964*. Bureau of Economics Staff Paper No. 21, June 1973.

U.S. Bureau of Economic Analysis (BEA). “National Income and Product Account Tables.” *Survey of Current Business* 92 (August 2012);
<http://www.bea.gov/scb/pdf/2012/08%20August/NIPA%20Tables/0812_%20nipa_%20tables.pdf>.

U.S. Bureau of Economic Analysis (BEA), Regional Income Division. “Annual State Personal Income and Employment” tables.
<<http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1&isuri=1&acrdn=4>>.

U.S. Bureau of Labor Statistics (BLS). “Consumer Expenditure Survey: Diary Survey, 1980-81”, Bulletin 2173, U.S. Department of Labor, September 1983.

U.S. Bureau of Labor Statistics (BLS). *2010 Consumer Expenditure Interview Survey Public Use Microdata: User’s Documentation*. Washington, DC: BLS, September 2011,
<<http://www.bls.gov/cex/2010/csxintvw.pdf>>.

U.S. Census Bureau. *Census 2000 Public Use Microdata Sample (PUMS), Technical Documentation*, 2003; <<http://www.census.gov/prod/cen2000/doc/pums.pdf>>.

U.S. Census Bureau. *Census 2000 Summary File 1: Technical Documentation*, 2001;
<<http://www.census.gov/prod/cen2000/doc/sf1.pdf>>.

U.S. Census Bureau, Current Population Reports, P60-200, 1998. *Money Income in the United States: 1997*. U.S. Government Printing Office, Washington, DC, August 1998;
<<http://www.census.gov/prod/3/98pubs/p60-200.pdf>>.

U.S. Census Bureau, Current Population Survey Annual Social and Economic Supplement. “Income, Poverty, and Health Insurance in the United States: 2011 - Detailed Tables.”
<<http://www.census.gov/hhes/www/income/data/incpovhlth/2011/dtables.html>>.

U.S. Department of Commerce, Office of Business Economics. *Supplement to the Survey of Current Business: Income Distribution in the United States*. U.S. Government Printing Office, Washington, DC, 1953.

U.S. Department of Commerce, Office of Business Economics. “National Income and Product Accounts.” *Survey of Current Business* 44 (July 1964);
<http://fraser.stlouisfed.org/docs/publications/SCB/1960-69/SCB_071964.pdf>.

U.S. Department of Defense. “DoD Personnel and Military Casualty Statistics.”
<<http://siadapp.dmdc.osd.mil/personnel/MMIDHOME.HTM>> .

U.S. Department of Defense. Defense Finance and Accounting Services. Military pay tables.
<<http://www.dfas.mil/militarymembers/payentitlements/militarypaytables.html>>.

Technical Appendix A:
Conduct of Household Surveys on Income and Expenditures

Current Population Survey Annual Social and Economic Supplement.--CPS-ASEC is an interview survey of a sample of about 75,000 households conducted in March of each year as a supplement to the monthly CPS, the primary source of labor market information for the U.S.¹ The CPS sample consists of the March CPS sample plus additional households identified from other CPS sample months. The reference period for the income data collected by CPS-ASEC is the previous calendar year. March is chosen as the month to conduct the survey because it is during this time that people are filing or preparing to file their Federal income tax returns, and they should be able to more accurately report their income than that at any other time of the year. Prior to weighting, imputations are made for missing supplement items. The sample universe for CPS-ASEC is slightly broader than for the regular CPS in that it includes military living with at least one civilian adult.

Consumer Expenditure Interview Survey.—The CE Interview Survey is a rotating panel survey which collects data on income and on expenditures that are large, such as for property and motor vehicles, or that occur on a fairly regular basis, such as utility and insurance payments. Each household in the Interview Survey is interviewed 5 times. An initial “bounding” interview consisting primarily of information on demographic and family characteristics is followed by four quarterly interviews which collect data on expenditures and, for the second and fifth interviews, on income. In the fifth interview, data on changes in assets are also collected. Each quarter, 20 percent of the sample is replaced, as households completing their fifth interview are dropped and a new sample of those interviewed for the first time is added. Each quarter, expenditure data are collected from about 7,100 households, so that over a full year about 28,400 interviews are conducted. Households are asked to recall purchases in the past three months, either for the month of purchase or for the quarterly amount of expenditures, depending on the type of expenditure. Quarterly interviews of the panels in the sample occur during each month of the quarter, so that expenditures collected in the first month of the quarter refer to purchases made in the three months of the previous quarter, expenditures collected in the second month of the quarter refer to purchases made in the first month of the quarter and the last two months of the previous quarter, and so on. For income in the Interview Survey, the recall period is the past 12 months, which are allocated to months for the derivation of calendar-year estimates, since only those households having their second or fifth interview in January report for the previous calendar year. Values have been imputed for missing income variables since 2004.

Consumer Expenditure Diary Survey.--The CE Diary Survey includes about 7,100 households per year. Each household completes two one-week diaries, so that there are about 14,200 diaries per year. The Diary Survey is designed to collect data on small, frequently purchased items which are difficult to recall. Diaries are spread evenly through all 52 weeks of the year.

¹ Since 2001, some CPS-ASEC interviews have been conducted in February and April.

References

U.S. Census Bureau. “Source and Accuracy of Estimates for Income, Poverty, and Health Insurance Coverage in the United States: 2011”. U.S. Census Bureau, September 2011.

<www.census.gov/hhes/www/p60_243sa.pdf>

U.S. Census Bureau. [*Current Population Survey Design and Methodology: Technical Paper 66*](#), October 2006.

U.S. Bureau of Labor Statistics. *BLS Handbook of Methods*. [Chapter 16: Consumer Expenditures and Income](#). Updated September 2011.

Technical Appendix B: Synthetic Data - Statistical Matching

Statistical matching first began to be widely used in the early 1970s through the work of Budd (1971), Okner (1972), Ruggles and Ruggles (1974), Radner (1981), Barr and Turner (1981), Rodgers and DeVol (1984), Rubin (1986) and more recently by Kadane (2001), D’Orazio et al. (2001), Moriarity and Scheuren (2001 and 2003), and Denk and Hackl (2003). Although statistical matching has been around for over forty years, there is no single best approach and continues to be an area of research. Currently, statistical matching methodologies fall under three general categories: unconstrained, constrained, and multiple imputations. Each approach has trade-offs and is therefore up to the researcher to determine which is best in regards to their application.

Unconstrained matching has the advantage of being relatively easy to implement and is guaranteed to find the best match based on a distance metric that compares a common set of variables across two (or more) data sources. It is called unconstrained because there is no limit on the number times a unit can be used in the matching process. As a result, it is possible for the same CE unit to be used multiple times, or, it is also possible for a CE unit to not be used at all. Therefore, the marginal distribution for each component is not guaranteed to be preserved which also happens to be one of the major criticisms of this approach. For example, in the original CE the average rental value of owner-occupied dwellings is \$16,184 whereas in the synthetic data generated from an unconstrained match the average is \$16,650.5. Although the difference is small, a constrained match would produce synthetic data with exactly the same average (as well as the same standard deviation). This is because constrained statistical matches require every unit to be used in the matching process, hence the “constraint.” From a macro perspective, the preservation of the marginal distributions is an appealing feature as it prevents the data from being biased. However, at the micro level, constrained statistical matches offer no guarantee that a household will be matched to the household with the smallest possible distance (i.e. best match). This is because the “constraint” condition *must* be satisfied which may or may not hinder the distance function from finding the best match. Constrained statistical matches also have the caveat of being computationally demanding requiring a significant amount of time to solve.²

Due to time constraints, an unconstrained statistical match was used to link the CPS to the CE as it is, in general, regarded as the easiest method to implement. The basic idea behind an unconstrained match is to find a set of “common” variables that exist in both the CPS and CE that can be used to measure how “similar” two units are from the two samples. In our application, we found twenty variables that were deemed compatible. These include twelve income variables (e.g. wages and salary, pension plan income, alimony received, etc.) and eight demographic variables (e.g. household size, number of kids, education, etc.). A distance function was then defined measuring how similar *each* unit in the CPS was to *all* units in the CE. The CE unit with the smallest distance was then chosen as the best match. This was repeated for all CPS units.

When defining the distance function, special care was needed when deciding how much weight/importance to assign to each common variable. For example, should wages and salary be equally

² To put things in perspective, the unconstrained match took just under an hour to run. Essentially, this required matching 75,188 CPS units to 32,188 CE units which translates into over 2.4 billion comparisons. Presumably, a constrained match would take substantially longer to run – perhaps several days.

as important as household size? Furthermore, how do you measure the distance between two categorical variables? The unconstrained matching algorithm developed for this application used several steps to mitigate these concerns. Beginning with the common variables in each data set, the distance between demographic variables only was first calculated, and only those CE units with a distance of zero (i.e. an exact demographic match) were kept. Next, datasets for the CPS variables and the selected CE variables were constructed using indicator variables, rather than actual values, for incomes. One (1) denoted the presence of an income variable and zero (0) designated its absence. The distance between the income indicator variables was then calculated, and for CE units with a difference of zero, the actual difference in income was calculated. The CE unit with the smallest distance was linked to the CPS unit of interest, creating a synthetic data set.

There are several exceptions to the steps described above. First, it may be possible that no CE unit(s) exist with the same demographics as the CPS unit of interest (i.e. demographic distance > 0). This typically occurs for housing units with “extreme” demographics. For example, if the CPS unit of interest has a household size of 10, has 5 kids, and has 3 people older than 65, then it is very possible that no such housing unit exists in the CE. In this case, the matching algorithm looks for all CE units with a demographic difference of 1 (rather than zero). If there are no CE units with a demographic distance of 1, then the matching algorithm looks for all CE units with a demographic distance of 2. This continues until the matching algorithm finds the CE unit with the “closest” demographic type.

It is also possible that no CE unit(s) exist with the same sources of income as the CPS unit of interest (see step 3 above). In this case, the matching algorithm looks for all those CE units where the income indicator difference is 1 (rather than 0). Again, as with the demographical differences described above, this process continues until the algorithm finds the CE unit with the “closest” sources of income. Finally, steps 4 and 5 are conducted as normal.

Overall, the unconstrained statistical matching algorithm performed well. Several summary statistics were constructed that compare the marginal distributions of both the synthetic and original data for each of the 24 unique CE income variables that were needed to construct Household Income. The comparisons of weighted population sizes, averages and medians, and percentile distribution show in the great majority of instances similar results, suggesting good results from the statistical matching; there is no formal way to measure the accuracy of a statistical match

References

Australian Bureau of Statistics: Methodology Advisory Committee. 2004. “Statistical Matching of the HES and NHS: An Exploration of Issues in the Use of Unconstrained and Constrained Approaches in Creating a Basefile for a Microsimulation Model of the Pharmaceutical Benefits Scheme.”

Bar, R. S. and S. J. Turner. 1981. “Microdata File Merging Through Large-Scale Network Technology.” *Mathematical Programming Study* 15: 1-22.

Budd, E. C. 1971. “The Creation of a Microdata File for Estimating the Size Distribution of Income.” *Review of Income and Wealth* 17: 317-333.

- D’Orazio, M., M. Di Zio, and M. Scanu. 2001. “Statistical Matching: A Tool for Integrating Data in National Statistical Institutes.” *Proceedings of the Joint ETK and NTTS Conference for Official Statistics*. Crete.
- Denk, M. and P. Hackl. 2003. “Data integration and Record Matching: An Austrian Contribution to Research in Official Statistics.” *Austrian Journal of Statistics* 32: 305:321.
- Kadane, J. B. 2001. “Some Statistical Problems in Merging Data Files.” *Journal of Official Statistics* 17: 423-433.
- Moriarty, C. and F. Scheuren. 2001. “Statistical Matching: A Paradigm for Assessing the Uncertainty in the Procedure.” *Journal of Official Statistics* 17: 407-422.
- Moriarty, C. and F. Scheuren. 2003. “A Note on Rubin’s Statistical Matching Using File Concatenation with Adjusted Weights and Multiple Imputations.” *Journal of Business and Economic Statistics* 21: 65 – 73.
- Okner, B. A. 1972. “Constructing a New Data Base from Existing Microdata Sets: The 1966 MERGE File.” *Annals of Economic and Social Measurement* 1: 1972.
- Radner, D. B. 1981. “An Example of the use of Statistical Matching in the Estimation and Analysis of the Size Distribution of Income.” *The Review of Income and Wealth* 27: 211-242.
- Rodgers, W. L. 1984. “An Evaluation of Statistical Matching.” *Journal of Business and Economic Statistics* 2: 91-102.
- Rubin, D. B. 1986. “Statistical Matching Using File Concatenation with Adjusted Weights and Multiple Imputations.” *Journal of Business and Economic Statistics* 4: 87-94.
- Ruggles, N. and R. Ruggles. 1974. “A Strategy for Merging and Matching Microdata Sets.” *Annals of Economic and Social Measurement* 3: 353-371.