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CONSUMPTION AND INCOME INEQUALITY IN THE U.S. SINCE THE 1960S

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ABSTRACT

Official income inequality statistics indicate a sharp rise in inequality over the past five decades. These statistics do not accurately reflect inequality because income is poorly measured, particularly in the tails of the distribution, and current income differs from permanent income, failing to capture the consumption paid for through borrowing and dissaving and the consumption of durables such as houses and cars. We examine income inequality between 1963 and 2014 using the Current Population Survey and consumption inequality between 1960 and 2014 using the Consumer Expenditure Survey. We construct improved measures of consumption, focusing on its well-measured components that are reported at a high and stable rate relative to national accounts. While overall income inequality (as measured by the 90/10 ratio) rose over the past five decades, the rise in overall consumption inequality was small. The patterns for the two measures differ by decade, and they moved in opposite directions after 2006. Income inequality rose in both the top and bottom halves of the distribution, but increases in consumption inequality are only evident in the top half. The differences are also concentrated in single parent families and single individuals. Although changing demographics can account for some of the changes in consumption inequality, they account for little of the changes in income inequality. Consumption smoothing cannot explain the differences between income and consumption at the very bottom, but the declining quality of income data can. Asset price changes likely account for some of the differences between the measures in recent years for the top half of the distribution.

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1. Introduction

There is a national discussion in the U.S. on trends in inequality and the appropriate responses to them. The extent of inequality is an important factor in the debates on some of our largest policy issues including income tax policy, immigration, and globalization. Much of this discussion focuses on inequality at the very top of the distribution. Political rhetoric emphasizes a growing divide between the rich and the poor, highlighting the rise in executive pay and the increasing ranks of the very rich. While the extremely affluent are an important group to study, they are a small share of the population. Measures of inequality that look beyond the very top of the distribution and that more accurately reflect economic well-being are essential for evaluating existing policies and for determining the need for policy changes.

The debate over inequality relies almost exclusively on income data. Official income statistics indicate that inequality has increased sharply. But these official statistics may not accurately reflect changes in economic well-being. They ignore taxes and transfers and rely on income that is badly reported in surveys. Even improved income measures reflect transitory changes and fail to capture consumption out of financial wealth and durables such as housing and cars, and therefore provide a narrow, short-term view of how well-being has changed. For these reasons, the consumption patterns of families may provide a better indicator of economic well-being.

Several researchers have documented the patterns in consumption inequality. The evidence from this literature is mixed, with some studies showing little change in consumption inequality over the past few decades and others showing a proportional rise equal to or exceeding that for income. These differences arise from the use of different data sources or definitions of consumption (i.e. total consumption or non-durable consumption), and different methods of addressing measurement error.

Our study advances this literature by presenting new evidence on consumption inequality that relies on improved measures of consumption. Our way of accounting for measurement error in consumption is simple, and relies on clear and transparent assumptions. We also extend the literature by providing results for both income and consumption inequality for more recent years that span the Great Recession, and by considering possible explanations

for changes in inequality over time and why the patterns for income and consumption inequality differ.

To address concerns about measurement error in consumption we build upon recent evidence showing that some components of consumption reported in survey data compare quite favorably to national accounts, both in levels and in changes over time. Other components are sharply under-reported with this bias increasing over time (Bee, Meyer, and Sullivan, 2015). We construct a measure of consumption that relies on the well-measured components. These components represent an important share of overall consumption—they include key components of consumption such as food at home, housing and vehicles. Even though several other papers rely on subsets of total consumption, they rarely test the conditions under which distributional statistics for these subsets can be extrapolated to total consumption. We show that the validity of well-measured consumption as a proxy for total consumption is robust to income and price changes—it is close to a constant share of total consumption and has aggregate price changes similar to the total consumption bundle.

We report measures of inequality for income and consumption over the past five decades, using income data from the Current Population Survey and consumption data from the Consumer Expenditure Interview Survey. We investigate inequality patterns in different parts of the distribution by reporting ratios of percentiles, focusing on the 90/10, 90/50, and 50/10 ratios that are less affected by errors in the extreme tails. Thus, our analyses do not capture changes in the extreme tails of the distribution. Recent studies have used income tax data to document a sharp rise in the share of income going to the very top of the distribution (Piketty and Saez, 2003). Unfortunately, there is not analogous administrative data on consumption at the very top of the distribution.

Our results for income show that how one measures income has a significant effect on changes. Accounting for taxes considerably reduces the rise in income inequality since 1963. Accounting for noncash benefits, using data available only since 1980, has only a small effect on changes in income inequality, likely due to increased under-reporting of transfer income at the bottom.

Using our improved measures of consumption, we show sharp differences in the patterns for consumption and income inequality. Since the early 1960s, the rise in income

inequality as measured by the 90/10 ratio (29 percent) has significantly exceeded the rise in consumption inequality (7 percent). Furthermore, this much smaller percentage increase in consumption inequality started from a considerably lower base. In some decades, such as the 1960s and 1990s, income and consumption inequality moved in parallel, but in other decades the differences were sharp. In the 1980s, inequality for both measures rose, but the increase was much greater for income (28 percent) than for consumption (5 percent). After 2005 these measures moved in opposite directions as income inequality rose sharply while consumption inequality fell. The differences between income and consumption through 2005 are almost exclusively in the bottom half of the distribution, indicating that the under-reporting of consumption by the rich is not an explanation for the differences. These results are robust to plausible alternative definitions of well-measured consumption and to accounting for the value of health insurance.

We also consider several possible explanations for the differences in inequality patterns. We decompose the changes in income and consumption inequality to determine the extent to which the patterns can be explained by changing demographics. These decompositions show that changing demographics can account for some of the changes in consumption inequality, but they account for little of the changes in income inequality. We do find that the divergence between income and consumption inequality measures is almost exclusively concentrated in single parent headed families and single individuals, who have the largest increases in income inequality, but the largest declines in consumption inequality. Consumption smoothing is not consistent with differences between income and consumption at the very bottom, but the declining quality of income data plays an important role. Changes in asset prices likely account for some of the differences between the measures in recent years for the top half of the distribution.

In the following section, we summarize the previous work on income and consumption inequality. In Section 3 we discuss the advantages of measuring economic well-being using consumption rather than income. We describe the data in Section 4 and discuss data quality issues in Section 5. The results are presented in Section 6 and we consider explanations for changes in inequality in Section 7. We conclude in Section 8.

2. Previous Research on Income and Consumption Inequality

Much of the previous work on inequality in the U.S. has focused on earnings and wages (Juhn, Murphy, and Pierce, 1993; Autor, Katz and Kearney, 2005a,b; 2008, for example). The dispersion in the distribution of wages and earnings is important for understanding the impact of changes in technology, human capital, globalization, labor market institutions or other factors that affect the labor market. However, these measures do not fully capture dispersion in family well-being. While wages are an important component of overall economic well-being, other factors also contribute to well-being such as unemployment, disability, retirement, family formation, child bearing, health, transfers from family, friends and government, and saving and borrowing.

Many past studies have shown that, like earnings inequality, income inequality has risen over time. Official measures of income inequality, which are based on pre-tax money income, indicate that inequality has risen steadily in the U.S. since the early 1970s (DeNavas-Walt and Proctor, 2015). The 90/10 ratio for official, pre-tax money income rose most noticeably in the 1980s and since 2006.

An important limitation of the official statistics is that they do not account for the effects of taxes on the distribution of resources. In addition, they do not account for changes in family size and are household weighted rather than person weighted, i.e. they weight a family with one person and one with six equally. Burkhauser, Feng and Jenkins (2009) find that individual weighted household income inequality measured by the 90/10 ratio rose until the early 1990s and then declined slightly through 2004, while the Gini coefficient rose over the entire period.

A common finding in the literature is that measures of income that more closely reflect resources available for consumption display a less noticeable increase in inequality in recent decades than other measures of income. Research examining after-tax income inequality shows that taxes reduce the level of inequality considerably, though income inequality still rises over time (Heathcote, Perri and Violante, 2010; Fisher, Johnson, and Smeeding, 2015; Armour, Burkhauser, and Larrimore, 2014), but the rise since the mid-1980s is less pronounced than that for pre-tax income (Heathcote, Perri and Violante, 2010). As with the

official statistics, some of the most noticeable increases in inequality based on more comprehensive measures of income occurred after 2005 (Fisher et al. 2015). Other research examines tax filing units and finds a sharp increase in inequality in the very top percentiles (Piketty and Saez, 2003), though some research has argued that definitional changes, income shifting, and other tax responses have exaggerated these changes (Reynolds, 2007; Guvenen and Kaplan 2017; also see Piketty and Saez, 2007 for a response to Reynolds). Armour, Burkhauser, and Larrimore (2013) find that when yearly accrued capital gains are incorporated into an income definition, income inequality falls between 1989 and 2007.

Other studies have looked at consumption as a more comprehensive measure of well-being. Cutler and Katz (1991) find that changes in consumption inequality were comparable to changes in income inequality for the period between 1960-61 and 1988, but Slesnick (1994) finds consumption inequality rose less than income inequality for the 1960-1991 period. Most recent work indicates that consumption inequality has risen less than income inequality since the early 1980s (Johnson and Shipp, 1997; Slesnick, 2001; Krueger and Perri, 2006; and Heathcote et al., 2010). Fisher, Johnson, and Smeeding (2015) indicate that income and consumption inequality follow similar patterns from 1984-2006, but the patterns diverge between 2006 and 2011. All of these studies that conclude that the rise in consumption inequality is more muted than the rise in income inequality rely on expenditure data from the Consumer Expenditure (CE) Interview Survey (the CE has both an Interview and Diary component), which provides the most comprehensive data on household spending for a nationally representative sample. However, there are many consumption categories in the Interview data, including alcohol, tobacco and jewelry, that are greatly under-reported and for which under-reporting has risen over time. This under-reporting patterns raises questions about the reliability of these studies, though in the end our examination supports the validity of relying on aggregate consumption to examine changes in dispersion.

A few recent studies have questioned the validity of these data, and have argued that once one corrects for the measurement error the evidence indicates that changes in consumption inequality mirror changes in income inequality (Attanasio, Battistin and Ichimura 2007; Attanasio, Hurst, and Pistaferri 2015; Aguiar and Bils 2015). These studies use the less well-measured CE Diary Survey as well as some of the poorly measured

Interview Survey components. These papers tend to use clever approaches to try to overcome the measurement error issues, but the assumptions are largely untestable. Aguiar and Bils (2015) take an Engel curve approach to addressing measurement error, comparing relative spending on luxuries versus necessities for high and low income households. This innovative approach recognizes that under-reporting of consumption varies by good, income and time. However, it relies on the lack of interaction effects, i.e. under-reporting not varying over time for different goods and different income levels, which seems implausible for many of the goods that have very high levels of under-reporting rates to begin with, as that leaves a lot of room for differential under-reporting.

Rather than relying on CE data, Attanasio and Pistaferri (2014) use data from the Panel Study of Income Dynamics (PSID) to measure consumption inequality. Historically, the PSID included only a few components of consumption, but additional components have been added in recent years.[1] Some of the components of consumption measured in the PSID are ones that, at least for the CE data, have not compared well to national aggregates and have been deteriorating over time, such as food away from home and child care (Bee, Meyer, and Sullivan, 2015). There is much less evidence on comparisons to aggregates for PSID consumption than for CE consumption, but Blundell, Pistaferri, and Saporta-Eksten (2016) report comparisons to National Income and Product Accounts (NIPA) for two broad categories in the PSID: nondurables and services (including food away from home and child care). These comparisons indicate that for nondurables and services the PSID to NIPA ratio ranges from 0.64 to 0.73 for the years from 1998 to 2008. This ratio is significantly lower, and varies more noticeably over time, than our ratio for well-measured consumption in the CE.

Attanasio and Pistaferri (2014) use the relationship between this total spending measure in the PSID and spending on food in the PSID in recent years to impute a measure of total spending for the years prior to 1999. This procedure relies on having a base year without under-reporting of any goods, which is not available given the long-standing differential under-reporting for some expenditure components.

[1] The PSID collects information on food and housing in most survey years, and it occasionally collects information on utilities. Starting in 1999, the PSID added additional spending variables, and since 2005 it has collected information on most of the key spending categories, providing a measure of total expenditures that is conceptually similar to that in the CE Interview Survey (Andreski et al., 2014).

3. The Conceptual Advantages of Consumption Measures of Well-Being

Previous work has examined whether consumption provides a better measure of well-being than income for families with few resources (Meyer and Sullivan 2003, 2011, 2012a). Conceptual arguments as to whether income or consumption is a better measure of material well-being almost always favor consumption. For example, consumption better reflects long-run resources (for further discussion, see Cutler and Katz 1991; Poterba 1991; Slesnick 1993). Income measures fail to capture disparities in consumption that result from differences across families in the accumulation of assets or access to credit. Consumption measures will reflect the loss of housing services flows if homeownership falls, the loss in wealth if asset values fall, and the belt-tightening that a growing debt burden might require, all of which an income measure would miss. Furthermore, consumption is more likely than income to be affected by access to public insurance programs. Thus, consumption will do a better job of capturing the effects of changes in access to credit or the government safety net.

Meyer and Sullivan (2003, 2011) provide evidence that consumption is a better predictor of well-being than income for those at the bottom. They show that other measures of material hardship or adverse family outcomes are more severe for those with low consumption than for those with low income, indicating that consumption does a better job of capturing well-being for these families. In an even more direct evaluation of poverty measures, Meyer and Sullivan (2012a) compare the characteristics of those added to poverty and subtracted from poverty when going from an income based measure to a consumption based measure, holding the poverty rate constant. They find that those added to poverty by the consumption based measure are less likely to have health insurance, and have less education, smaller and cheaper cars, and fewer household appliances and housing amenities.

Some researchers have argued that income may have some conceptual advantages over consumption.[2] One reason is that individuals can choose to have low consumption, while

[2] Blundell and Preston (1998) is sometimes characterized as finding that income has advantages over consumption. A more accurate summary is that some comparisons of consumption across cohorts or age will not give the correct sign to the difference in utility, but income suffers from the same types of problems in the situations they consider.

income reflects access to resources that can be used for consumption, and as such is not driven by consumption decisions (Atkinson, 1991). However, individual choices affect the level of income as well through education, occupation and labor supply choices. Another potential advantage to income is that current consumption fails to capture the utility of leaving bequests.

While the conceptual advantages of consumption are clear, previous studies have raised concerns about the quality of income and consumption data. We discuss these important measurement issues in Section 5.

4. Data and Measures of Income and Consumption

The official inequality measures in the U.S. are based on data from the Current Population Survey Annual Social and Economic Supplement (CPS). We use data from the 1964-2015 CPS surveys which provide data on income for the previous calendar year. Our analysis focuses on three different measures of income: pre-tax money income, after-tax money income, and after-tax money income plus noncash benefits. Pre-tax money income follows the Census' definition of money income that is used to measure poverty and inequality (see Data Appendix for details). To calculate after-tax money income we add the value of tax credits such as the EITC, and subtract state and federal income taxes and payroll taxes. Our measure of after-tax money income plus noncash benefits adds to after-tax money income the cash value of food stamps, and the Census' imputed value of housing subsidies and school lunch programs.[3] We also consider measures of income that include the imputed value of Medicaid and Medicare, employer health benefits, and the net return on housing equity. See the Data Appendix for more details.

We measure income at the family level, counting the resources of all individuals within a housing unit who are related by blood or marriage. Measuring resources at the family level follows the approach used for official poverty statistics. This approach excludes from family income the resources of unrelated individuals, such as a cohabiting partner. Analytically, the unit should be based on those who share resources. However, in the CPS we

[3] While it is possible to account for under-reporting of transfers and to simulate non-cash benefits for the 1960s and 1970s prior to the Census imputations, we have not taken this route given the lack of information in the survey to impute these benefits and limited information on the correlates of under-reporting in the earlier years.

do not observe whether the cohabitor is sharing resources with other family members. In the CE we have more information about who shares resources as explained below. To adjust for differences in family size and composition we scale all income and consumption measures in the paper using an NAS recommended equivalence scale (Citro and Michael, 1995) that allows for differences in costs between adults and children and exhibits diminishing marginal cost with each additional adult equivalent. In particular, we scale our measures by $(A + 0.7K)^{0.7}$, where A is the number of adults in the family and K is the number of children.

Our consumption data come from the Consumer Expenditure (CE) Interview Survey, which is the most comprehensive source of consumption data in the U.S. We use data from the 1960-1961, 1972-1973, 1980-1981 and 1984-2014 survey years (see Data Appendix for details). The consumer unit is defined as either a group of individuals who are related by blood or marriage, a single or financially independent individual, or two or more persons who share resources.[4]

For our main analyses we report measures of total consumption and well-measured consumption (described in Section 5.C), focusing on the latter. To convert reported expenditures into a measure of consumption, we make a number of adjustments. First, we convert vehicle spending to a service flow equivalent. Instead of including the full purchase price of a vehicle, we calculate a flow that reflects the value that a consumer receives from owning a car during the period that is a function of a depreciation rate and the current market value of the vehicle. To determine the current market value of each car owned, we use detailed information on vehicles (including make, model, year, age, and other characteristics). This approach accounts for features and quality improvements through what purchasers are willing to pay. See Section B.1 of the Data Appendix for more details on how we calculate vehicle service flows.

Second, to convert housing expenditures to housing consumption for homeowners, we substitute the reported rental equivalent of the home for the sum of mortgage interest payments, property tax payments, spending on insurance, and maintenance and repairs. Finally, we exclude spending that is better interpreted as an investment such as spending on

[4] Individuals are considered to be sharing resources if expenses are not independent for at least two of the three major expense categories: housing, food, and other living expenses.

education and health care, and outlays for retirement including pensions and social security.[5] We exclude out of pocket medical expenses because high out of pocket expenses may reflect substantial need or lack of good insurance rather than greater well-being. We discuss how our results change for alternative consumption measures, such as one that excludes food at home and one that includes the value of public and private health insurance, in Section 6B (more details on our measures of consumption are in the Data Appendix).

5. Data Quality and Under-reporting in the CPS and CE Survey

Evidence on the tendency of surveys to capture more accurate information on income or on consumption is split. For most families, pre-tax income is easier to report, given administrative reporting by employers and other sources, and the typically small number of sources. However, for analyses of families with few resources this argument is less valid, as these families tend to have many income sources. Additionally, conceptually better income measures require accounting for taxes and in-kind transfers that are poorly reported and/or imputed. Furthermore, while pre-tax money income may be easier to report, it is likely to be a more sensitive topic for survey respondents than consumption. The CPS has slightly lower survey non-response than the CE, but much higher item non-response on income questions than the CE has on expenditure questions. Taken together, the CPS has appreciably higher nonresponse than the CE (Meyer and Sullivan 2011).

5.A. Income Under-Reporting

Income in the CPS is substantially under-reported, especially for categories of income important for those with few resources. Furthermore, the extent of under-reporting has increased over time. Meyer and Sullivan (2003, 2011) and Meyer, Mok and Sullivan (2015) report comparisons of weighted micro-data from the CPS to administrative aggregates for government transfers and tax credits. These ratios are substantially below one and have declined over time, falling to below 0.6 for Food Stamps and 0.5 for Temporary Assistance

[5] We also exclude spending on charitable contributions and spending on cash gifts to non-family members. This category is very small relative to total consumption.

for Needy Families (TANF) in recent years. Comparisons of CPS micro-data to administrative micro-data for the same individuals corroborate the severe under-reporting of government transfers (Meyer, Goerge and Mittag 2014; Meyer and Mittag 2015). The direct substitution of administrative program data for survey data shows that measures of poverty and inequality are sharply overstated when calculated using reported income (Meyer and Mittag 2015). Concerns about income under-reporting are not limited to transfer income. Davies and Fisher (2009) summarize evidence finding under-reporting in surveys of earnings at the bottom of the distribution based on comparisons of survey and administrative data. Bollinger (1998) finds over-reporting in the CPS at the bottom, while Czajka and Denmead (2012) find that the CPS understates income at the bottom relative to the SIPP. Consistent with many of these results, income is often far below consumption for those with few resources, even for those with little or no assets or debts (Meyer and Sullivan 2003, 2011a). U.S. Census (2015) shows that retirement income is also significantly under-reported; more than forty percent of those who receive pension income fail to report it.

5.B. Consumption Under-Reporting

There is also substantial evidence that aggregate consumption is under-reported in the CE and that this under-reporting has increased over time. To assess the degree of under-reporting, CE data have been compared to data from many sources, but the most extensive and heavily cited comparisons are to the Personal Consumption Expenditure (PCE) data from NIPA. Focusing on comparable expenditure categories is important because past studies have indicated that half or more of the discrepancy between the two sources is due to definitional differences (Slesnick 1992, General Accounting Office 1996) and the impact of these conceptual differences has grown over time. Bee, Meyer and Sullivan (2015) survey and update these analyses, focusing on the CE Interview Survey data rather than the published integrated data usually examined in the literature.

Table 1, derived from Bee, Meyer, and Sullivan (2015), reports ratios of CE Interview Survey and Diary Survey data to National Income Account aggregate data for 1986 and 2010. We show the largest categories of expenditures for which comparable CE and National Account data are available, dividing them into well-measured and poorly measured categories.

Among the eight largest comparable categories of expenditures, six are reported at a high rate in the CE Interview Survey and that rate has been roughly constant over time. These well-measured categories are the imputed rent on owner-occupied nonfarm housing, rent and utilities, food at home, gasoline and other energy goods, communication and new motor vehicles. In 2010, the ratio of CE to PCE is 0.95 or higher for imputed rent, rent and utilities, and new motor vehicles. It is 0.86 for food at home, 0.80 for communication, and 0.78 for gasoline and other energy goods. The largest poorly measured expenditure categories are food away from home with a ratio of 0.51, furniture and furnishings at 0.44, clothing at 0.32, and alcohol at 0.22, and for all of these poorly measured categories, the ratio has fallen noticeably since 1980. However, these aggregate numbers will overstate the weakness of the data for the typical person and even more so for those with few resources if under-reporting of expenditures is concentrated in the extreme upper tail of the spending distribution as suggested by Sabelhaus et al. (2015), who point to the low expenditure-to-income ratios at very high incomes.

Our measures of consumption also include the value of the service flow from the ownership of durables such as houses and cars. Reporting ownership of houses and vehicles is very different from reporting the mostly small, discretionary purchases that are badly reported in the CE. Validation of these data suggests that ownership of these durables is reported reasonably well (Bee, Meyer and Sullivan 2015).

On the other hand, the CE Diary Survey tends to be less well reported than the CE Interview Survey. For nearly all categories, the Interview data have higher ratios than the Diary data. For the four largest categories of spending that are available for all three sources (rent and utilities, food at home, food away, and gasoline and other energy goods), the ratio of the CE Interview Survey relative to NIPA is closer to one than that for the CE Diary Survey. For the largest of these categories (rent and utilities) the ratio in 2010 was 0.95 for the Interview Survey and 0.80 for the Diary Survey. The Diary data have a higher ratio for clothing in both years, food away in 1986, and alcohol in 2010, but these are very poorly reported categories (particularly clothing and alcohol), for which the surveys capture generally much less than half of aggregate expenditures. Not only do the components collected in the CE Diary Survey, largely nondurables and services, tend to have low and falling ratios to

national account data, but the short time frame covered (one or two weeks) means that the coefficient of variation for the diary data is high and potentially influenced by changes over time in the size and frequency of purchases.

5.C. Addressing Under-Reporting of Consumption

To address concerns about measurement error in consumption, we build upon this evidence that some components of consumption reported in the CE compare quite favorably to national accounts, both in levels and in changes over time, while other components do not compare well and are deteriorating in quality. Incorporating this information, we construct a measure of economic well-being that is based on "well-measured consumption," which is composed of food at home, rent plus utilities, gasoline and motor oil, the rental value of owner-occupied housing, and the rental value of owned vehicles.[6] As discussed above and reported in Bee, Meyer, and Sullivan (2015), the first four of these components have reporting ratios that are high and constant or that decline slowly over time. Although there is not a direct comparison to national accounts for the rental value of owned vehicles, there is evidence that vehicle ownership is reported well in the CE from direct comparisons for new purchases and comparisons of vehicle counts to registrations.

There are two key requirements for well-measured consumption to serve as an accurate proxy for total consumption: the well-measured components should have a total consumption elasticity of one and their prices should not change over time relative to those of all items consumed. Even though many other papers rely on subsets of total consumption, they rarely test the conditions under which distributional statistics for these subsets can be extrapolated to total consumption.[7]

We first examine if well-measured consumption is roughly a constant share of total consumption, as total consumption rises. In Table 2 we report average consumption for three

[6] Even though it is well-measured, we exclude communication because this category of expenditures changes greatly over time with the introduction of cell phones and other changes.

[7] An alternative to directly reporting percentiles of well-measured consumption would be to predict percentiles of total consumption using well-measured consumption and other household characteristics. We considered such an approach, but in the end found the approach to be too sensitive to the methods used and less obvious and direct than the approach we take here. One of the main difficulties with such approaches is that there is less consistency over time in the collection of other consumption items, income, and other variables than there is of the well-measured consumption items.

different measures: total consumption, well-measured consumption, and well-measured consumption less food consumed at home. We also calculate the means for these measures by quintile of total consumption, excluding the bottom and top five percent of overall consumption because those observations are disproportionately likely to be in error. Overall, we see in Table 2 that the well-measured components account for 59 percent of total reported consumption in 1980 and 60 percent in 2014. When food at home is excluded, the well-measured components account for 42 percent of the total in 1980 and 49 percent in 2014. The higher share in the more recent year is consistent with the pattern of increased under-reporting of the poorly measured components of consumption over time.

The ratio of means by quintile provide evidence on whether well-measured consumption is roughly a constant share of total consumption. For well-measured divided by total in 1980, the ratio falls from 0.68 in the bottom quintile to 0.54 in the top quintile. In 2014, the fall is less pronounced, from 0.68 to 0.57. Now these numbers show some tendency for the well-measured share to fall as total consumption rises, but one should bear in mind that the construction of the statistic will naturally lead to this pattern. Because we are dividing observations into groups on the basis of the denominator, when we examine a higher quintile it will naturally have a lower ratio because the classification will partly be due to cases where the denominator has a large positive reported (but not necessarily true) value. In Appendix Table A1 we classify consumer units into consumption quintiles based on well-measured consumption and find that the share falls only from 0.60 to 0.57 in 1980 and 0.62 to 0.60 in 2014. Thus, it appears that much of the decline is due to this bias. When we examine the ratio of well-measured less food to the total, the ratio falls from 0.45 to 0.40 in 1980, and from 0.51 to 0.48 when going from the bottom quintile of overall consumption to the highest. Again, we would expect at least some tendency for the ratio to fall due to the selection of the categories based on the denominator. In fact, when we define the quintiles based on well-measure consumption less food, the share rises in both years as total consumption rises.

While Table 2 clearly shows the reported shares do not change much as total consumption rises, there is still a concern, but little evidence, that under-reporting rises with income. Most of this concern seems to be focused on the very top percentiles of income and expenditures that we exclude. Furthermore, there is a remarkable similarity over time in the

relationship between reported income and reported expenditures. Sabelhaus et al. (2015) show that the ratio of expenditures to income at very high incomes is virtually the same in 2010 as in the early 1970s.

We also directly estimate the total consumption elasticity of well-measured consumption. The worry is that if well-measured consumption has an elasticity much below one then it would understate the growth in inequality as total consumption rose. Conversely, if well-measured consumption is elastic, inequality based on this measure would overstate the rise inequality in total consumption rose. In the top panel of Table 3, we report the coefficient on total consumption from an OLS regression of the logarithm of well-measured consumption on the logarithm of total consumption. We have separate rows for 1980 and 1988, but focus on 1980 because of the declining reporting over time of some of the components of total consumption.[8] The elasticity estimate in the first column of the first row is 0.93, close to one, but statistically significantly below one given the precision of the estimate. In the second column, we consider estimates for well-measured consumption less food at home, our alternative version of well-measured consumption. Given that food at home is often taken to be the prototypical necessity, it is not surprising that the resulting elasticity estimate is above one, in this case 1.17, even further above one than the earlier estimate was below one. For 1988, the estimates in both cases are slightly lower, 0.81 for well-measured consumption and 0.97 for well-measured consumption excluding food at home.

There are potential issues with OLS regressions here. First, the right hand side variable, total consumption, contains the dependent variable, well-measured consumption. Second, this same variable is subject to substantial error since it includes the poorly measured components of consumption. We thus instrument total consumption with income, recognizing that income is measured with error as well, particularly in the tails. We include only consumer units designated complete income reporters and those who are not in the tails of the income distribution (dropping the top and bottom five percent). The resulting IV estimates are reported in the second panel of Table 3.

[8] We could examine the 1960/61 or 1972/73 data, but total consumption measures from those years are incomplete and noncomparable in certain ways to later years. Starting in 1988, the CE collected information on insurance coverage, which is needed to impute a value of health insurance that we use in some of our alternative consumption measures.

The IV estimates indicate similar but usually slightly higher elasticities than those reported in the top panel. Again, the estimates for well-measured consumption including food at home are under one, while those for well-measured consumption excluding food at home are either above or equal to one. Thus, it appears that one of our well-measured consumption series is slightly inelastic, while the other is slight elastic, so that they bracket the behavior of total consumption as income and total consumption rise.

The second assumption necessary for well-measured consumption to be an accurate indicator of trends in total consumption, is that the prices for the well-measured components should not change over time relative to the prices of overall consumption. To test for changes in relative prices, we construct several different price indices based off the CPI (Figure 1). The CPI-All Items is the standard CPI-U reported by the Bureau of Labor Statistics (BLS, 2016). This index should reflect price changes for total spending. We also construct a CPI for well-measured consumption by taking the weighted average of the CPI indices for each component, where the weights are defined as the share of well-measured consumption represented by each component in 1980.[9] We construct a similar index for well-measured consumption less food.

As shown in Figure 1, there are only trivial differences from 1960 through the mid-2000s across these three indices, implying that relative price changes are not important for the vast majority of our time period. After 2000, the price of well-measured consumption, either including or excluding food at home, tends to rise faster than total consumption. The rise since 2000 is about an eighth to a quarter higher for well-measured consumption than total consumption, depending on the base year and whether food at home is included. These differences are not trivial, but would require a substantial price elasticity of well-measured consumption to sharply alter the relationship between well-measured and total consumption.

6. Results

The results that follow report measures of income and consumption inequality between 1961 and 2014. We focus on measures of the distribution of income and consumption such as

[9] The results are similar when we use 2014 as the base year.

the ratio of the 90th percentile to the 10th percentile (the 90/10 ratio), the 50/10 ratio, and the 90/50 ratio. These ratios will be less sensitive to the poorly measured extreme tails of the distributions of income and consumption than other measures such as the variance of the logarithm or the Gini coefficient.

6.A. Income Inequality

In Figure 2 we report the 90/10 ratio for the official measure of income (household pre-tax money income without an adjustment for household size or composition) from Census Bureau reports (DeNavas-Walt and Proctor, 2015). We also report 90/10 ratios for other income measures that conceptually better capture disposable resources. The 90/10 ratio for the official measure shows a pattern with no discernible trend from 1967 through the mid-1970s. Since the late 1970s, this measure of inequality rose steadily, aside from a few transitory dips around 1989 and 1995. Between 1975 and 2014 the 90/10 ratio grew by 50 percent.

Our pre-tax money income measure of inequality differs from the official measure in three ways. First, we measure resources at the family level, while the official measure pools resources at the household level. Second, our observations are person weighted while the official measure is household weighted. Finally, we adjust for differences in family size and composition, while the official measure is not equivalence-scale adjusted. These changes significantly lower the level of inequality. In 2014, for example, the 90/10 ratio for our measure is 18 percent lower than that of the official measure. That we adjust income by an equivalence scale accounts for most of this reduced dispersion at a point in time. In 2014, for example, adjusting income by an equivalence scale, but measuring resources and weighting at the household level, as is done in the official measure, reduces the 90/10 ratio by 12.5 percent.

Our different methodology also affects changes over time in pre-tax income inequality. The most important difference for changes over time is that our measure is person weighted. The 90/10 ratio rose faster for person weighted income than for household weighted income, mainly because the 10th percentile of person weighted income rose more slowly over time than does the 10th percentile of household weighted income in the late 1970s and 1980s. Consequently, a person weighted measure of pre-tax money income inequality

rose more in the late 1970s and early 1980s than did the official measure, while the two series changed nearly one-for-one between the early 1980s and 2014. We also present pre-tax income inequality measures for several years in the 1960s that are not available in official reports. These data indicate that pre-tax income inequality fell between 1963 and 1970.

After-tax money income inequality has a very different pattern. Both pre-tax and after-tax income inequality fell in the 1960s. Starting in the early 1970s, after-tax income inequality rose more slowly than did pre-tax income inequality. In each decade since 1970, after-tax income inequality rose noticeably less than pre-tax income inequality, except the 1980s, when the reverse was true. There was very little increase in after-tax money income inequality for the period from the late-1980s through the early-2000s, although there was a small temporary increase centered around 1993. After-tax income inequality rose noticeably from 2007 to 2011, but the rise was not nearly as great as that for the pre-tax series. This evidence is consistent with previous studies that have shown that the level of after-tax income inequality is lower than that of pre-tax income inequality, and that incorporating taxes moderates the rise in inequality somewhat, as we discussed in Section 2. For the years since 1980, we also have information on noncash benefits. Adding non-cash benefits to after-tax money income leads to slightly lower inequality, but the changes over time are similar to those for after-tax money income.

Changes in inequality in the bottom half of the income distribution differ considerably from those of the overall distribution, as shown in Figure 3, which reports the 50/10 ratio for several measures of income. The official pre-tax measure declined in the 1960s and early 1970s and then was nearly constant for the next 35 years. The pre-tax measure at the family level that is equivalence scale adjusted and person weighted declined in the 1960s, rose in the late 1970s and early 1980s and then changed little until after 2008 when it rose substantially. The after-tax measures show a similar pattern, except that there was a decline in inequality in the bottom half of the distribution in the early 1990s that persisted at least until the early 2000s. The decline in inequality for the after-tax measure in the early 1990s occured during a period when the EITC expanded considerably, increasing disposable incomes near the bottom of the distribution.

Including non-cash benefits results in a slightly lower level of inequality in the 1980-2014 period, because these benefits affect the 10th percentile more than the median. However, the addition of non-cash benefits has little effect on changes over time in income inequality. One potential reason that noncash benefits may have only a small effect on the 90/10 or 50/10 ratios is that many of these benefits go to individuals below the 10th percentile. As shown in Appendix Figure 1, adding noncash benefits to after-tax income noticeably reduces the 50/5 ratio. However, even for these results that focus on the very bottom of the distribution, the inclusion of noncash benefits does little to alter the pattern of inequality between 1980 and 2007, although after 2007 there was a noticeable impact of noncash benefits on changes in income inequality—the 50/5 ratio for after-tax income plus noncash benefits rose noticeably less than that for after-tax income excluding these benefits, reflecting among other things a sharp rise in participation in food stamps—total SNAP spending nearly doubled in real terms between 2007 and 2014.

It is important to note that our measure of noncash benefits does not adjust for under-reporting of these benefits in surveys. Given that these benefits are significantly under-reported in the CPS and that this under-reporting has increased over time (Meyer, Mok, and Sullivan, 2015), it is likely that our results understate the true impact of noncash benefits on the level and changes in income inequality.[10]

The results in Figure 4 show that income inequality in the top half of the distribution as measured by the 90/50 ratio, has a very different pattern than the bottom half as measured by the 50/10 ratio. The official measure shows a steady increase beginning in the late 1960s and continuing through 2014. Adjusting for family size and person weighting flattens out or even eliminates the increase through around 1980, but the steady increase in inequality in the years after the early 1980s remains. After-tax income inequality actually fell between 1963 and 1980, but the change in after-tax income inequality mirrored that of the pre-tax measure between 1980 and 2014. Not surprisingly, the inclusion of noncash benefits has no discernible effect on the level or trend in inequality for the top half of the distribution.

[10] Meyer and Mittag (2015) find that transfer under-reporting leads the uncorrected CPS to understate the reduction in inequality over time in New York CPS data, but the time period available is only six years.

6.B. Consumption Inequality

We now turn to measures of consumption inequality, highlighting how they have changed over time and how these patterns compare to those for income inequality. We report the levels of and changes in the 90/10 ratio for well-measured and total consumption along with that for after-tax money income for comparison in Figure 5 and Table 4. The consumption distribution is less dispersed than the after-tax income distribution. In 2014, the 90/10 ratio for after-tax income was nearly double that of well-measured consumption. Moreover, the trends differ considerably across these measures. While overall income inequality (as measured by the 90/10) rose over the past five decades (by 29 percent), the rise in well-measured consumption inequality was much smaller (7 percent). Differences are even more noticeable for some shorter periods. Income inequality fell in the 1970s (the 90/10 ratio declined 5 percent) while consumption inequality rose (by 5 percent). In the 1980s, inequality for both measures rose, but the increase was much greater for income (28 percent) than for consumption (5 percent). Both consumption and income inequality changed little over the course of the 1990s, but after 2005 these measures moved in opposite directions as income inequality rose sharply while consumption inequality fell.

For reasons discussed in Section 5.C, we focus on the consumption measures that rely on the well-measured components, but the patterns for inequality based on the different measures of consumption are similar. Over the entire period total consumption inequality rose only slightly more than well-measured consumption inequality (7.8 percent vs. 7.2 percent), and the patterns for these two measures of inequality were quite similar over the past five decades.

The similarity of the results for the well-measured and total consumption measures is not surprising. Since well-measured consumption has a total consumption elasticity of approximately one, poorly measured consumption, its complement, should as well. In other words, since the well-measured components of consumption are roughly a constant share of consumption as total consumption rises, poorly measured components must also be roughly a constant share of the total. A decline over time in the reporting of these components (if constant across income for each component) would not bias inequality measures. We should emphasize that although some previous work has suggested that expenditure under-reporting

varies with income, this same work shows that this under-reporting has remained remarkably constant over time (see Figure 8.4 of Sabelhaus et al. 2015).[11]

Consumption inequality in the bottom half of the distribution (Figure 6 and Table 4) shows a similar pattern to overall consumption inequality for most periods. The most noticeable difference is in the latter part of the 1980s, when the 90/10 ratio for consumption was flat (Figure 5) but the 50/10 ratio fell (Figure 6). As with the 90/10 ratio, the 50/10 ratio for consumption fell noticeably after 2005.

The patterns for consumption inequality in the bottom half of the distribution are noticeably different from those for income. For example, between the early 1960s and 2014 the 50/10 ratio for after-tax income rose by 9 percent while the ratio for consumption fell by 3 percent. These results also show that the difference in the levels of consumption and income inequality are particularly large for the bottom half of the distribution. In 2014, the 50/10 ratio for after-tax income was more than 56 percent greater than the 50/10 ratio for consumption, which is likely due, in part, to income being understated at the bottom. Previous research has argued that spending exceeds income at the bottom of the distribution in large part due to under-reporting of income (Meyer and Sullivan 2011, Meyer and Mittag 2015).

In the top half of the distribution, income and consumption inequality both rose over the past five decades— the 90/50 ratio for after-tax income rose by 18 percent and that for consumption rose 11 percent (Figure 7 and Table 2). After 2005, however, these measures moved in opposite directions when the 90/50 ratio for after-tax income continued to rise while

[11] The evidence of under-reporting from Sabelhaus et al. (2015) is for expenditures rather than service flows for housing and vehicles, which amount to about forty percent of consumption. It is hard to know to what extent the pattern of differential under-reporting at a point in time reflects measurement error in income and deviations of annual income from permanent income as opposed to differential under-reporting by income. One does not obtain conclusive evidence of differential under-reporting from these results, and one certainly cannot assess its magnitude. Sabelhaus et al. (2015 also find that there is an under-representation of people from the ZIP codes in the top five percentiles of average income. The degree of under-representation is not large as the response rate falls from about 74 percent to 68 percent. Furthermore, Bee, Gathright and Meyer (2015) apply the same approach to the CPS but are able to also link household level tax records. They find similar or even more pronounced under-representation based on ZIP code level income, but none when looking at household income. This difference is explained by low income households in high income neighborhoods having the lowest response rate. Sabelhaus et al. (2015) also find that aggregate income reported in the CE Survey is well below that in other surveys, but it is unclear whether it is due to under-reporting by representative respondents or an unrepresentative mix of respondents.

the 90/50 ratio for consumption fell. These measures also moved in opposite directions in the 1960s and 1970s when income inequality fell but consumption inequality was flat or rose.

In summary, our main results show that while overall income inequality (90/10 ratios) rose over the past five decades, the rise in overall consumption inequality was small. Moreover, the patterns for income and consumption inequality differ sharply within each decade, and most notably, these measures have moved in opposite directions since 2005. Income inequality rose for the top (90/50 ratio) and bottom (50/10 ratio) of the distribution, but an increase in consumption inequality is only evident for the top. That the patterns for consumption and income inequality at the top are fairly similar from the early 1960s through 2005 suggests that under-reporting of consumption by the rich cannot account for the differences.

In Table 5 we report the 90/10, 50/10 and 90/50 ratios for other measures of consumption and for expenditures. When we exclude food at home, an inelastic component of consumption, we see that inequality rises less (or falls more) than the measure that includes food at home. Over the past five decades the 90/10 ratio for well-measured consumption less food fell by 13 percent. When we also exclude utilities—another relatively inelastic component of consumption—the patterns for inequality look very similar to those for well-measured consumption less food. We also considered a measure of consumption excluding housing to see the extent to which our inequality patterns might be driven by housing consumption. Prior to 1990, the patterns for this measure that excludes housing tended to move in the opposite direction from that for well-measured consumption. However, between 1990 and 2014, a period during which housing prices fluctuated considerably, the inequality patterns for these two measures are quite similar.

Dispersion in expenditures is greater than that of consumption because expenditures include lumpy spending on owner occupied housing and vehicles, while consumption includes the service flow from ownership of these durables. The 90/10 ratio for expenditures rose much more than that for well-measured consumption between 1972 and 1986 but from the mid-1980s to the mid-2000s this ratio was flat for both measures. After 2006, inequality in both of these measures fell.

We also considered a measure of total consumption that includes the imputed value of health insurance. We impute a measure of the value of public and private health insurance using the coverage information in the CE and data on insurance costs. See the Data Appendix for more details on this imputation. We do not report changes in this measure of inequality for all periods, because health insurance coverage information is not available in all years in the CE. The pattern in inequality for this consumption measure that includes health is very similar to that for total consumption.

6.C. Inequality by Family Type

We also examine how inequality changes for specific demographic groups. Examining such changes is important for explaining trends and for thinking about designing or understanding the impact of targeted policies. Changes in inequality may be uneven across demographic groups because one group is the target of a redistributive policy or because of differences in employment patterns across groups. For example, tax and transfer policies often target specific family types; welfare and EITC dollars predominantly go to single parent families.

We examine how inequality patterns differ across family types, separating the full sample into five mutually exclusive groups defined by the age and marital status of the head and the presence of children in the household. Changes in inequality may also arise because of changing population shares of groups with different levels of inequality. We consider this possibility later, as well as the role of additional demographic characteristics—such as education, employment, race and geographic region—when we decompose the changes in inequality into the within and between group changes in the following section. However, that later section does not speak to how inequality changes for specific groups, which is important when thinking about designing or understanding the impact of targeted policies. In principle, differences across groups could even cancel. It is the differences in the change across groups that we now address.

The 90/10 ratios for consumption and income from 1961 to 2014 are presented in Appendix Table A2 for each of the family types, and the changes in these ratios since 1980 for these groups are summarized in Figures 8 and 9 (see Appendix Table A3 for the 90/50

ratios and Appendix Table A4 for the 50/10 ratios). As shown in Figure 8, consumption inequality patterns are very different across these groups. For single mothers and single individuals consumption inequality generally fell while consumption inequality for married families (both with and without children) rose. From the mid-1980s through the mid-1990s, consumption inequality for single individuals and families fell sharply and then was fairly flat after then. For married families, on the other hand, consumption inequality was fairly flat from the mid-1980s through the mid-1990s, but then rose noticeably until 2005. The change in consumption inequality for elderly households is less pronounced—the 90/10 ratio of consumption for these households in 2014 was only 10 percent greater than the ratio in 1980 and about the same as the ratio in 1985.

The patterns are very different for income, where the 90/10 ratio rose sharply for all groups over the past 25 years (Figure 9). In fact, income inequality rose the most for the groups that saw consumption inequality fall. For single mothers and single individuals the 90/10 ratio more than doubled between 1980 and 2014 while consumption inequality fell by more than 20 percent. Nearly all of this difference is due to the difference between income and consumption in the bottom half of the distribution with the 50/10 ratio accounting for the vast majority of the discrepancy. For married parents, married couples without children, and the elderly, both income and consumption inequality rose during this period, but for each of these groups, income inequality rose significantly more than consumption inequality.

The sharp difference in the patterns for income and consumption inequality for single parents and single individuals is consistent with work examining income and consumption poverty (Meyer and Sullivan 2012,b) that shows that consumption poverty fell much more sharply than income poverty for these groups over the past few decades. These differences are driven in large part by differences between income and consumption at the very bottom of the distribution; differences in the patterns for deep poverty are even more pronounced. And there is considerable evidence that income, in particular, is significantly under-reported at the bottom and that under-reporting of government transfers can explain a substantial part of the differences between income and consumption for households with few resources (Meyer and Sullivan 2012a, 2012b, 2014; Meyer and Mittag 2015).

7. Potential Explanations for Inequality Patterns

In this section we consider various explanations for changes in income and consumption inequality over time and for differences in the patterns for these measures. In particular, we consider the extent to which changes in demographic characteristics over the past five decades can explain changes in either income or consumption inequality. We also discuss two other possible explanations for changes in income and consumption inequality: borrowing and saving and changes in under-reporting.

Changing demographics may contribute to changes in inequality as well as explain why patterns differ for income and consumption. For example, rising college completion rates, or rising wages for college graduates relative to high school graduates, may lead to greater inequality. And if education is related to borrowing and saving behavior, or to reporting of income and consumption, then greater educational attainment or a rising college premium would affect income and consumption inequality differently. To determine the impact of changing demographics, we decompose changes in inequality into two separate components: explained changes (due to either changes in observable characteristics or in the return to these characteristics) and unexplained changes (due to changes in unobservables). This decomposition can be done for each quantile, following the approach of Melly (2005) and Autor, Katz and Kearney (2005). This procedure is similar to, but less restrictive than, the decompositions of Juhn, Murphy, Pierce (1992), because the quantile decomposition approach allows observable characteristics to affect the whole distribution of income or consumption.

The first step in the quantile decomposition is to estimate a model of the conditional quantiles of income or consumption. Then, we generate a close approximation to the unconditional distribution by numerically integrating the conditional distribution over the range of the distribution of observable characteristics and over all quantiles. Using this estimated unconditional distribution, we can construct counterfactual distributions. For example, we can construct a hypothetical distribution of income for 1980 in the case where observable characteristics are the same as those in 1990.

It is helpful to first provide some notation (we follow Autor, Katz and Kearney 2005 here). Let y be income or consumption and let g(X) be the empirical distribution of a set of explanatory variables X that can account for demographic changes or define groups of households. Let $\hat{\beta}(\theta)$ be the vector of coefficients on X from a θ quantile regression of y on X, where θ is an element of (0,1). $\hat{\beta}^m = \hat{\beta}(.5)$ is the vector of coefficients from a median regression, while $\hat{\beta}^w(\theta) \equiv [\hat{\beta}(\theta) - \hat{\beta}^m]$ is the difference between the coefficient for a θ quantile regression and those for the median. Let $\hat{\beta}^w$ be a matrix of $\hat{\beta}^w(\theta)$ values as θ varies over a grid of values such as 0.01, 0.02… up to 0.99. Then, the approximation to the unconditional distribution of y in time period t can be written as $f_t(y) \equiv f(g_t(X),\ \hat{\beta}_t^m,\ \hat{\beta}_t^w)$ where we have added the t subscripts for the time period. Finally, we denote the change in the θ quantile of the distributions between two different time periods, t and τ, as $\Delta Q_\theta = Q_\theta(f_\tau(y)) - Q_\theta(f_t(y))$.

We can then decompose this change into three parts.

$$\Delta Q_\theta = Q_\theta\left(f\left(g_\tau(X),\ \hat{\beta}_\tau^m,\ \hat{\beta}_\tau^w\right)\right) - Q_\theta\left(f\left(g_t(X),\ \hat{\beta}_t^m,\ \hat{\beta}_t^w\right)\right)$$

$$= \Delta Q_\theta^X + \Delta Q_\theta^m + \Delta Q_\theta^w, \text{where}$$

$$\Delta Q_\theta^X = \left[Q_\theta\left(f\left(g_\tau(X),\ \hat{\beta}_t^m,\ \hat{\beta}_t^w\right)\right) - Q_\theta\left(f\left(g_t(X),\ \hat{\beta}_t^m,\ \hat{\beta}_t^w\right)\right)\right],$$

$$\Delta Q_\theta^m = \left[Q_\theta\left(f\left(g_\tau(X),\ \hat{\beta}_\tau^m,\ \hat{\beta}_t^w\right)\right) - Q_\theta\left(f\left(g_\tau(X),\ \hat{\beta}_t^m,\ \hat{\beta}_t^w\right)\right)\right], \text{and}$$

$$\Delta Q_\theta^w = \left[Q_\theta\left(f\left(g_\tau(X),\ \hat{\beta}_\tau^m,\ \hat{\beta}_\tau^w\right)\right) - Q_\theta\left(f\left(g_\tau(X),\ \hat{\beta}_t^m,\ \hat{\beta}_t^w\right)\right)\right].$$

ΔQ_θ^X is the contribution of changes in observable characteristics *X* to the change in the θ quantile, ΔQ_θ^m is the contribution of changes in the return to these characteristics at the median, and ΔQ_θ^w is the contribution of changes in dispersion within groups over time (where the groups are defined by different values of *X*).

We further decompose the log of consumption and income so that changes in ratios of quantiles, such as the 90/10 ratio, can be written as differences between expressions like that above for two different quantiles. We rely on the result that the natural logarithm is a monotonic function so that the logarithm of a quantile is just the quantile of the logarithm. Then, because the ratio of two quantiles, $\ln(Q_\theta / Q_{\theta'})$ is just $\ln(Q_\theta) - \ln(Q_{\theta'})$, we have that

the change in the ln of the 100*θ /100*θ' ratio between t and τ is $\Delta Q_\theta - \Delta Q_{\theta'}$ for ln(y) rather than y. Thus, to decompose changes in ratios, we simply expand $\Delta Q_\theta - \Delta Q_{\theta'}$ into its parts for ln(y).

$$\Delta Q_\theta - \Delta Q_{\theta'} = \Delta Q_\theta^X + \Delta Q_\theta^m + \Delta Q_\theta^w - \Delta Q_{\theta'}^X - \Delta Q_{\theta'}^m - \Delta Q_{\theta'}^w$$

Grouping like terms, we have

$$\Delta Q_\theta - \Delta Q_{\theta'} = \left[\Delta Q_\theta^X - \Delta Q_{\theta'}^X\right] + \left[\Delta Q_\theta^m - \Delta Q_{\theta'}^m\right] + \left[\Delta Q_\theta^w - \Delta Q_{\theta'}^w\right].$$

Each term in brackets is the contribution of one determinant of the change in the distribution of ln(y) to the change in the ratio of percentiles. For example, $\left[\Delta Q_\theta^X - \Delta Q_{\theta'}^X\right]$ is the contribution of changing characteristics, *X*, to the change in the ratio of percentiles.

The results from these decompositions are presented in Table 6 for consumption inequality and Table 7 for income inequality. We decompose the changes in the 90/10, 50/10, and 90/50 ratios for each decade separately. In Table 6 we see that for the 1960s, changes in the return on observable characteristics account for much of the change in overall consumption inequality, while the effect of changing demographic characteristics explains the rise in overall consumption inequality in the 1970s. For the 1980s, the rise in consumption inequality can be accounted for by changes in both demographic characteristics and the return on these characteristics. For example, between 1980 and 1990, the 90/10 ratio rose by 0.034 and changes in demographic characteristics during this period account for a rise in the 90/10 ratio of 0.025. Since 1990, changing demographics can explain very little of the overall pattern in consumption inequality, although this was a period when consumption inequality was fairly flat. In each of the decades except the 1980s, a third or more of the change in consumption inequality is unexplained.

For income inequality (Table 7), changes in demographic characteristics suggest a rise in inequality throughout the period from 1963 to 2014. Given that income inequality fell in the 1960s and 1970s, changing demographics cannot account for actual changes in income inequality during these periods. For each of the periods, changes in the return on observable characteristics account for a sizeable fraction of the actual change in overall income inequality, but much of the change remains unexplained—changes in residuals account for more than a third of the overall change in every decade except the 1990s.

Borrowing and saving could potentially explain some of the differences between the patterns for income and consumption inequality, particularly if, due to greater access to credit, some families can now more easily smooth consumption. Krueger and Perri (2006) suggest this as an explanation for why consumption inequality rose less than income inequality in recent decades. Individuals at the bottom of the distribution, however, have only limited access to debt, so consumption smoothing cannot explain why, for example, the 25/5 ratio for after-tax income rose sharply over the past three decades while the 25/5 ratio for consumption fell (not reported).

A standard representative agent model, where households can fully insure themselves against consumption risk, implies that consumption does not respond to changes in asset values. In the absence of full risk sharing, however, consumption may be sensitive to changes in wealth. Empirical studies typically reject full risk sharing (i.e. Cochrane 1991; Attanasio and Davis 1996; Mian, Sufi, and Rao 2013). Campbell and Cocco (2007) show with micro data that changing asset prices have a noticeable effect on consumption for groups with considerable wealth, such as older homeowners, but little effect on consumption for groups with few assets, such as young renters. Thus, the sharp decline in asset prices after 2006, first housing and then financial assets, could explain why consumption inequality fell in recent years even though income inequality did not.

If declining asset prices had a significant impact on consumption inequality, then we would expect to see more noticeable declines in consumption for households with more significant asset holdings. To see if this pattern is evident in the data, we sort households by the value of their total asset holdings, including both financial and housing assets. In Table 8, we report the mean of well-measured consumption by quintile of total household assets from 1991 to 2014.[12] This analysis shows that that consumption growth for the lowest asset households was different from that for higher asset households. Between 1991 and 2006—a period when housing prices and financial asset values rose considerably—consumption grew for all quintiles of the asset distribution, but the growth was bit more pronounced for the higher quintiles. Between 2006 and 2010 asset prices fell sharply. The Case-Shiller index of

[12] Total assets are measured as total financial assets (stocks, bonds, checking and savings) plus housing equity (current house value less housing debt including mortgages, home equity loans, and home equity lines of credit). Information on housing equity loans and lines of credit are not available in the CE prior to 1991.

house prices fell by 21 percent and the S&P 500 index fell by 12 percent. These declines coincided with a drop in real consumption of between 3 and 11 percent for the second through fifth quintiles of the asset distribution. But for the bottom quintile, consumption actually rose by 10 percent.[13] In separate analyses we find that homeowners tended to reduce their consumption more than non-homeowners between 2006 and 2010. Between 2010 and 2014 the S&P 500 rose by more than 60 percent and the Case-Shiller index rose by 14 percent. During this period of sharply rising asset values, consumption rose for the second through fifth quintiles, but changed very little for the bottom quintile.

Given the distribution in asset holdings, it is easy to see why changing asset values would disproportionately impact the top of the consumption distribution. During the 2000s, families in the bottom quintile of consumption had very few assets—the median was zero throughout this period. Families in the top quintile of consumption, in contrast, had substantial asset holdings. This pattern suggests that falling asset prices contributed to the decline in consumption inequality in the latter part of the 2000s, a period when income inequality was rising.

Declining survey data quality is another potential explanation for the income and consumption differences. As discussed in Section 5, there is considerable evidence that consumption is better measured than income for those with few resources. Comparisons to administrative aggregates show that transfer income, which is particularly important for those at the bottom of the income distribution, is significantly under-reported in surveys and the extent of under-reporting has grown over time. A story of declining relative quality of income data at low percentiles is consistent with our results that show a much more noticeable rise in the 50/10 ratio for income than the 50/10 ratio for consumption over the past three decades. It is also consistent with the fact that we find pronounced differences between income and consumption inequality changes for single mothers—a group that receives a disproportionate share of these income transfers.

One might also be concerned with the declining quality of consumption data. However, as discussed in Section 5, many of the important components of consumption, and

[13] Petev, Pistaferri and Eksten (2012) provide similar evidence for the 2003-06 and 2007-09 periods also using the CE.

those that comprise our measure of well-measured consumption, compare favorably to administrative aggregates both at a point in time and over time. Moreover, if under-reporting of expenditures were increasingly concentrated in the top of the distribution, such under-reporting might bias measures of inequality for the top half of the distribution but not the bottom half. However, for most of our sample period we find that differences between income and consumption inequality changes are most noticeable in the bottom half of the distribution—both income and consumption inequality rose noticeably at the top (90/50 ratios) for the period from 1980-2005, but at the bottom income and consumption inequality moved in opposite directions. Also, it is unlikely that increased under-reporting of consumption is the primary explanation for why the 90/50 ratio for consumption fell while the 90/50 ratio for income rose after 2005, because our measure of consumption is composed of well-measured components; as discussed in Section 5.B, comparisons of these components to national accounts do not indicate an increase in under-reporting after 2005.

7. Conclusions

The perception of a growing divide in economic well-being in the U.S. has fueled debates over whether the benefits of economic growth are shared by all and has played prominently in efforts to reform tax, immigration, and trade policy. These concerns are supported by well-documented evidence of rising earnings and income inequality over the past forty years, particularly, but not exclusively, at the top of the distribution. Several studies have examined consumption inequality to provide a better picture of how dispersion in economic well-being has changed. The evidence from this literature is mixed, with some studies showing little change in consumption inequality over the past few decades and others showing a proportional rise equal to or exceeding that of income. These differences arise from the use of different data sources or definitions, and different approaches for correcting for measurement error.

Our study advances this literature by presenting new evidence on consumption inequality that relies on improved measures of consumption. To address concerns about measurement error we construct a measure of consumption that relies on components that are

consistently reported well in surveys. These components represent an important share of overall consumption, and the validity of our use of them as a proxy for total consumption is robust to income and price changes.

Our results show that consumption inequality rose considerably less than income inequality over the past five decades. Between the early 1960s and 2014 income inequality grew by nearly 30 percent while inequality in consumption rose just 7 percent. The patterns differ sharply for certain subperiods, with the most noticeable differences occurring during the 1980s, when income inequality rose much more than consumption inequality, and since 2005, when these measures moved in opposite directions. Income inequality rose at the top (90/50 ratio) and bottom of the distribution (50/10 ratio), but increases in consumption inequality are only evident in the top. The differences between income and consumption inequality changes through 2005 are almost exclusively in the bottom half of the distribution. When looking by family type, we find that differences between income and consumption inequality changes are most pronounced for single mothers and single individuals. For these groups consumption inequality has fallen and income inequality has risen over much of the past five decades.

Although changing demographic characteristics can account for some of the changes in consumption inequality, they do not account for changes in income inequality. Sharp changes in asset prices may explain some of the differences in the patterns for income and consumption inequality in the top half of the distributions. Evidence on changes in consumption by asset quintile suggests that declines in asset prices in recent years contributed to the decline in consumption inequality in a period when income inequality was rising. For the differences in the bottom part of the distribution, measurement error likely plays an important role. Comparisons of survey data to administrative records and national income accounts data indicate under-reporting of both income and consumption. There is evidence of considerable under-reporting of government transfers in income surveys, and the extent of under-reporting has grown overtime. Such under-reporting could lead to significant bias in the level and pattern of income inequality particularly at the bottom, which is where we find the most significant differences between income and consumption inequality changes. We also find pronounced differences between income and consumption inequality changes for single mothers—a group that receives a disproportionate share of these income transfers.

There is also evidence of under-reporting of consumption data, although major components of consumption such as food at home and housing are reported at a high and stable rate relative to aggregate data. That most of the differences between income and consumption inequality changes prior to 2005 are in the bottom half of the distribution indicates that the under-reporting of consumption by the rich is not an explanation for the differences.

Our evidence of only a modest rise in consumption inequality over the past five decades contrasts sharply with evidence from administrative data that an increasing share of the nation's income is going to the very highest income families (Piketty and Saez, 2003). It is important to qualify, however, that our analyses do not capture dispersion in the extreme tails of the distribution. Rather, we focus on the bulk of the distribution, between the 90^{th} and 10^{th} percentiles, because these percentiles will be less sensitive to the poorly measured extreme tails in survey data than other measures of inequality that consider the full distribution.

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Data Appendix

A. CE and CPS Samples

Income data primarily come from the Current Population Survey Annual Social and Economic Supplement (CPS), which is the source for official measures of poverty and inequality in the U.S. This survey interviews approximately 75,000 households annually (60,000 households prior to 2002).[14] For the previous calendar year, respondents report the income amounts for a number of different sources that are included in the money income measure used to determine official income distribution statistics. In addition, the survey collects information on the dollar value of food stamps received by the household, as well as whether household members received other noncash benefits including housing subsidies and subsidies for reduced or free school lunch. Starting in 1980, the survey also provides imputed values for these and other noncash benefits including Medicaid and Medicare, the value of housing equity converted into an annuity, and the value of employer health benefits. We use data from the 1964-2015 surveys which provide data on income for the previous calendar year.

For our analysis of after-tax income, Federal income tax liabilities and credits and FICA taxes are calculated for all years using TAXSIM (Feenberg and Coutts 1993). State taxes and credits are also calculated using TAXSIM for the years 1977-2014. Prior to 1977 we calculate state taxes using IncTaxCalc (Bakija, 2008). We confirm that in 1977 net state tax liabilities generated using IncTaxCalc match very closely those generated using TAXSIM.[15]

All expenditure and consumption data come from the Interview component of the Consumer Expenditure (CE) Survey. The CE provides annual or annualized data for 13,728 families in 1960-1961 and 19,975 families in 1972-1973. From 1980-2011 the survey is a rotating panel that includes about 5,000 families each quarter until 1998 and about 7,500 families thereafter. Each family, or what the CE refers to as the consumer unit, reports spending on a large number of expenditure categories for up to four consecutive quarters. We use data from the 1960-1961 and 1972-1973 surveys and all quarterly waves from the first quarter of 1980 through the third quarter of 1981 and from 1984 through 2014 (some of the fourth quarter of 2014 data comes from surveys conducted in the first quarter of 2015). The 1960-1961 surveys provide data on annual expenditures collected in a single interview, while the 1972-1973 surveys provide data on annualized expenditures collected from quarterly interviews. Since 1980, quarterly expenditures have been provided. To obtain annual measures we multiply these quarterly measures by four. We do not use the data from the fourth quarter of 1981 through the fourth quarter of 1983 because the surveys for these quarters only include respondents from urban areas. We report inequality for years 1960 and 1961 together because

[14] The Annual Social and Economic Supplement (formerly known as the March Current Population Survey or the Annual Demographic File) is currently administered to the March sample of the Current Population Survey as well as a subsample of the respondents in the February and April surveys. Prior to reference year 2002 (survey year 2003), the supplement was only included in the March survey.

[15] The CPS also includes an imputed value for taxes and credits, but this information is only available starting with the 1980 survey, and the methodology for imputing taxes has changed over time.

the data are only representative of the full population when the samples from these two years are combined.

B. Measuring Consumption and Spending in the CE

As discussed in Sections 4 and 5, the main measures of consumption presented in this paper are total consumption and well-measured consumption, but we also present inequality for subcomponents of well-measured consumption, for total consumption plus health insurance, and for expenditures. We provide more details on these measures here, and highlight how some components of these measures have changed over time.

Expenditures: This summary measure includes all expenditures reported in the CE Interview Survey except miscellaneous expenditures and cash contributions because some of these expenditures are not collected in all interviews. Since 1980 a subset of miscellaneous expenditures has been collected only in the fifth interview, and cash contributions are only collected in the fifth interview for surveys conducted from the first quarter of 1980 through the first quarter of 2001.

Total Consumption: Consumption includes all spending in our measure of total expenditures less spending on out of pocket health care expenses, education, and payments to retirement accounts, pension plans, and social security. In addition, housing and vehicle expenditures are converted to service flows. For homeowners we subtract spending on mortgage interest, property taxes, maintenance, repairs, insurance, and other expenses, and add the reported rental equivalent of the home. For years when the rental equivalent is not reported (1960-1961 and 1980-1981 surveys), we impute a value as explained below. For those in public or subsidized housing, we impute a rental value using the procedure outlined below. For vehicle owners we subtract spending on recent purchases of new and used vehicles as well vehicle finance charges. We then added the service flow value of all vehicles owned by the family, as described below.

B.1. Estimating Vehicle Service Flows

Our measure of consumption replaces the purchase price of vehicles and vehicle maintenance costs with the service flow value from owned vehicles. Our improved measure of vehicle service flows follows the approach we used in Meyer and Sullivan (2012,b). Previous studies have imputed flows based only on recent spending on vehicles and descriptive characteristics of the family (Cutler and Katz 1991), recent spending on vehicles, vehicle age, and descriptive characteristics of the family (Meyer and Sullivan 2003, 2004), or reported purchase prices and vehicle age (Slesnick 1993). Our approach provides two important improvements upon previous work. First, in addition to vehicle age, our approach uses detailed information for each vehicle (such as make, model, year, automatic transmission, and other characteristics) to determine the market price. Second, we estimate depreciation rates by comparing the reported purchase prices for similar vehicles of different ages. We use the detailed expenditure data for owned vehicles from the 1980-2014 CE.

We determine a current market price for each of the 1.6 million vehicles in the data from 1980-2014 in one of three ways. First, for vehicles that were purchased within twelve months of the interview and that have a reported purchase price (the estimation sample), we take the current market price to be the reported purchase price. This estimation sample accounts for about 14 percent of all vehicles in the 1980-2014 surveys. Second, for vehicles that were purchased more than twelve months prior to the interview and that have a reported purchase price (about 15 percent of all vehicles), we specify the current market price as a function of the reported purchase price and an estimated depreciation rate as explained below.

For the remaining 71 percent of vehicles, we impute a current market price because the purchase price is not reported. Using the estimation sample, we regress the log real purchase price on a cubic in vehicle age, vehicle characteristics, family characteristics, and make-model-year fixed effects.[16] The vehicle characteristics include indicators for whether the vehicle has automatic transmission, power brakes, power steering, air conditioning, a diesel engine, a sunroof, four-wheel drive, or is turbo charged. Family characteristics include log real expenditures (excluding vehicles and health), family size, region, and the age and education of the family head. Coefficient estimates from this regression are then used to calculate a predicted log real purchase price for the ith vehicle ($x_i\hat{\beta}$). The predicted current market value for each vehicle without a reported purchase price is then equal to $\hat{\alpha} * \exp(x_i\hat{\beta})$, where $\hat{\alpha}$ is the coefficient on $\exp(x_i\hat{\beta})$ in a regression of y_i on $\exp(x_i\hat{\beta})$ without a constant term.[17]

To estimate a depreciation rate for vehicles, we compare prices across vehicles of different age, but with the same make, model, and year. In particular, from the estimation sample we construct a subsample of vehicles that are in a make-model-year cell with at least two vehicles that are not the same age. Using this sample, we regress the log real purchase price of the vehicle on vehicle age and make-model-year fixed effects.[18] From the coefficient on vehicle age (β), we calculate the depreciation rate (δ): $\delta = 1 - EXP(\beta)$. The service flow is then the product of this depreciation rate and the current market price. If the vehicle has a reported purchase price but was not purchased within 12 months of the interview we calculate the service flow as: (real reported purchase price)*$\delta(1-\delta)^t$, where t is the number of years since the car was purchased.

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[16] 76 percent of the vehicles without a reported purchase price can be matched to at least one vehicle in the estimation sample with the same make, model, and year, and 69 percent of the remaining 24 percent do not have a match because they are not a car, truck, or van so make and model are not observed. Starting in 2006, vehicles can be matched on make, but not model, because the CE stopped providing information on vehicle model after 2005. For those vehicles without a reported purchase price that do not have the same make, model, and year as at least one vehicle in the estimation sample, but do have the same make and year as a vehicle in the estimation sample, a separate regression is estimated that includes make-year fixed effects instead of make-model-year fixed effects.

[17] This adjustment is made because $\exp(x_i\hat{\beta})$ will tend to underestimate y_i.

[18] The distribution of service flows does not differ noticeably when alternative specifications for depreciation are estimated. For example, specifications that allow the depreciation rate to vary by age of the vehicle (by including a cubic in vehicle age in the regression) yield similar results.

Although the 1972-1973 CE data files include an inventory of vehicles owned, we do not use these data to calculate service flows from vehicles for several reasons. First, we do not observe the year the car was manufactured, only whether it was manufactured before or after 1967. Second, we do not observe the model for vehicles manufactured during or before 1967, and for those manufactured after 1967 we only observe a broadly defined model group: subcompact domestic, compact domestic, etc. Thus, rather than using the vehicle inventory data, we impute service flows for owned automobiles using data on reported spending on new and used automobile purchases during the survey year and the reported number of automobiles owned during the year. Specifically, for a sample with positive spending on automobiles, we regress annual spending for new and used automobiles on a quadratic in total (non-automobile) spending and observable characteristics of the family including family income, family size, and the age, sex, and education of the family head. Parameter estimates from these regressions are used to predict spending on new and used car purchases for all families that own automobiles. We calculate the service flow from automobiles as the product of predicted automobile spending, the number of owned automobiles and a depreciation rate. This approach will understate total automobile flows for some families because the number of automobiles is topcoded at 2. This approach will overstate vehicle flows for families that dispose of an automobile during the survey year if this automobile is included in the total count of automobiles owned. This approach will also overstate vehicle flows for families that have owned their vehicles for an extended time, because we are predicting the value based on recent automobile purchases. Note that unlike our approach for 1980-2014, we calculate service flows only for automobiles, not for other vehicles such as trucks, motorcycles, campers, etc., because we do not have reliable information on the total number of each of these types of vehicles owned.

We validate our procedure for predicting the current market value of vehicles for those observations where we do not have a purchase price by comparing the predicted values to published values in National Automobile Dealers Association (NADA) guides. For a given year of the CE we take a random sample of 100 vehicles for which a purchase price was not observed. We then find the average retail price of the vehicle reported in the NADA Official Used Car Guide, using observable vehicle characteristics including make, model, year, number of cylinders, and number of doors. In cases where a unique match is not found in the NADA guide (for example, there might be multiple sub-models listed in the NADA guide), we use the midpoint of the range of prices for the vehicles that match the description of the vehicle from the CE. For the sample of vehicles randomly drawn from the 2000 CE, the correlation between our imputed price and the 2000 NADA price was 0.88. Similarly, for a sample of 100 cars with a reported purchase price, the correlation between the reported price and the NADA price was 0.91.

B.2. Estimating a Rental Equivalent for Families Living in Government or Subsidized Housing

We impute a rental equivalent for families in the CE living in government or subsidized housing using reported information on their living unit including the number of rooms, bedrooms and bathrooms, and the presence of appliances such as a microwave, disposal,

refrigerator, washer, and dryer. Specifically, for renters who are not in public or subsidized housing we estimate quantile regressions for log rent using the CE housing characteristics mentioned above as well as a number of geographic identifiers including state, region, urbanicity, and SMSA status, as well as interactions of a nonlinear time trend with appliances (to account for changes over time in their price and quality). We then use the estimated coefficients to predict the 40th percentile of rent for the sample of families that do not report full rent because they reside in public or subsidized housing. We use the 40th percentile because public housing tends to be of lower quality than private housing in dimensions we do not directly observe. Evidence from the PSID indicates that the average reported rental equivalent of public or subsidized housing is just under the predicted 40th percentile for these units using parameters estimated from those outside public or subsidized housing.

B.3. Estimating the Value of Health Insurance

We impute a measure of the value of public and private health insurance using the coverage information in the CE and data on insurance costs. The worker and firm cost of employer provided insurance is obtained from a combination of sources including the National Medical Care Expenditure Survey and the Mercer/Foster Higgins National Survey of Employer Sponsored Health Plans. From these surveys we calculate a cost of employer provided health insurance that varies by year and nine geographic regions. The cost of Medicaid and Medicare is taken from expenditures per person in a given state and year. For Medicaid we calculate these expenditures separately for children, adults under 65, and adults 65 and over.

The value a family places on health coverage may exceed its cost because of its insurance value. On the other hand, this in-kind transfer may be valued at much less than cost given the one size fits all nature of insurance and the lower value of purchases of most goods by the poor. The compromise that we consider here is to count desired health expenditures. Assuming that desired health expenditures by those with few resources can be characterized by Cobb-Douglas preferences with a coefficient of 0.33 on health and 0.67 on other goods, only health expenditures up to one-third of total expenditures are included. This compromise values health coverage at cost for those with substantial resources as they likely spend less than one-third of consumption on health, but at much less than cost for those with few other resources. Because information on health insurance coverage is not available in 1960-1961, 1972-1973 and from 1984 to 1987, we do not report consumption measures that include health insurance for these years.

B.4. Imputing Rental Equivalent

In survey years 1960-61 and 1980-81 we do not observe the reported rental equivalent of the home. To construct an imputed value of housing consumption for homeowners for these years, we rely on data from subsequent waves of the CE Survey where rental equivalent is reported. Using data from 1984, for example, we estimate the relationship between reported rental equivalent and the reported house value and other characteristics. Specifically, for a sample of homeowners we estimate quantile regressions of the following form:

(A.1) $Q_\alpha(\ln rent_i) = \beta_1 \ln hval_i + \beta_2 \ln nh_i + \beta_3 X_i + \beta_2 W_i$,

where $rent_i$ denotes the reported rental equivalent for consumer unit *i*; $hval_i$ is the reported market value of the home; nh_i is total non-housing consumption; X_i is a vector of characteristics including age and education of the head, family size, and family type (single parent, married parents, single individual, and other); and W_i is a vector of living unit characteristics including whether the unit has central or window air conditioning, the number of rooms and whether the unit is located within a SMSA. We then use the coefficient estimates of Equation A.1 to predict the α quantile of rental equivalent for consumer units in the 1980-81 surveys. We estimate Equation A.1 for 99 different percentiles, yielding 99 predicted values of rental equivalent for each homeowner. For non-homeowners in 1980-81 we generate 99 duplicate observations. Stacking these two datasets together yields a sample with 99 X N consumer units, where N is the number of consumer units in the 1980-81 data.

We calculate our various consumption measures for this expanded 99 X N sample using predicted rental equivalent as our measure of service flow from owned homes. Our measures of consumption inequality are then calculated for the various measures of consumption using this expanded 99 X N sample. When predicting within sample (i.e. when the estimation and prediction samples are the same) the distribution of predicted rental equivalent lines up very closely with the actual reported rental equivalent.

We follow a similar procedure to impute rental equivalent for the 1960-61 sample, except we estimate the coefficients in Equation A.1 using the 1972-73 CE Survey. Also, the 1960s surveys provide information on the range within which the value of the home falls, rather than a continuous value. So when estimating Equation A.1 using the 1972-73 surveys, we map the reported value of the home into the same ranges (in real terms) as are available in the 1960-61 surveys, and then include indicator variables for these home value ranges in place of the reported home value (*hval*).

B.5. Comparability over Time

We make two minor adjustments to the measure of total expenditures provided in the CE to maintain a comparable definition of expenditures across our sample period. First, we add in insurance payments and retirement contributions for the 1960-1961 and 1972-1973 surveys because these categories were not treated as expenditures in these years. This adjustment does not affect consumption measures because these categories are excluded from consumption. Second, the wording for the question regarding spending on food at home in surveys conducted between 1982 and 1987 differed from other years. Several studies have noted that this wording change resulted in a decrease in reported spending on food at home (Battistin 2003; Browning et al. 2003). To correct for the effect of this change in the questionnaire, for the years 1984-1987 we multiply spending on food at home by an adjustment factor which is equal to the ratio of average spending on food at home from 1988 through 1990 to average spending on food at home from 1984 through 1987. These adjustment factors, which we estimate separately for different family types, range from 1.12 to 1.30. Starting with the

second quarter of 2007, the question on food away from home changed from a query about usual monthly spending to usual weekly spending. This change resulted in a noticeable increase in reported food away spending. We estimate the effect of the question change by regressing food away spending on a new question indicator, controlling for interview month and reference month (respondents report spending for the previous three months) for survey years 2005 through 2007. Based on these estimates we adjust spending on food away down by 55 percent for the most recent years. This adjustment does not affect our well-measured consumption measure because this measure excludes food away. Reported food away spending is a small fraction of total spending, accounting for about 5 percent of total spending for all consumer units in 2015.[19]

The values for certain spending components are top coded in the public use files, and the threshold values for the top code changes over time. For example, the top code threshold for the monthly rental equivalent value of an owned home increased from $1,000 in 1988 to $1,500 in 1989. Over longer periods the real values of the top code thresholds have typically risen. For example, the value of the rental equivalent threshold in 2014 ($3,200) is 17% greater in real terms than the value of this threshold in 1980 ($1,000).

Also, we do not observe whether a consumer unit resides in public or subsidized housing prior to 1982, so a rental equivalent value for those in such housing is not included in consumption prior to 1982. Estimates of the rental equivalent for those in public or subsidized housing in the mid-1980s are small relative to total consumption, suggesting that this exclusion is not likely to significantly bias our estimates for changes in inequality. Finally, the availability of information on vehicles also changes during our sample period as we noted above.

C. Measures of Income in the CPS

CPS respondents report annual measures of money income for the previous calendar year. Respondents also report the dollar value of food stamps received by the household, as well as whether household members received other noncash benefits including housing subsidies and subsidies for reduced or free school lunch. Starting with the 1980 survey, the Census also provides imputed values for these and other noncash benefits. For more details see U.S. Census (various years-a,b), Appendices B and C.

The income inequality results reported in this study focus on three main measures of income: Pre-Tax Money, After-Tax Money Income, and After-Tax Money Income Plus Noncash Benefits. We also examined alternative income-based measures of resources that include the imputed value of Medicaid and Medicare, employer health benefits, and the net return on housing equity. These measures of income are defined as follows:

Pre-Tax Money Income: The Census definition of money income that is used to measure poverty and inequality. This definition of income, as reported in the ASEC codebook, includes: earnings; net income from self-employment; Social Security, pension, and retirement income; public transfer income including Supplemental Security Income, welfare

[19] https://www.bls.gov/cex/tables.htm#avgexp.

payments, veterans' payment or unemployment and workmen's compensation; interest and investment income; rental income; and alimony or child support, regular contributions from persons outside the household, and other periodic income.

After-Tax Money Income: adds to money income the value of tax credits such as the EITC, and subtracts state and federal income taxes and payroll taxes. Federal income tax liabilities and credits and FICA taxes are calculated for all years using TAXSIM (Feenberg and Coutts 1993). State taxes and credits are also calculated using TAXSIM for the years 1977-2005. Prior to 1977, we calculate state taxes using IncTaxCalc (Bakija, 2008). We confirm that in 1977 net state tax liabilities generated using IncTaxCalc match very closely those generated using TAXSIM.

After-tax Money Income Plus Noncash Benefits: this adds to After-Tax Money Income the face value of food stamps, and imputed values for housing subsidies and the school lunch program.

Face Value of Food Stamps: The value of food stamps for each family is determined by the Census using reported information on the number of persons receiving food stamps in the household and the reported total value of food stamps received.

Income Value of School Lunch Program: The Census imputes a value for lunch subsidies for families that report having children who receive free or reduced price school lunch. The value is determined using information on the dollar amount of subsidy per meal as reported by the USDA. If a child participates in school lunch, it is assumed that the child receives that subsidy type (reduced price or free) for the entire year.

Housing Subsidies: The Census imputes a value of housing subsidies for households that report living in public housing or receiving a public rent subsidy. The value of the subsidy is calculated as follows. Using data from the 1985 American Housing Survey (AHS), reported rent for unsubsidized two-bedroom housing units is regressed on housing characteristics. Separate regressions are estimated for each of four regions, and the coefficients from these models are used to predict rent for those living in subsidized units in the AHS. The subsidy for those in subsidized housing in the AHS sample is then calculated as the difference between out of pocket rent and imputed total rent. Region-specific adjustment factors for smaller and larger units are estimated using data on rent for units with different numbers of bedrooms in the 1985 AHS. Thirty-six different subsidy values are calculated which vary by four regions, three income brackets, and three different unit sizes. Because unit size is not observed in the CPS, this is imputed from family composition. Subsidy values for each year are based on estimates using the 1985 data, but are updated to reflect changes in shelter costs using the CPI residential rent index. Before 1985 housing subsidies in the CPS were imputed using the 1979 or 1981 Annual Housing Survey.

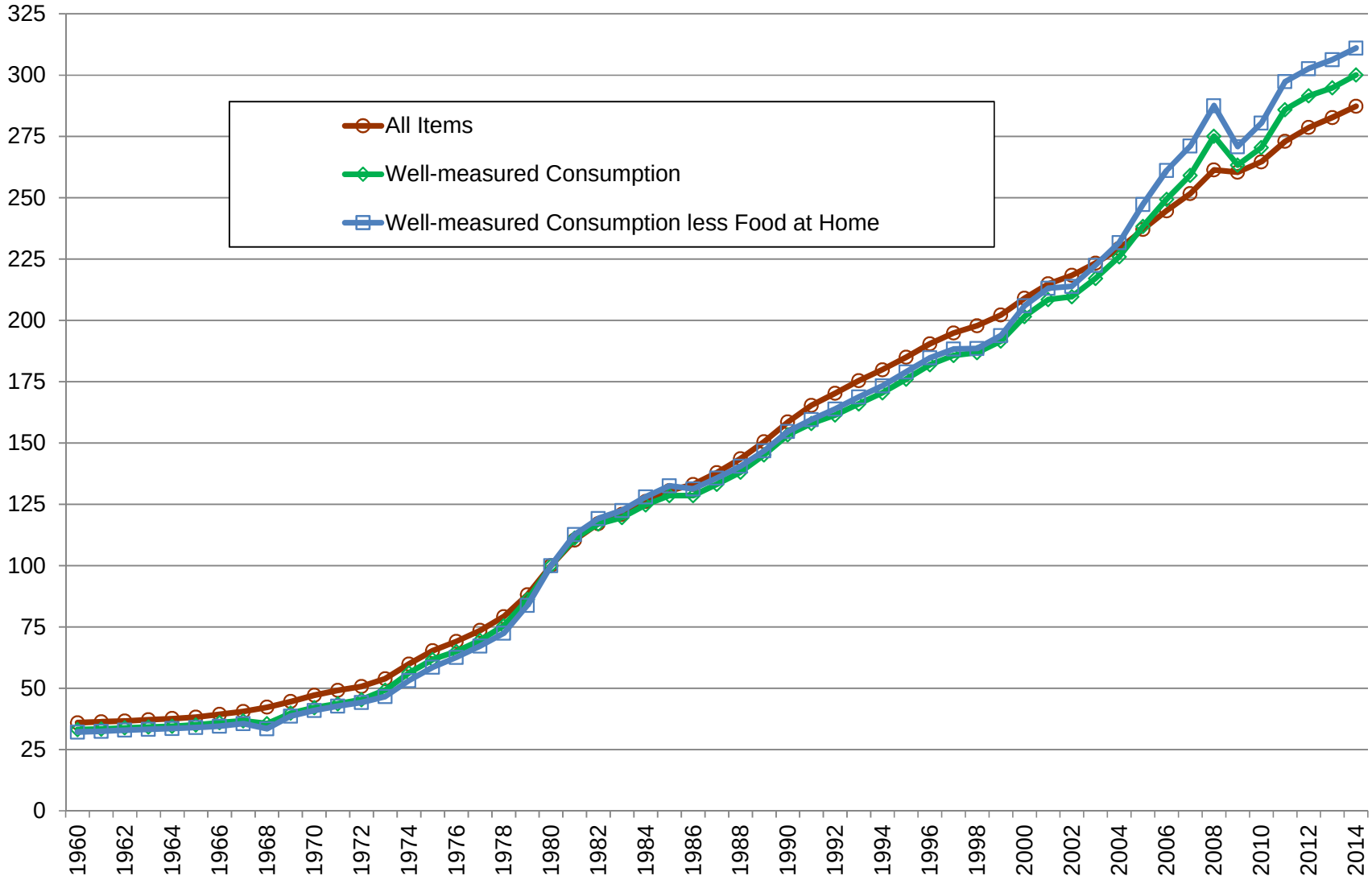
Fungible Values of Medicaid and Medicare: The Census imputes a "fungible" value of Medicaid or Medicare for families that include an individual who is reported to be covered by Medicaid or Medicare. Fungible means that "Medicare and Medicaid benefits are counted as

income to the extent that they free up resources that could have been spent on medical care" (U.S. Census various years-b). Thus, these programs have no income value if the family does not have resources (the sum of money income, food stamps, and housing subsidies) that exceed basic needs. If these resources do exceed basic needs, then the fungible value of medical benefits is equal to the smaller of: a) the market value of these benefits and b) the value of resources less basic needs. The market value of Medicaid is equal to mean government outlays for families in a given state and risk class. The four risk classes are: 65 and over, blind and disabled, 21-64 nondisabled, and less than 21 nondisabled. The market value of Medicare is equal to mean government outlays for families in a given state and risk class. The two risk classes are: 65 and over and blind and disabled.

Employer Contributions to Health Insurance: The Census imputes a value of health insurance for persons who were covered by an employer health insurance plan. Using data from the 1977 National Medical Care Expenditures Survey, the value of the employer contribution was imputed as a function of observable characteristics including earnings, full-time/part-time, industry, occupation, sector, public/private, residence, and personal characteristics of the worker such as age, race, marital status, and education, and information on whether the employer paid all, part, or none of the cost of health insurance as reported in the supplement.

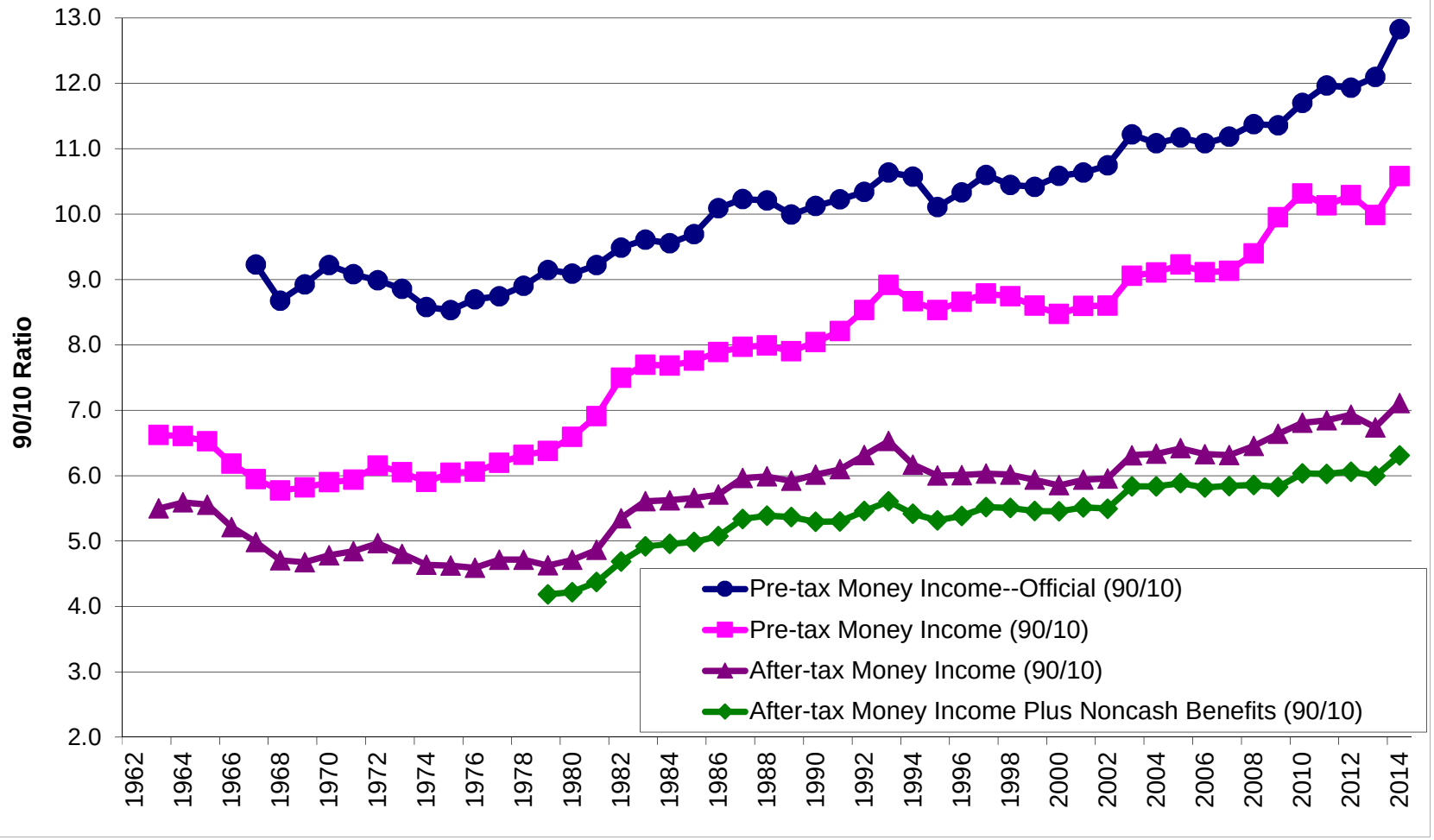
Net Return on Home Equity (annuitized value): Using data from the AHS, a value of home equity is imputed for each CPS household by statistically matching the two surveys on observable characteristics including geographic location, income, household size, number of living quarters, and the age, race, sex, and education of the household head. The equity value of the home and property taxes for homeowners in the CPS are determined by using these values from a household with similar characteristics in the AHS. This equity is converted to an annuity using a rate of return based on high grade municipal bonds from the Standard & Poor's series. The value of home equity is net of imputed property taxes. The AHS survey year used for these imputations is updated periodically. For example, starting with the 2006 CPS, the 2003 AHS was used, while in 2002 the 1995 AHS was used (Short and O'Hara, 2008)

Figure 1: CPI for All Items and Well-Measured Consumption --1980 Shares (1980=100)



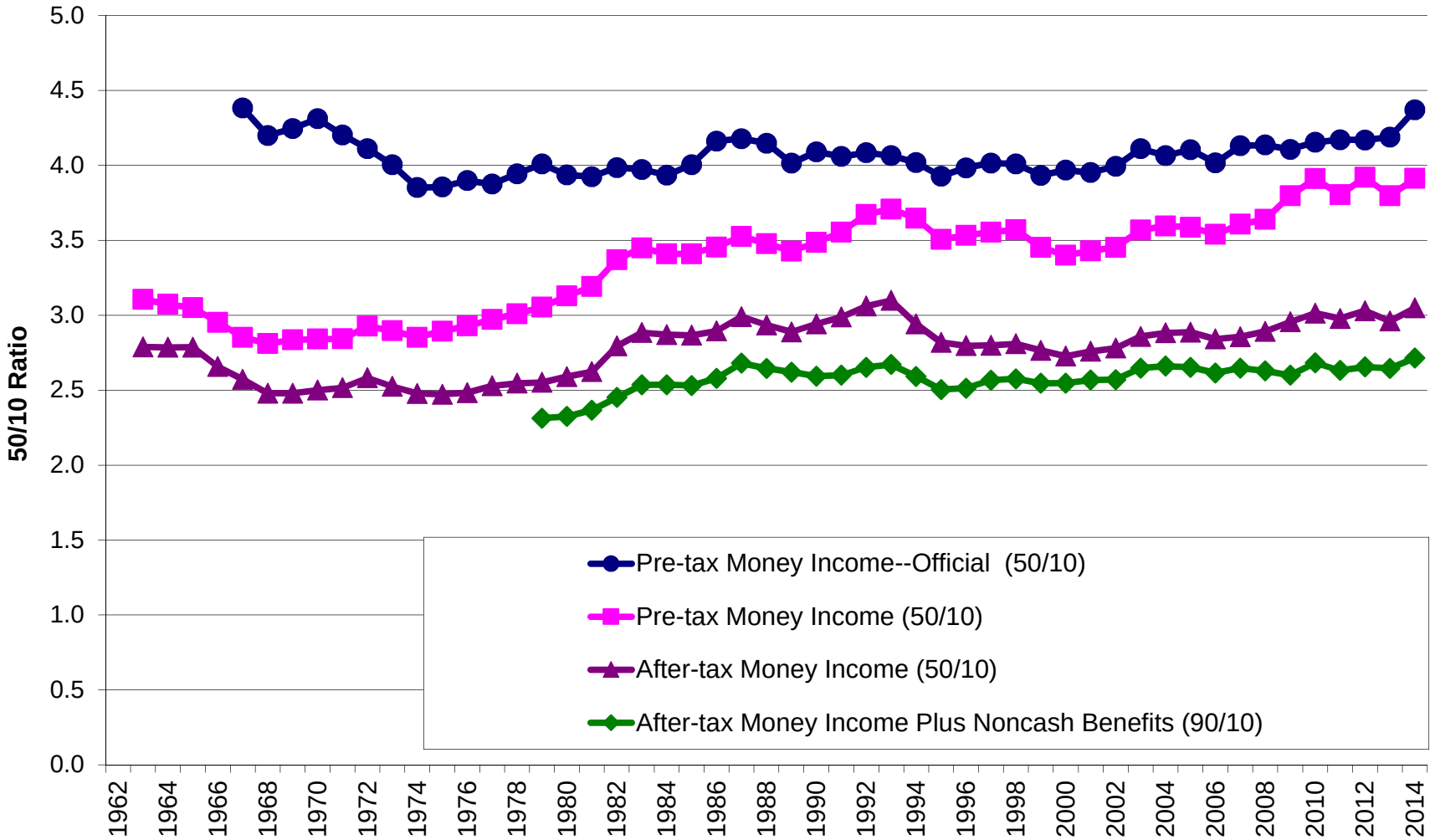
Notes: All items is the U.S. City Average for All Items. The other price indices are constructed by taking the weighted avearge of the component specific CPIs provided by the BLS using as weights the share of well-measured consumption accounted for by each component in 1980.

Figure 2: Income Inequality 1963-2014



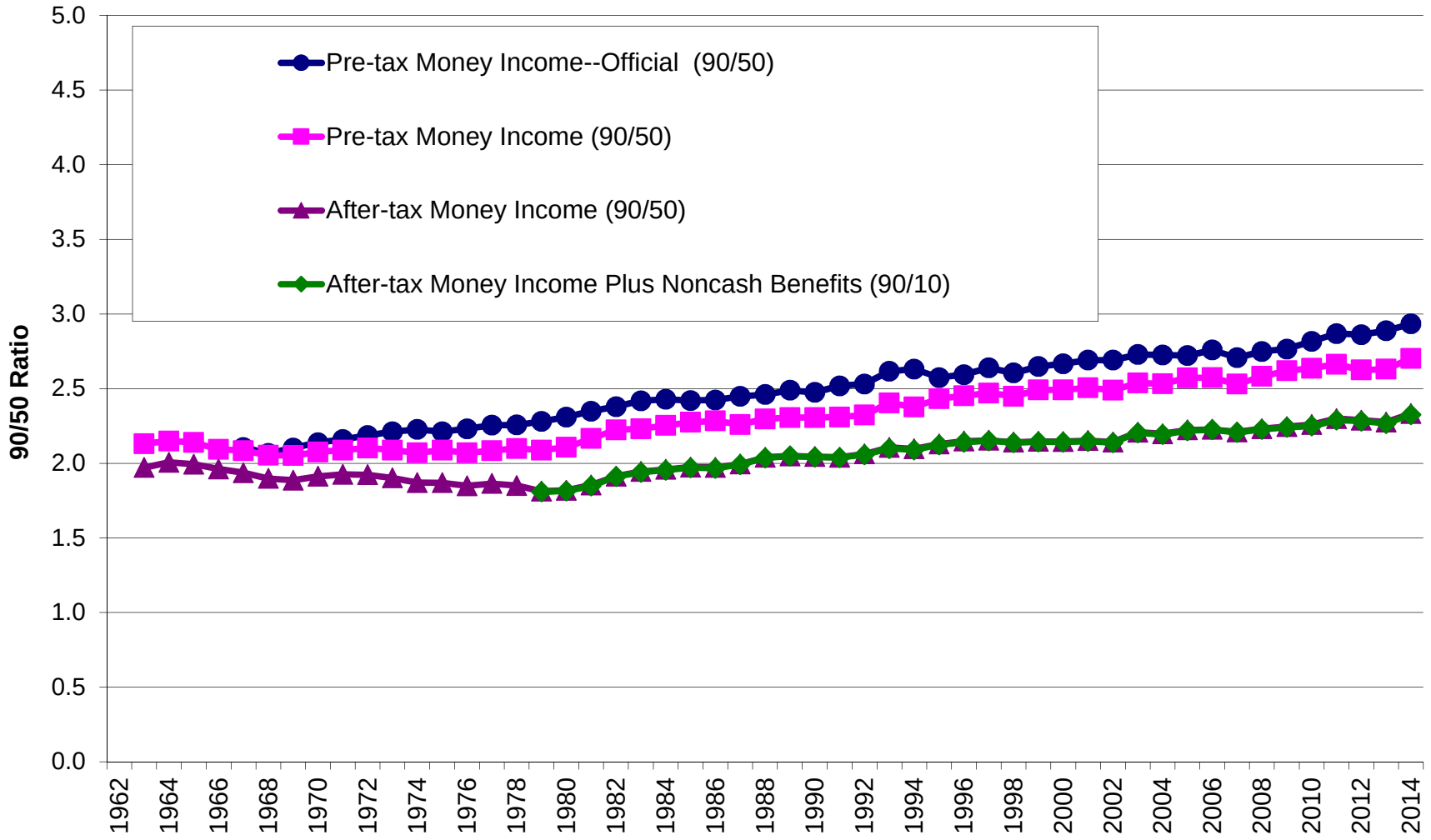
Notes: All data are from the CPS. All measures other than the official measure, are adjusted for differences in family size using the NAS recommended equivalence scale. The unit of observation for the official measure is the household, while it is the family for the other income measures. After-tax Money Income is calculated as Pre-tax Money Income plus the value of tax credits such as the EITC, less state and federal income taxes and payroll taxes. Noncash benefits include the cash value of food stamps, and the Census' imputed values of housing and school lunch subsidies.

Figure 3: Income Inequality 1963-2014



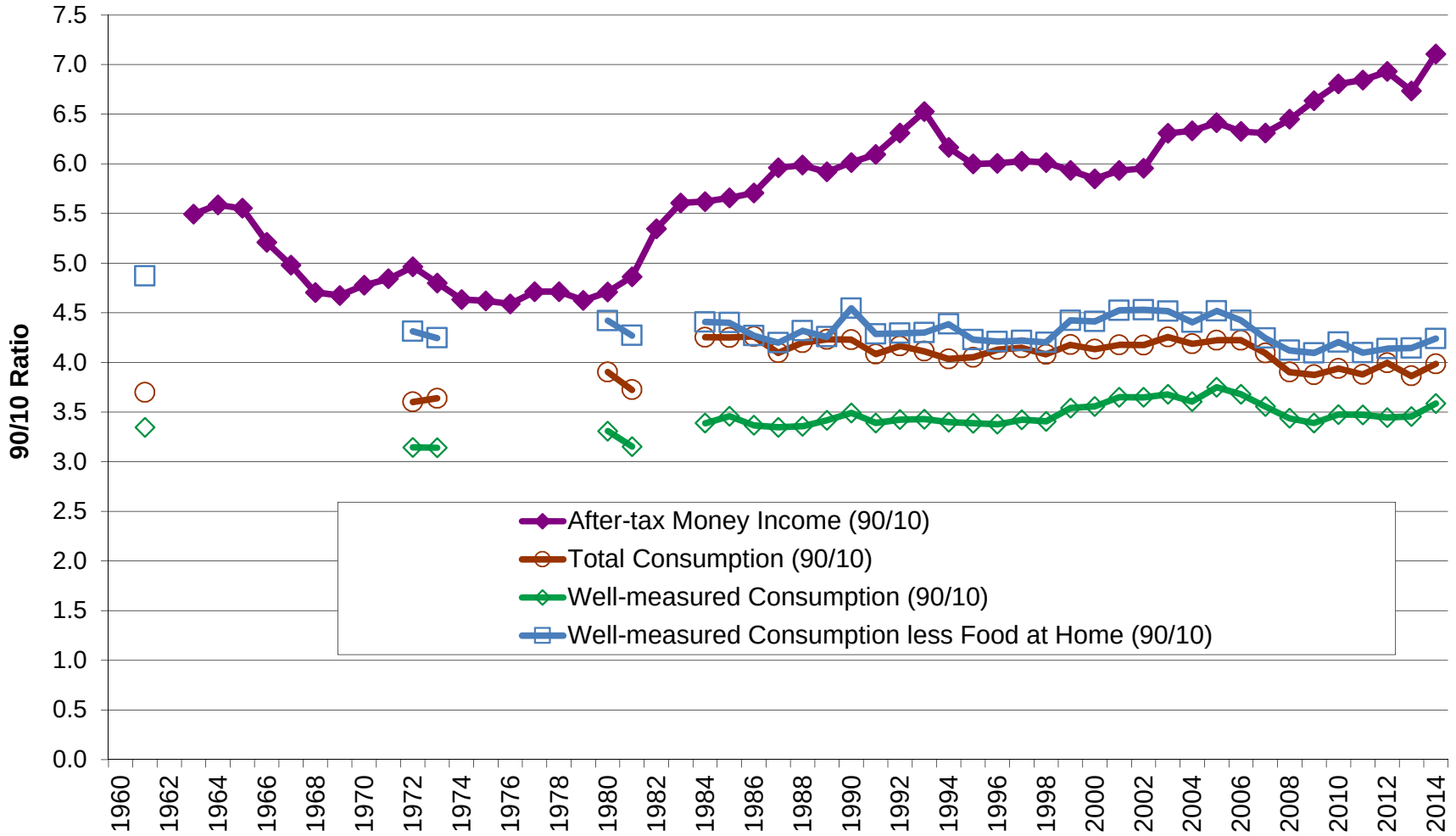
Notes: See notes to Figure 2.

Figure 4: Income Inequality 1963-2014



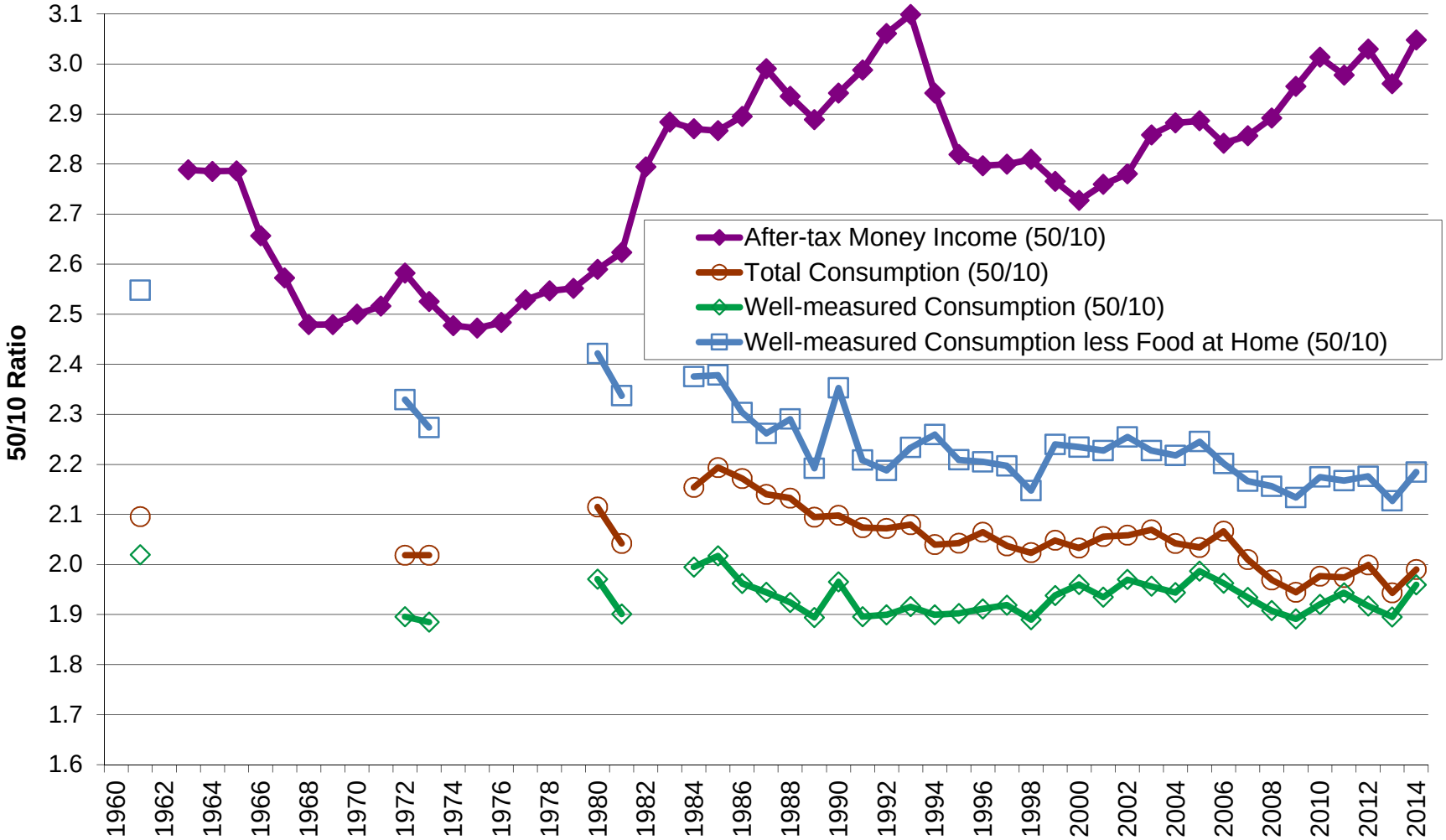
Notes: See notes to Figure 2.

Figure 5: Consumption Inequality 1961-2014



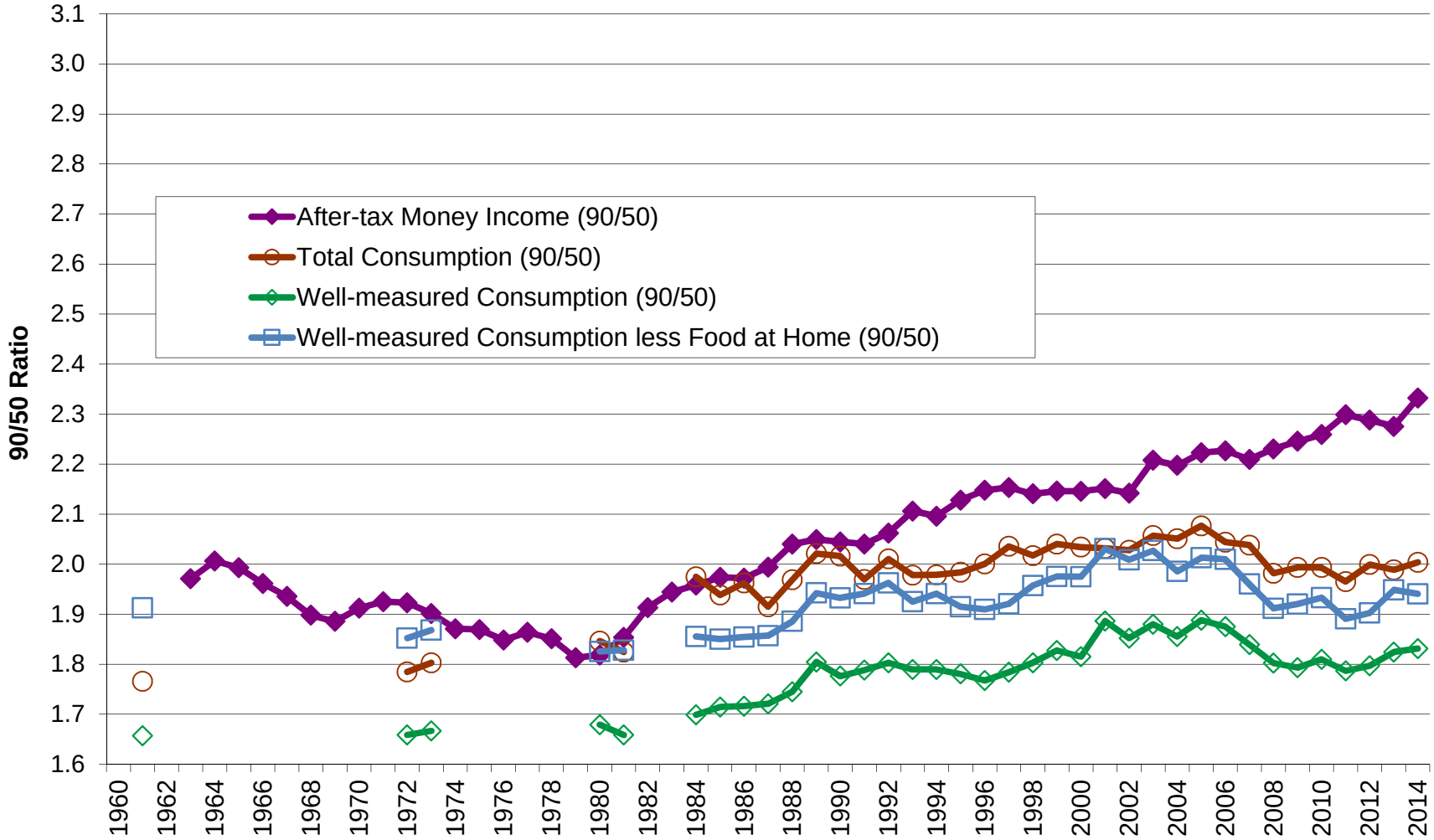
Notes: Consumption data are from the CE and income data are from the CPS. Well-measured consumption includes spending on food at home, rent (for renters), rental equivalent (for homeowners or those in government or subsidized housing), utilities, service flows from owned vehicles, and spending on gasoline and motor oil. See text for more details.

Figure 6: Consumption Inequality 1961-2014



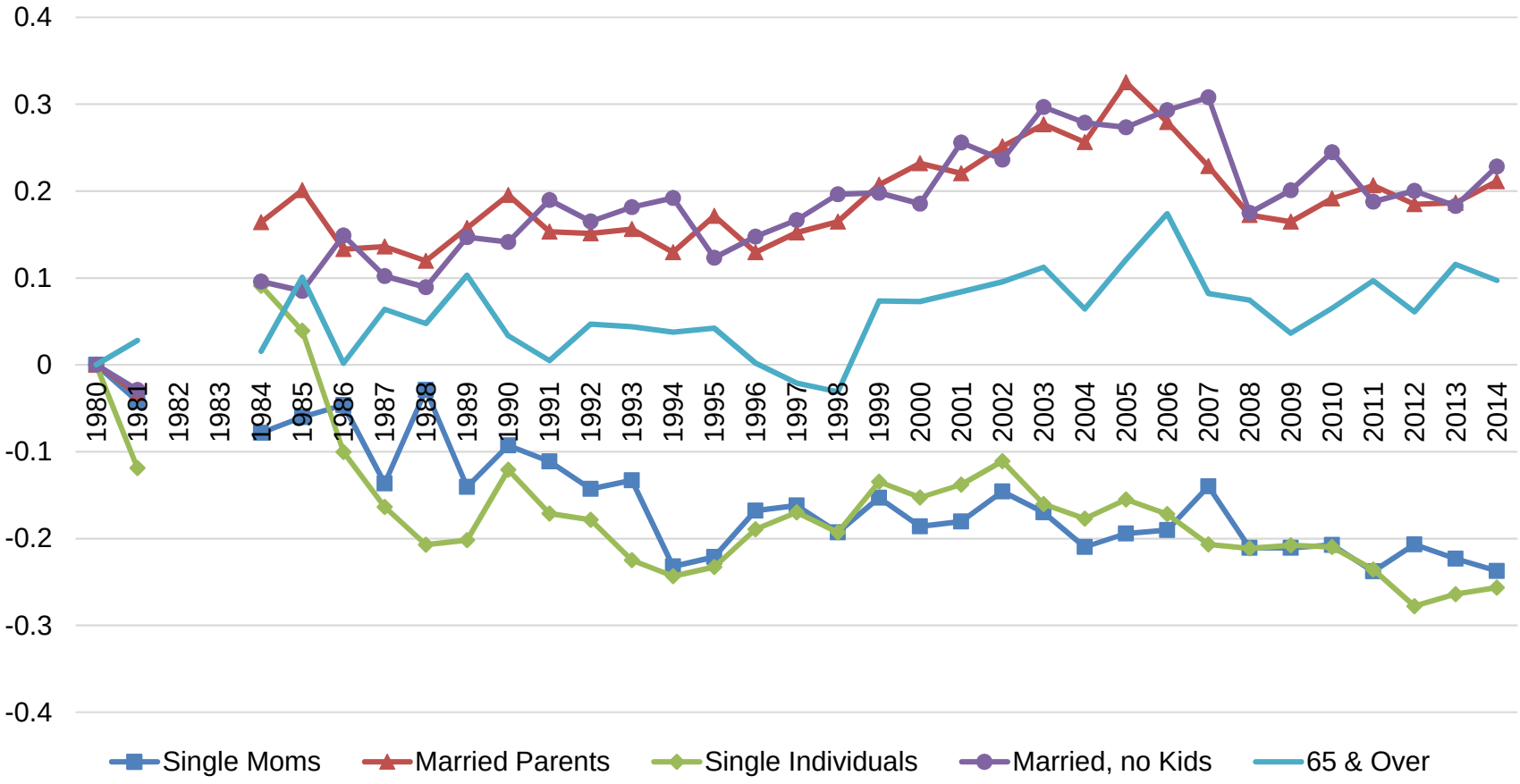
Notes: See notes to Figure 5.

Figure 7: Consumption Inequality 1961-2014



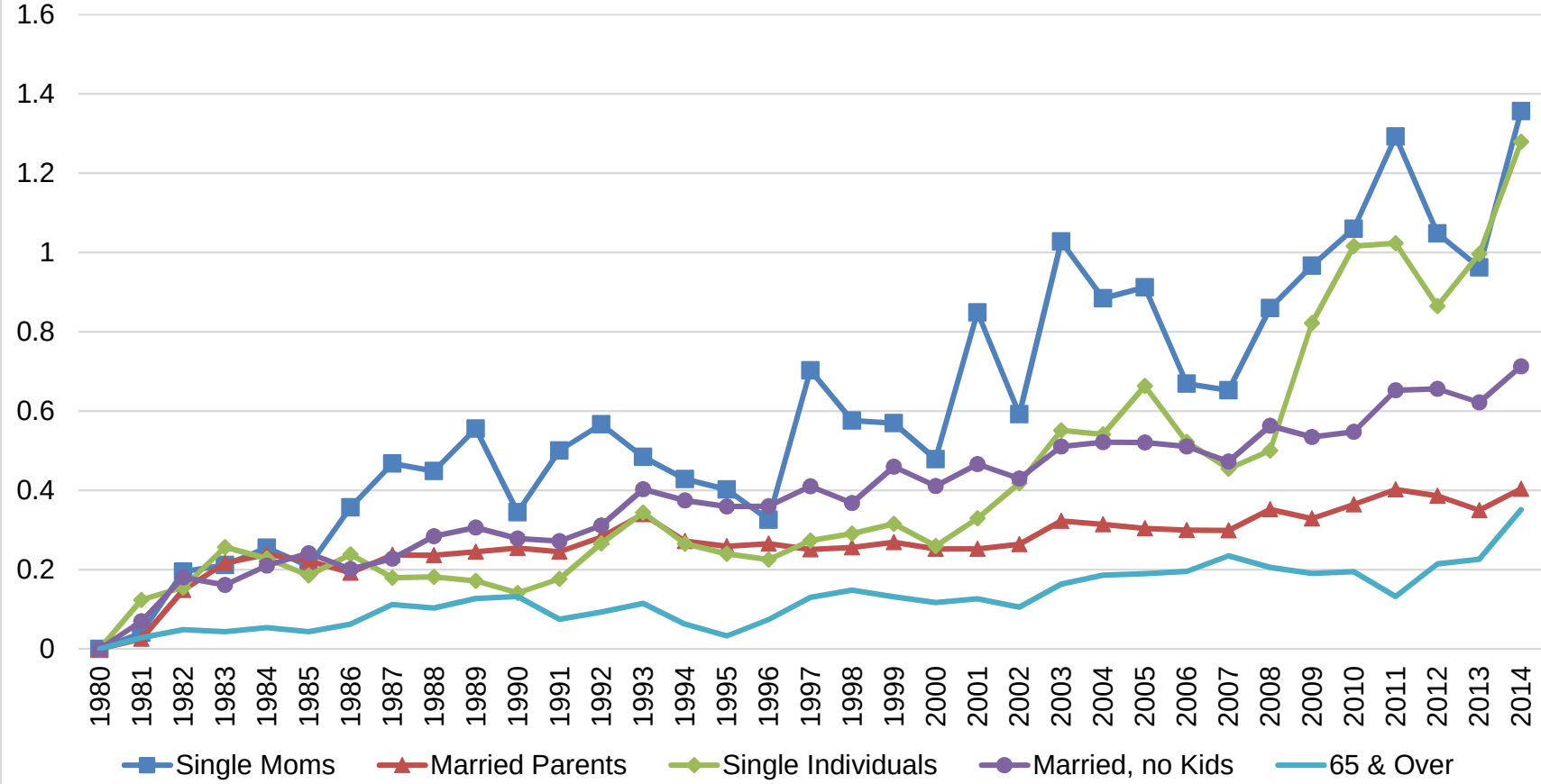
Notes: See notes to Figure 5.

Figure 8: Percent Change in the 90/10 Ratio of Consumption Since 1980 by Family Type



Notes: Data are for well-measured consumption using data the CE.

Figure 9: Percent Change in the 90/10 Ratio of After-Tax Income Since 1980 by Family Type



Notes: Data are from the CPS.

Table 1: CE PCE Comparisons for 10 Large Categories, 1986 and 2010 [In millions of dollars]

	1986			2010		
	PCE	CE Diary /PCE	CE Interview /PCE	PCE	CE Diary /PCE	CE Interview /PCE
Well-measured consumption categories						
Imputed rental of owner-occupied nonfarm housing	304,497		1.120	1,203,053		1.065
Rent and utilities	225,758	0.831	0.965	668,759	0.797	0.946
Food and nonalc. beverages purchased for off-premises consumption (food at home)	273,849	0.675	0.793	659,382	0.656	0.862
New motor vehicles	134,047		1.153	178,464		0.961
Gasoline and other energy goods	91,191	0.838	1.060	354,117	0.725	0.779
Communication	55,600	0.752	0.796	223,385	0.686	0.800
Poorly measured consumption categories						
Purchased meals and beverages (food away from home)	161,472	0.724	0.647	533,078	0.508	0.528
Clothing	122,817	0.311	0.271	256,672	0.487	0.317
Furniture and furnishings	59,392	0.453	0.766	140,960	0.433	0.439
Alcoholic beverages purchased for off-premises consumption	41,670	0.334	0.342	106,649	0.253	0.220

Notes: Data are from Bee, Meyer, and Sullivan (2015). The PCE category name for food at home is "Food and nonalcoholic beverages purchased for off-premises consumption." The PCE category name for food away from home is "Purchased meals and beverages." IS = Interview Survey, DS = Diary Survey.

Table 2: Mean Well-measured Consumption and Total Consumption

	Well-Measured Consumption	Well-Measured Consumption Less Food at Home	Total Consumption	Well-Measured / Total	Well-Measured Less Food / Total
All					
1980	2,407	1,729	4,092	0.588	0.422
2014	3,945	3,210	6,541	0.603	0.491
5th-20th Percentiles of Consumption					
1980	1,406	920	2,055	0.684	0.448
2014	2,209	1,672	3,259	0.678	0.513
Second Quintile of Consumption					
1980	1,978	1,387	2,976	0.665	0.466
2014	3,068	2,410	4,705	0.652	0.512
Third Quintile of Consumption					
1980	2,438	1,766	3,866	0.631	0.457
2014	3,941	3,201	6,336	0.622	0.505
Fourth Quintile of Consumption					
1980	2,924	2,144	4,953	0.590	0.433
2014	4,941	4,074	8,283	0.597	0.492
80th-95th Percentiles of Consumption					
1980	3,587	2,647	6,702	0.535	0.395
2014	6,509	5,496	11,440	0.569	0.480

Notes: Well-measured consumption includes spending on food at home, rent (for renters), rental equivalent (for homeowners or those in government or subsidized housing), utilities, service flows from owned vehicles, and spending on gasoline and motor oil. Quintiles of consumption are for total consumption. All figures are expressed in 2014$ using the adjusted CPI-U-RS, which subtracts 1.1 percentage points from the CPI-U-RS each year from 1960 to 1977 and 0.8 percentage points each year after 1977. See Meyer and Sullivan (2012) for more details on the adjusted CPI-U-RS.

Table 3: Total Consumption Elasticities of Well-Measured Consumption

Model Sample Restriction Year and Sample Size Independent Variable	Dependent Variable Log Well-measured Consumption	Dependent Variable Log Well-measured Consumption Less Food at Home
OLS		
None		
1980, N= 19,073		
Log Total Consumption	0.928	1.169
	(0.001)	(0.001)
1988, N= 20,294		
Log Total Consumption	0.810	0.967
	(0.005)	(0.008)
IV, instrument = Log income		
Complete income reporters between the 5th and 95th percentile of income		
1980, N= 14,531		
Log Total Consumption	0.944	1.167
	(0.001)	(0.002)
1988, N= 15,596		
Log Total Consumption	0.829	0.997
	(0.009)	(0.013)

Notes: All data are from the Consumer Expenditure Interview Survey. Well-measured consumption includes spending on food at home, rent (for renters), rental equivalent (for homeowners or those in government or subsidized housing), utilities, service flows from owned vehicles, and spending on gasoline and motor oil. Income and consumption are adjusted for differences in family size using the NAS recommended equivalence scale.

Table 4: Changes in Consumption and Income Inequality, 1961-2014

	Initial Level in 1960	Percentage Changes						
		1961*-1972	1972-1980	1980-1990	1990-2000	2000-2014	1984-2014	1961*-2014
90-10 Ratio								
After tax income	5.50	-9.65%	-5.14%	27.71%	-2.72%	21.48%	26.45%	29.34%
Total consumption	3.70	-2.64%	8.38%	8.33%	-2.24%	-3.57%	-6.29%	7.75%
Well-measured consumption	3.35	-6.04%	5.23%	5.49%	1.90%	0.86%	5.87%	7.20%
Well-measured consumption less food at home	4.87	-11.46%	2.46%	2.84%	-2.95%	-3.91%	-3.79%	-12.98%
50-10 Ratio								
After tax income	2.79	-7.40%	0.30%	13.60%	-7.30%	11.77%	6.19%	9.31%
Total consumption	2.10	-3.67%	4.77%	-0.80%	-3.11%	-2.11%	-7.63%	-5.04%
Well-measured consumption	2.02	-6.13%	3.95%	-0.27%	-0.27%	-0.04%	-1.77%	-2.98%
Well-measured consumption less food at home	2.55	-8.57%	3.96%	-2.84%	-5.03%	-2.22%	-8.03%	-14.25%
90-50 Ratio								
After tax income	1.97	-2.43%	-5.43%	12.43%	4.94%	8.69%	19.08%	18.32%
Total consumption	1.77	1.07%	3.44%	9.20%	0.90%	-1.49%	1.45%	13.47%
Well-measured consumption	1.66	0.09%	1.23%	5.78%	2.18%	0.90%	7.78%	10.50%
Well-measured consumption less food at home	1.91	-3.15%	-1.43%	5.85%	2.19%	-1.72%	4.61%	1.48%

Notes: Consumption data are from the CE and income data are from the CPS. Well-measured consumption includes spending on food at home, rent (for renters), rental equivalent (for homeowners or those in government or subsidized housing), utilities, service flows from owned vehicles, and spending on gasoline and motor oil. See text for more details. 1961* refers to 1961 for consumption but 1963 for income.

Table 5: Changes in Consumption and Income Inequality for Other Measures of Consumption, 1961-2014

	Initial Level in 1960	Percentage Changes						
		1961*-1972	1972-1980	1980-1990	1990-2000	2000-2014	1984-2014	1961*-2014
90-10 Ratio								
Well-measured consumption	3.35	-6.04%	5.23%	5.49%	1.90%	0.86%	5.87%	7.20%
Well-measured consumption less food at home	4.87	-11.46%	2.46%	2.84%	-2.95%	-3.91%	-3.79%	-12.98%
Well-measured consumption less food at home and utilities	5.65	-5.93%	0.37%	5.76%	-8.12%	-2.03%	-4.42%	-10.11%
Well-measured consumption less housing	3.15	11.29%	-4.08%	-6.39%	-0.63%	3.20%	1.30%	2.48%
Expenditures	3.86	0.20%	19.94%	17.22%	1.60%	-9.89%	-6.82%	28.96%
Total consumption	3.70	-2.64%	8.38%	8.33%	-2.24%	-3.57%	-6.29%	7.75%
Total consumption including health insurance				9.14%	0.59%	-0.65%		
50-10 Ratio								
Well-measured consumption	2.02	-6.13%	3.95%	-0.27%	-0.27%	-0.04%	-1.77%	-2.98%
Well-measured consumption less food at home	2.55	-8.57%	3.96%	-2.84%	-5.03%	-2.22%	-8.03%	-14.25%
Well-measured consumption less food at home and utilities	2.82	-4.13%	2.04%	-2.46%	-8.25%	-0.42%	-8.49%	-12.82%
Well-measured consumption less housing	2.02	7.71%	-8.93%	-4.76%	-1.85%	1.54%	-2.10%	-6.89%
Expenditures	2.15	-2.28%	6.36%	3.86%	-1.80%	-6.04%	-8.82%	-0.41%
Total consumption	2.10	-3.67%	4.77%	-0.80%	-3.11%	-2.11%	-7.63%	-5.04%
Total consumption including health insurance				1.69%	0.21%	-0.72%		
90-50 Ratio								
Well-measured consumption	1.66	0.09%	1.23%	5.78%	2.18%	0.90%	7.78%	10.50%
Well-measured consumption less food at home	1.91	-3.15%	-1.43%	5.85%	2.19%	-1.72%	4.61%	1.48%
Well-measured consumption less food at home and utilities	2.00	-1.88%	-1.64%	8.43%	0.15%	-1.62%	4.45%	3.10%
Well-measured consumption less housing	1.56	3.32%	5.33%	-1.71%	1.25%	1.63%	3.48%	10.06%
Expenditures	1.80	2.54%	12.77%	12.87%	3.46%	-4.10%	2.20%	29.49%
Total consumption	1.77	1.07%	3.44%	9.20%	0.90%	-1.49%	1.45%	13.47%
Total consumption including health insurance				7.32%	0.38%	0.07%		

Notes: See notes to Table 4 and the Data Appendix for details on the measures of consumption and expenditures reported here.

Table 6: Decomposition of Changes in Consumption Inequality

		Unexplained	Explained	
	Total Change	Residuals	Coefficients	Characteristics
1961-1972				
90-10	-0.083	-0.029	-0.077	0.023
		34.8%	92.6%	-27.4%
50-10	-0.075	-0.028	-0.059	0.012
		37.1%	78.5%	-15.6%
90-50	-0.008	-0.001	-0.018	0.011
		13.8%	222.8%	-136.5%
1972-1980				
90-10	0.058	0.053	-0.039	0.045
		90.9%	-67.8%	77.0%
50-10	0.042	0.034	-0.019	0.027
		81.7%	-45.2%	63.4%
90-50	0.016	0.018	-0.020	0.018
		114.6%	-126.8%	112.1%
1980-1990				
90-10	0.034	-0.021	0.030	0.025
		-63.6%	89.5%	74.0%
50-10	-0.021	-0.041	0.003	0.017
		198.1%	-14.0%	-84.2%
90-50	0.055	0.020	0.027	0.008
		35.9%	50.2%	13.9%
1990-2000				
90-10	0.004	0.003	0.001	0.000
		72.0%	18.7%	9.4%
50-10	-0.020	-0.020	0.001	-0.001
		101.5%	-4.3%	2.8%
90-50	0.024	0.023	0.000	0.001
		96.3%	-0.3%	4.0%
2000-2014				
90-10	-0.007	-0.024	-0.004	0.020
		324.6%	47.9%	-272.5%
50-10	0.000	-0.007	-0.007	0.014
		-2201.9%	-2160.2%	4461.7%
90-50	-0.008	-0.017	0.003	0.006
		217.8%	-45.4%	-72.4%

Notes: Data are from the CE survey. These estimates are for log well-measured consumption. See text for more details.

Table 7: Decomposition of Changes in Income Inequality

		Unexplained	Explained	
	Total Change	Residuals	Coefficients	Characteristics
1963-1972				
90-10	-0.070	-0.099	-0.062	0.092
		141.7%	89.2%	-130.9%
50-10	-0.046	-0.064	-0.044	0.062
		139.0%	94.0%	-132.9%
90-50	-0.024	-0.035	-0.019	0.030
		147.1%	79.9%	-127.0%
1972-1980				
90-10	-0.043	-0.069	-0.040	0.066
		159.4%	92.9%	-152.3%
50-10	0.013	-0.004	-0.025	0.042
		-31.7%	-196.5%	328.1%
90-50	-0.056	-0.065	-0.015	0.024
		115.6%	26.5%	-42.0%
1980-1990				
90-10	0.257	0.095	0.132	0.031
		36.8%	51.3%	12.0%
50-10	0.125	0.038	0.064	0.023
		30.3%	51.0%	18.6%
90-50	0.132	0.057	0.068	0.008
		42.8%	51.5%	5.7%
1990-2000				
90-10	-0.034	0.020	-0.073	0.019
		-57.4%	211.4%	-54.0%
50-10	-0.067	-0.036	-0.051	0.020
		54.5%	75.7%	-30.2%
90-50	0.032	0.056	-0.022	-0.002
		173.2%	-68.3%	-4.9%
2000-2014				
90-10	0.142	0.069	0.049	0.024
		48.5%	34.6%	16.9%
50-10	0.061	0.030	0.016	0.014
		50.1%	26.0%	23.9%
90-50	0.081	0.038	0.033	0.009
		47.3%	41.0%	11.7%

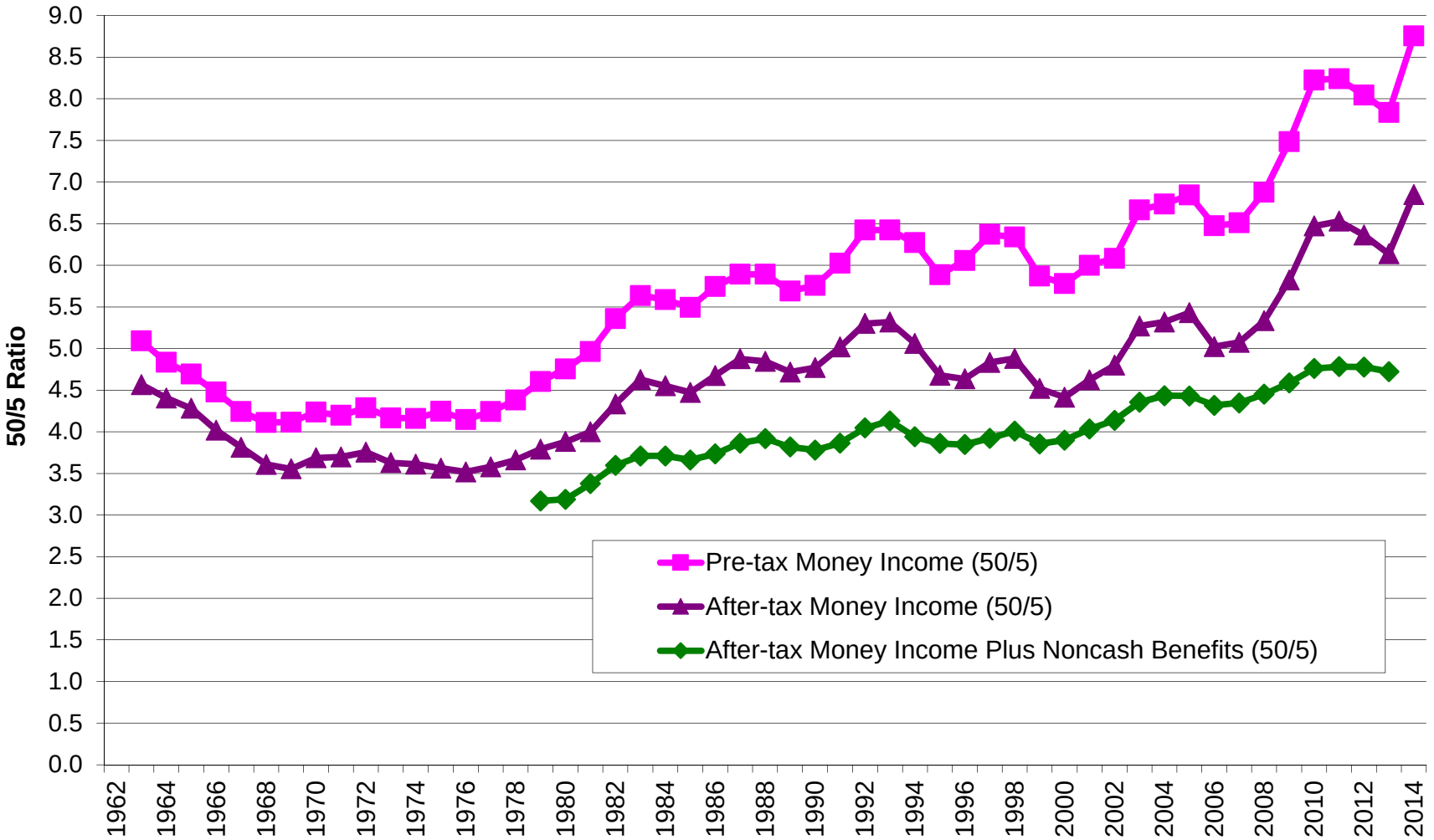
Notes: Data are from the CPS. These estimates are for log after-tax income. See text for more details.

Table 8: Real Well-Measured Consumption Growth, 1991-2014 by Asset Quintile

Year	1991 (1)	2000 (2)	2006 (3)	2010 (4)	2014 (5)	Percent Change: 1991-2000 (6)	Percent Change: 2000-2006 (7)	Percent Change: 2006-2014 (8)	Percent Change: 2006-2010 (9)	Percent Change: 2010-2014 (10)
Total Asset Quintile										
First	18,038	20,162	23,753	26,067	26,114	11.8%	17.8%	9.9%	9.7%	0.2%
Second	20,752	22,620	27,308	25,091	26,929	9.0%	20.7%	-1.4%	-8.1%	7.3%
Third	23,676	27,304	32,343	31,217	33,043	15.3%	18.5%	2.2%	-3.5%	5.8%
Fourth	27,167	32,100	39,636	35,240	38,706	18.2%	23.5%	-2.3%	-11.1%	9.8%
Fifth	34,551	43,267	53,008	51,257	53,696	25.2%	22.5%	1.3%	-3.3%	4.8%

Notes: Data are from the CE Survey. Well-measured consumption includes spending on food at home, rent (for renters), rental equivalent (for homeowners or those in government or subsidized housing), utilities, service flows from owned vehicles, and spending on gasoline and motor oil. See text for more details.The amounts are in 2014 dollars using the adjusted CPI-U-RS, are equivalence scale adjusted and scaled to a 2-adult, 2 child family.

Appendix Figure 1: Income Inequality 1963-2014



Notes: See notes to Figure 2.

Appendix Table A1: Mean Well-measured Consumption and Total Consumption, Sorted by Well-Measured Consumption

	Well-Measured Consumption	Well-Measured Consumption Less Food at Home	Total Consumption	Well-Measured / Total	Well-Measured Less Food / Total
All					
1980	2,407	1,729	4,092	0.588	0.422
2014	3,945	3,210	6,541	0.603	0.491
5th-20th Percentiles of Consumption					
1980	1,264	819	2,115	0.598	0.387
2014	2,148	1,619	3,441	0.624	0.471
Second Quintile of Consumption					
1980	1,887	1,334	3,106	0.608	0.430
2014	3,028	2,381	4,986	0.607	0.477
Third Quintile of Consumption					
1980	2,391	1,729	3,979	0.601	0.435
2014	3,929	3,172	6,567	0.598	0.483
Fourth Quintile of Consumption					
1980	2,941	2,155	4,982	0.590	0.432
2014	5,054	4,180	8,496	0.595	0.492
80th-95th Percentiles of Consumption					
1980	3,747	2,770	6,528	0.574	0.424
2014	6,834	5,767	11,408	0.599	0.506

equivalent (for homeowners or those in government or subsidized housing), utilities, service flows from owned vehicles, and spending on gasoline and motor oil. Quintiles of consumption are for well-measured consumption. All figures are expressed in 2014$ using the adjusted CPI-U-RS, which subtracts 1.1 percentage points from the CPI-U-RS each year from 1960 to 1977 and 0.8 percentage points each year after 1977. See Meyer and Sullivan (2012) for more details on the adjusted CPI-U-RS.

Appendix Table A2: 90/10 Ratios for Consumption and Income, By Family Type, 1961-2014

	Single Parents		Married Parents		Single Individuals		Married no Children		Head Over 65	
	Consumption	Income	Consumption	Income	Consumption	Income	Consumption	Income	Consumption	Income
Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1960-61/1963	3.836	13.324	2.923	4.214	3.697	10.927	2.710	4.640	3.551	6.656
1972	4.218	7.202	2.800	3.623	3.690	7.873	2.735	3.749	3.643	5.682
1973	3.680	6.859	2.710	3.491	3.619	7.169	2.754	3.632	3.904	5.284
1980	3.777	7.216	2.546	3.474	4.819	5.830	2.426	3.198	3.060	4.769
1981	3.618	7.509	2.463	3.562	4.247	6.551	2.356	3.421	3.146	4.905
1982		8.624		3.989		6.732		3.774		5.000
1983		8.743		4.228		7.328		3.714		4.977
1984	3.482	9.060	2.964	4.302	5.257	7.162	2.659	3.870	3.108	5.027
1985	3.550	8.720	3.058	4.247	5.007	6.911	2.632	3.971	3.369	4.977
1986	3.602	9.795	2.885	4.141	4.336	7.222	2.788	3.841	3.065	5.067
1987	3.262	10.592	2.892	4.299	4.031	6.878	2.675	3.925	3.256	5.303
1988	3.668	10.453	2.851	4.294	3.822	6.889	2.643	4.106	3.206	5.263
1989	3.246	11.227	2.947	4.325	3.846	6.829	2.783	4.177	3.376	5.378
1990	3.427	9.704	3.043	4.359	4.237	6.653	2.770	4.089	3.162	5.401
1991	3.357	10.829	2.936	4.325	3.995	6.859	2.887	4.067	3.074	5.126
1992	3.238	11.308	2.931	4.455	3.959	7.380	2.827	4.192	3.204	5.213
1993	3.275	10.712	2.944	4.653	3.735	7.835	2.867	4.488	3.194	5.316
1994	2.901	10.306	2.876	4.420	3.646	7.378	2.893	4.396	3.175	5.067
1995	2.942	10.116	2.982	4.374	3.698	7.230	2.725	4.348	3.190	4.926
1996	3.143	9.565	2.876	4.397	3.906	7.145	2.784	4.349	3.066	5.123
1997	3.166	12.285	2.934	4.345	4.001	7.426	2.831	4.509	2.996	5.390
1998	3.048	11.374	2.966	4.363	3.889	7.528	2.903	4.374	2.965	5.478
1999	3.200	11.324	3.073	4.409	4.171	7.669	2.907	4.668	3.286	5.396
2000	3.074	10.668	3.137	4.351	4.084	7.346	2.877	4.511	3.283	5.326
2001	3.096	13.343	3.107	4.350	4.154	7.750	3.047	4.689	3.317	5.373
2002	3.226	11.489	3.186	4.392	4.284	8.266	3.000	4.574	3.353	5.272
2003	3.135	14.633	3.251	4.597	4.047	9.043	3.147	4.830	3.404	5.548
2004	2.985	13.600	3.198	4.565	3.966	8.985	3.103	4.865	3.257	5.658
2005	3.044	13.798	3.374	4.530	4.072	9.697	3.089	4.863	3.430	5.674
2006	3.059	12.043	3.257	4.515	3.990	8.875	3.138	4.831	3.593	5.703
2007	3.249	11.927	3.128	4.512	3.823	8.482	3.174	4.709	3.311	5.890
2008	2.981	13.418	2.985	4.697	3.800	8.747	2.851	4.999	3.289	5.751
2009	2.981	14.194	2.966	4.617	3.818	10.622	2.914	4.908	3.172	5.677
2010	2.994	14.866	3.033	4.741	3.809	11.753	3.021	4.951	3.259	5.700
2011	2.879	16.545	3.072	4.871	3.683	11.797	2.882	5.285	3.357	5.401
2012	2.996	14.780	3.017	4.816	3.480	10.874	2.913	5.295	3.247	5.793
2013	2.934	14.162	3.021	4.690	3.546	11.642	2.870	5.187	3.414	5.847
2014	2.881	17.004	3.083	4.878	3.584	13.291	2.980	5.478	3.358	6.446
Change:										
1961-1972	9.96%	-45.95%	-4.19%	-14.01%	-0.17%	-27.95%	0.93%	-19.22%	2.59%	-14.64%
1972-1980	-10.44%	0.20%	-9.08%	-4.12%	30.58%	-25.95%	-11.28%	-14.69%	-16.00%	-16.06%
1980-1990	-9.27%	34.47%	19.53%	25.46%	-12.09%	14.12%	14.15%	27.86%	3.32%	13.24%
1990-2000	-10.29%	9.94%	3.07%	-0.19%	-3.61%	10.41%	3.86%	10.33%	3.85%	-1.39%
2000-2014	-6.29%	59.39%	-1.71%	12.12%	-12.24%	80.93%	3.59%	21.42%	2.26%	21.03%
2010-2014	-3.76%	14.38%	1.65%	2.89%	-5.90%	13.08%	-1.34%	10.65%	3.04%	13.08%
1980-2014	-23.72%	135.64%	21.10%	40.40%	-25.63%	127.96%	22.82%	71.29%	9.71%	35.16%
1972-2014	-31.69%	136.10%	10.10%	34.62%	-2.89%	68.81%	8.97%	46.13%	-7.84%	13.45%

Notes: Consumption data are from the CE and income data are from the CPS. Income refers to after-tax money income as defined in Figure 2. Consumption measure is well-measured consumption. All numbers are in 2014 $ using the adjusted CPI-U-RS; are equivalence scale adjusted and multiplied by 2.157, the value of the scale for a 2-adult, 2 child family; and are measured at the family level but are person weighted.

Appendix Table A3: 90/50 Ratios for Consumption and Income, By Family Type, 1961-2014

	Single Parents		Married Parents		Single Individuals		Married no Children		Head Over 65	
	Consumption	Income	Consumption	Income	Consumption	Income	Consumption	Income	Consumption	Income
Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1960-61/1963	1.851	2.738	1.542	1.788	1.674	2.213	1.528	1.798	1.667	2.543
1972	1.871	2.528	1.559	1.736	1.800	2.074	1.581	1.753	1.790	2.376
1973	1.790	2.362	1.578	1.711	1.780	2.072	1.623	1.724	1.848	2.354
1980	1.856	2.299	1.505	1.630	1.824	1.903	1.482	1.603	1.635	2.169
1981	1.750	2.294	1.456	1.643	1.776	1.942	1.472	1.645	1.636	2.215
1982		2.538		1.731		1.952		1.703		2.201
1983		2.528		1.755		2.019		1.726		2.175
1984	1.963	2.570	1.624	1.772	1.846	2.044	1.590	1.739	1.733	2.200
1985	1.857	2.540	1.647	1.786	1.872	2.025	1.562	1.763	1.777	2.179
1986	1.872	2.619	1.622	1.788	1.855	1.987	1.638	1.758	1.707	2.157
1987	1.827	2.696	1.635	1.800	1.872	2.036	1.604	1.722	1.752	2.191
1988	1.931	2.579	1.606	1.835	1.875	2.052	1.585	1.763	1.742	2.274
1989	1.748	2.572	1.709	1.836	1.885	2.043	1.694	1.813	1.873	2.295
1990	1.833	2.466	1.692	1.863	1.895	2.016	1.658	1.793	1.773	2.242
1991	1.923	2.628	1.685	1.835	1.823	2.053	1.715	1.814	1.752	2.206
1992	1.844	2.548	1.707	1.858	1.888	2.060	1.715	1.793	1.762	2.204
1993	1.832	2.490	1.686	1.909	1.865	2.098	1.689	1.834	1.768	2.299
1994	1.712	2.435	1.671	1.890	1.782	2.133	1.655	1.846	1.763	2.247
1995	1.760	2.289	1.702	1.931	1.756	2.164	1.622	1.871	1.795	2.210
1996	1.827	2.245	1.673	1.938	1.832	2.163	1.637	1.859	1.756	2.243
1997	1.818	2.303	1.692	1.952	1.819	2.171	1.707	1.905	1.721	2.327
1998	1.762	2.238	1.733	1.923	1.870	2.128	1.670	1.914	1.711	2.338
1999	1.827	2.316	1.736	1.953	1.906	2.172	1.705	1.926	1.839	2.334
2000	1.793	2.199	1.747	1.945	1.881	2.189	1.703	1.917	1.816	2.309
2001	1.833	2.169	1.767	1.948	1.963	2.202	1.753	1.948	1.873	2.344
2002	1.857	2.085	1.762	1.938	2.006	2.186	1.727	1.931	1.866	2.281
2003	1.891	2.170	1.791	2.001	1.938	2.249	1.750	1.940	1.859	2.407
2004	1.814	2.227	1.750	2.006	1.946	2.229	1.758	1.949	1.836	2.425
2005	1.761	2.204	1.806	2.014	1.949	2.276	1.738	2.009	1.845	2.421
2006	1.773	2.204	1.774	2.018	1.995	2.262	1.771	2.012	1.891	2.440
2007	1.808	2.227	1.745	1.959	1.860	2.199	1.736	1.995	1.859	2.491
2008	1.761	2.213	1.711	2.029	1.905	2.248	1.671	2.001	1.776	2.409
2009	1.729	2.207	1.706	2.034	1.839	2.357	1.693	2.000	1.785	2.377
2010	1.804	2.196	1.715	2.041	1.850	2.333	1.745	1.993	1.753	2.376
2011	1.769	2.182	1.702	2.082	1.847	2.355	1.671	2.043	1.786	2.322
2012	1.775	2.245	1.695	2.053	1.852	2.364	1.639	2.030	1.773	2.416
2013	1.761	2.304	1.720	2.091	1.858	2.413	1.689	2.047	1.810	2.323
2014	1.729	2.222	1.743	2.116	1.832	2.357	1.686	2.057	1.766	2.455
Change:										
1961-1972	1.10%	-7.65%	1.13%	-2.88%	7.54%	-6.27%	3.49%	-2.51%	7.37%	-6.57%
1972-1980	-0.78%	-9.06%	-3.47%	-6.14%	1.35%	-8.23%	-6.29%	-8.58%	-8.66%	-8.72%
1980-1990	-1.25%	7.27%	12.43%	14.32%	3.88%	5.92%	11.91%	11.89%	8.39%	3.40%
1990-2000	-2.17%	-10.82%	3.24%	4.42%	-0.71%	8.59%	2.68%	6.89%	2.43%	2.97%
2000-2014	-3.57%	1.01%	-0.27%	8.78%	-2.63%	7.69%	-0.97%	7.33%	-2.72%	6.32%
2010-2014	-4.13%	1.14%	1.60%	3.69%	-0.98%	1.03%	-3.37%	3.24%	0.76%	3.30%
1980-2014	-6.84%	-3.37%	15.77%	29.85%	0.42%	23.86%	13.80%	28.37%	8.01%	13.20%
1972-2014	-7.56%	-12.13%	11.75%	21.88%	1.78%	13.67%	6.64%	17.35%	-1.34%	3.33%

Notes: See notes to Table A1.

Appendix Table A4: 50/10 Ratios for Consumption and Income, By Family Type, 1961-2014

	Single Parents		Married Parents		Single Individuals		Married no Children		Head Over 65	
	Consumption	Income	Consumption	Income	Consumption	Income	Consumption	Income	Consumption	Income
Year	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1960-61/1963	2.073	4.867	1.896	2.357	2.209	4.939	1.773	2.581	2.130	2.617
1972	2.254	2.849	1.796	2.087	2.051	3.796	1.730	2.139	2.035	2.391
1973	2.056	2.903	1.718	2.040	2.033	3.459	1.697	2.106	2.112	2.245
1980	2.035	3.139	1.692	2.132	2.642	3.063	1.638	1.996	1.871	2.199
1981	2.067	3.273	1.691	2.169	2.391	3.373	1.601	2.079	1.922	2.215
1982		3.397		2.304		3.448		2.216		2.272
1983		3.459		2.409		3.630		2.151		2.288
1984	1.774	3.525	1.825	2.428	2.848	3.504	1.672	2.225	1.793	2.285
1985	1.912	3.433	1.856	2.378	2.675	3.413	1.686	2.252	1.896	2.284
1986	1.924	3.740	1.778	2.316	2.338	3.634	1.702	2.185	1.795	2.349
1987	1.785	3.929	1.769	2.388	2.153	3.378	1.668	2.280	1.858	2.420
1988	1.899	4.054	1.775	2.340	2.039	3.357	1.668	2.330	1.840	2.314
1989	1.857	4.365	1.724	2.356	2.041	3.342	1.643	2.304	1.802	2.343
1990	1.869	3.935	1.798	2.340	2.236	3.300	1.670	2.280	1.784	2.409
1991	1.746	4.120	1.742	2.357	2.191	3.341	1.683	2.242	1.755	2.323
1992	1.755	4.438	1.717	2.398	2.097	3.582	1.648	2.338	1.818	2.365
1993	1.787	4.301	1.746	2.438	2.003	3.734	1.697	2.447	1.806	2.312
1994	1.694	4.233	1.721	2.339	2.047	3.460	1.748	2.381	1.801	2.255
1995	1.672	4.420	1.753	2.265	2.106	3.341	1.680	2.324	1.777	2.229
1996	1.720	4.261	1.719	2.269	2.132	3.303	1.701	2.340	1.746	2.284
1997	1.741	5.335	1.734	2.226	2.200	3.421	1.658	2.367	1.741	2.316
1998	1.730	5.083	1.711	2.269	2.080	3.537	1.739	2.285	1.733	2.343
1999	1.752	4.890	1.770	2.257	2.188	3.531	1.705	2.424	1.787	2.312
2000	1.714	4.851	1.795	2.236	2.171	3.356	1.689	2.354	1.808	2.307
2001	1.689	6.150	1.758	2.233	2.116	3.519	1.738	2.407	1.771	2.292
2002	1.738	5.511	1.808	2.266	2.136	3.782	1.736	2.369	1.797	2.312
2003	1.658	6.743	1.815	2.297	2.088	4.021	1.798	2.490	1.831	2.305
2004	1.646	6.107	1.828	2.275	2.038	4.030	1.765	2.496	1.774	2.333
2005	1.728	6.260	1.868	2.249	2.090	4.261	1.778	2.420	1.860	2.344
2006	1.726	5.464	1.837	2.237	2.000	3.923	1.772	2.401	1.899	2.338
2007	1.797	5.356	1.793	2.303	2.055	3.857	1.828	2.360	1.781	2.364
2008	1.692	6.064	1.744	2.314	1.995	3.891	1.707	2.499	1.851	2.387
2009	1.724	6.432	1.738	2.270	2.076	4.506	1.721	2.454	1.777	2.389
2010	1.660	6.768	1.769	2.323	2.059	5.037	1.731	2.484	1.859	2.399
2011	1.627	7.582	1.805	2.339	1.994	5.010	1.725	2.587	1.880	2.326
2012	1.688	6.584	1.780	2.346	1.879	4.601	1.777	2.608	1.831	2.398
2013	1.666	6.147	1.756	2.244	1.909	4.825	1.699	2.534	1.887	2.517
2014	1.666	7.654	1.769	2.305	1.956	5.638	1.767	2.663	1.901	2.626
Change:										
1961-1972	8.76%	-41.47%	-5.26%	-11.46%	-7.16%	-23.13%	-2.47%	-17.14%	-4.45%	-8.63%
1972-1980	-9.74%	10.17%	-5.81%	2.15%	28.85%	-19.31%	-5.32%	-6.68%	-8.04%	-8.04%
1980-1990	-8.12%	25.36%	6.31%	9.75%	-15.37%	7.74%	2.00%	14.27%	-4.68%	9.52%
1990-2000	-8.30%	23.28%	-0.16%	-4.42%	-2.92%	1.68%	1.15%	3.22%	1.38%	-4.23%
2000-2014	-2.82%	57.80%	-1.44%	3.08%	-9.87%	68.01%	4.61%	13.13%	5.12%	13.84%
2010-2014	0.38%	13.09%	0.04%	-0.78%	-4.97%	11.93%	2.10%	7.18%	2.26%	9.46%
1980-2014	-18.12%	143.87%	4.61%	8.13%	-25.95%	84.05%	7.93%	33.44%	1.58%	19.40%
1972-2014	-26.10%	168.68%	-1.47%	10.45%	-4.59%	48.51%	2.18%	24.52%	-6.59%	9.80%

Notes: See notes to Table A1.