

**Recent Trends in U.S. Top Income Shares in Tax Record Data Using More
Comprehensive Measures of Income Including Accrued Capital Gains**

Jeff Larrimore *
Richard V. Burkhauser **
Gerald Auten †
Philip Armour ‡

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* Federal Reserve Board, 20th St. and Constitution Avenue, Washington, DC 20551 USA.
jeff.larimore@frb.gov

** Cornell University, the University of Texas at Austin, and the University of Melbourne,
rvb1@cornell.edu;

† U.S. Treasury Gerald.Auten@treasury.gov

‡ RAND Corporation parmour@rand.org.

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Abstract

Access to IRS personal income tax records improves researchers' ability to track U.S. income and inequality, especially at the very top of the distribution (Piketty and Saez 2003). However, rather than following standard Haig-Simons income definitions, tax form income measures were designed to implement the Internal Revenue Code. Using IRS tax record data since 1989 statistically matched to Survey of Consumer Finances and Census data for income sources not available in tax data, we explore the robustness of levels and trends in inequality using the top income literature's tax return market income definition (Saez 2016) to more comprehensive income measures. We find that focusing solely on market income misses the important redistributive effects of government taxes and transfers. In addition, we find that the use of taxable realized capital gains changes the level and trend in top incomes relative to an accrued capital gains measure that is more consistent with Haig-Simons income definitions.

An important new international literature (Atkinson, Piketty and Saez 2011) based on personal income tax return data has focused on the share of income held by top income groups and how it has changed over time. Piketty and Saez (2003) were the first to use Internal Revenue Service (IRS) personal income tax record data to track U.S. levels and trends in income and its distribution in this way. These administrative records offer substantial advantages over survey-based data with respect to their sample size, high response rates, and lower recall bias.

However Federal individual income tax rules and forms are intended to implement the Internal Revenue Code and are not necessarily comparable with the income definitions economic researchers prefer to measure income.¹ Atkinson, Piketty, and Saez (2011, p.34) in their review of the results of research based on tax record data state that: “In all cases, the estimates follow the tax law, rather than a ‘preferred’ definition of income, such as the Haig-Simons comprehensive definition, which includes such items as imputed rent, fringe employer benefits, or accruing capital gains and losses.”

Unless supplemented with such data from other sources, researchers using IRS tax return data will miss any non-taxable income that does not appear on IRS tax forms. Particularly relevant for research on top income shares, while tax record based researchers sometimes include a measure of taxable realized capital gains as an alternative for accrued capital gains, we will show that doing so not only misses capital gains that are not taxed but also fails to reflect the year in which these realized capital gains were accrued. As a result the use of taxable realized capital gains will dramatically alter levels and trends in the share of income held by the top 1 percent relative to a measure using accrued capital gains.

¹ The U.S. income tax can be (or has been) described as a hybrid tax that is a combination income tax, consumption tax and gross receipts tax in its various provisions.

This paper explores the impact of how income is defined on levels and trends in top income shares. Using income tax records from the IRS Statistics of Income, with a statistical match to Survey of Consumer Finances (SCF) and March Current Population Survey (CPS) data for income sources that cannot be observed in IRS data, we consider the extent to which trends in top 1 percent income shares differ when using a narrow tax return based income definition compared to a broader income definition more in the spirit of Haig-Simons income principles.

This research makes several substantial advancements relative to previous research that considered how using more comprehensive income definitions influence inequality trends (see e.g. Burkhauser, Larrimore, and Simon 2012; Armour, Burkhauser, and Larrimore 2014; Smeeding and Thompson 2011).

First, by starting with income tax data from the IRS, rather than survey based data, we are able to capture the trend in the top 1 percent income shares using our broader income definitions and compare them directly to the top 1 percent income shares from Piketty and Saez (2003) that focus on market income from tax returns.² By contrast, most previous research considering the impact of income definitions on inequality trends have exclusively used survey data which is less able to track the top of the income distribution.

Second, we include estimates of accrued gains on housing based on individual-level property values from property-tax records and data on local level housing appreciation. Doing so provides a more accurate assessment of the capital gains from housing than previous research, which either used national level estimates or ignored capital gains from housing (see, e.g. Armour, Burkhauser and Larrimore 2014; Piketty, Saez and Zucman 2016). To our knowledge,

² Researchers using survey-based data have typically avoided consideration of the top 1 percent income share due to concerns about the coverage of the survey data at the top of the distribution as well as topcoding of data to protect the confidentiality of high income respondents. For additional information on these limitations of survey-based data for considering top income shares, see Atkinson, Piketty, and Saez 2011 and Burkhauser et al. 2012.

this is the first paper to consider how capital gains from local level housing price trends impact broader measures of income inequality such as top income shares.

When evaluating distributional trends using our broader income measure with our improved estimate of housing capital gains, we observe important differences from those observed using just income as it appears on income tax returns. Most notably, while Saez (2016) and others using tax data including taxable realized capital gains find that top income shares fell during the early years of the Great Recession, we find they dramatically increased using our accrued capital gains measure which fully captures the collapse of the housing market in 2008 and its disproportionate negative consequences for the American middle class.

2. Defining Income

Recognizing that the choice of income definition may influence income trends, what is the most appropriate way to measure income? The traditional view in the economics literature is that an ideal income definition would capture the total inflow of resources that individuals receive for their potential personal consumption in a year, regardless of who provides the income or the form it takes. This principle underlies the Haig-Simons income definition, which states that individuals' yearly income is equal to their consumption plus the change in their net wealth in that year. (see Auerbach 1989 and Barthold 1993 for discussions of the Haig-Simons income approach). On the income side of the Haig-Simons equality, this implies that income should include any consumable resources flowing to individuals in a given year. This not only includes before tax cash income but also in-kind employee benefits and accrued capital gains. It also recognizes the importance of government taxes and transfers by including cash and in-kind government transfers and netting out government taxes.

Despite general agreement that the comprehensive Haig-Simons income measure is the gold standard for defining economic income, by necessity most researchers base their choice of income definition on data availability. For example, some researchers using IRS tax records data limit their analysis to pre-tax, pre-transfer income of tax units since non-taxable sources of income are not included in these data (Piketty and Saez 2003). Similarly, researchers using March Current Population Survey (CPS) data typically include transfer income, but may exclude in-kind transfers, taxes, and all capital gains – all of which are not captured in CPS data (see, e.g. Burkhauser, Feng, Jenkins, and Larrimore 2011; Gottschalk and Danziger 2005).

One of the more important aspects of measuring comprehensive incomes in the spirit of Haig-Simons is the appropriate treatment of capital gains and returns to asset wealth. There are four major approaches to handling these returns to capital income used in the literature: ignoring all capital gains (Aguiar and Bils 2016, Burkhauser, Larrimore, Simon 2012, Proctor, Semega, and Kollar 2016), including capital gains at realization as they appear on tax returns (Congressional Budget Office 2016, Piketty and Saez 2003), distributing corporate retained earnings in lieu of capital gains (Piketty, Saez, and Zucman 2016), and distributing capital gains as they accrue (Smeeding and Thompson 2011, Armour, Burkhauser and Larrimore 2014).³

The first of these approaches – ignoring all capital gains – almost certainly understates incomes, particularly among higher income individuals and homeowners who may have substantial capital income. Yet it is the dominant way income is measured in the income and poverty survey-based literatures. The second – including capital gains at realization – is convenient since tax returns offer high-quality data on realized capital gains on taxable assets

³ While not directly addressing capital gains, a fifth, less common, approach to incorporating income from wealth is to include the imputed annuitized value of wealth holdings with income regardless of whether that wealth generates any income (Wolff and Zacharias 2009). This approach is useful for considering the inequality of potential consumption in a year, but systematically overstates the income of all individuals with a positive savings rate. This overstatement occurs because under this measure saved income is included in both the year it is earned and in all subsequent years until it is spent. Since this approach reflects a hybrid of income and wealth rather than just annual income, we do not consider it further here.

(see, e.g. Piketty and Saez 2003; Saez 2016). However, as described in Armour, Burkhauser, and Larrimore (2014), many realized capital gains are never reported on tax returns, including most gains from primary housing, those occurring in certain tax deferred accounts, and those on assets held until death. Furthermore, the realized capital gains that do appear on tax returns are often not reported until years or even decades after they were accrued. This, in turn, impacts both the observed level of capital gains and the timing of their receipt.

The third approach – distributing retained earnings to shareholders – has been used by researchers attempting to align individual incomes with national accounts (Piketty, Saez and Zucman 2016). This approach is advantageous for its alignment with some national accounts measures. But since it only distributes current year corporate incomes to individuals, rather than the value of a corporation based on its projected future earnings as reflected in stock prices, this method fails to fully capture capital income that occurs based on investors’ perceptions of a corporation’s economic potential. As a result it does not necessarily reflect the change in the price that investors could sell their asset for on the open market in any given year. Additionally, simply distributing retained earnings will result in substantially lower levels of observed long-run capital income than is observed in asset prices.⁴

The final approach– to capture capital gains as they occur in each year – is most consistent with Haig-Simons income principals and is the method that we employ in this paper. Including capital gains at accrual, rather than at realization, is commonly cited as a preferred approach for measuring capital gains (see e.g. Slemrod 2016, Smeeding and Thompson 2011, Roine and Waldenström 2012, Veall 2012, Atkinson, Piketty and Saez 2011), although data

⁴ This can be observed by comparing the accrued capital gains revaluation series in the Bureau of Economic Analysis’ (BEA) Integrated Macroeconomic Accounts (Table S.3.a) to the undistributed corporate profits series in the BEA’s National Income and Product Accounts (Table 1.12). From 1989 through 2013, the BEA reported \$8.2 trillion in corporate retained earnings, compared to \$15.9 trillion in accrued capital gains from equities going to households and non-profits serving households along with another \$2.4 trillion in accrued gains from mutual funds going to these groups (Bureau of Economic Analysis 2016a, 2016b).

availability often limit its implementation. Including capital gains at accrual is the approach specified by the System of National Accounts, the international standard for national accounting (European Commission *et al.* 2008), and capital gains are similarly included in this way in the Integrated Macroeconomic Accounts produced by the Federal Reserve Board and Bureau of Economic Analysis (Bond, Martin, McIntosh, and Mead 2007).

While many researchers agree that accrued capital gains is conceptually preferable for measuring income over realized capital gains, a major limitation of this approach is the lack of accrued capital gains data. As a result, researchers using this approach must impute accrued capital gains on each of the assets held in household wealth portfolios. Smeeding and Thompson (2011) do so by assuming that all assets receive the long-run average return for the asset class and Armour, Burkhauser, and Larrimore (2014) assume that all assets receive the current-year return for the asset class. The advantage of the Smeeding and Thompson approach is that it smooths the substantial year-to-year variance in accrued capital gains. Nevertheless, doing so is inconsistent with the Haig-Simons principal since it systematically overstates capital gains in years where actual rates of return are low and understates them in years when actual rates of return are high. The analysis in the current paper builds off of the Armour, Burkhauser, and Larrimore (2014) method, which more closely captures accrued capital gains each year. However, we present a new approach to measuring gains on owner-occupied housing that substantially improves upon prior approaches for imputing housing incomes, as will be discussed further in Section 4. Because of the regional differences in the housing bubble and crash over the last 15 years, this new approach provides a more accurate and nuanced picture of the pattern of these gains. Throughout this paper, we focus on key income metrics from the inequality literature. We consider two base-income measures and three treatments of capital gains.

The first income measure is *tax return income*, which includes labor earnings and non-labor market income such as small business income, farm income, taxable and tax-exempt interest, dividends, rents, royalties, and taxable and non-taxable Social Security benefits. This is a broader income measure than the *tax return market income* measure used by Piketty and Saez (2003) and Saez (2016) in that it includes the non-market income sources that appear on IRS tax returns: specifically Social Security benefits, and unemployment insurance. It also differs by adding back the foreign earned income exclusion and by deducting gambling losses from gambling winnings for those who itemize (reflecting that net gambling winnings are a more accurate reflection than gross gambling winnings for this form of income). In addition, alimony paid and state and local tax refunds (which adjust for over-deduction of taxes in the prior year) and net operating losses carried over from prior years are also removed as they do not reflect current year net income. Finally, to reflect that business expenses are part of the cost of generating income rather than pure consumption, we exclude from income the net employee business expenses that appear on tax returns.⁵

The second income measure, *comprehensive income* includes all elements of *tax return income* but also includes federal income and payroll tax credits or liabilities along with major cash transfers, in-kind transfers, and in-kind benefits that do not appear on tax returns. The untaxed cash transfers include workers compensation, supplemental security income, public assistance income, child support income, and other financial and educational assistance as captured in the March CPS. The in-kind transfers and benefits we include are the ex-ante value of employer- and government-provided health insurance, food stamps, housing subsidies, and

⁵ These expenses are only observed to the extent that they exceed 2 percent of AGI income. While we would exclude all employee business expenses from income irrespective of this threshold, we cannot observe any such expenses for those whose net employee business expenses are less than 2 percent of AGI. As a result, to avoid treating someone whose net employee business expenses are just above the 2 percent threshold and someone whose expenses are just below the threshold dramatically differently, we only remove from income the portion of employee business expenses that are above the threshold and are reported on the tax return.

school lunches. This measure does not include imputed rents as part of income, although the impact that including imputed rents to bring comprehensive income even closer to the Haig-Simons income definition is explored in the appendix.

For each of these income measures, we also evaluate the impact on top income shares of using the three distinct capital gains treatments described above: excluding capital gains completely, including taxable realized capital gains, and including all capital gains at accrual.

3. Differences between taxable realized capital gains and accrued capital gains

Taxable realized capital gains and accrued capital gains differ in several important respects. Taxable realized capital gains measures gains at the point when an asset is sold, rather than at the point the asset appreciates in value. Thus, if an investor purchases an asset in 1990 for \$10,000, which appreciates to \$40,000 by the year 2000, but remains largely flat thereafter until it is sold in 2010, the \$30,000 gain would appear on the investor's 2010 tax return even though virtually all the investment returns accrued in the 1990s.⁶ This both delays the timing of when the gains appear in the data and can also result in an artificial increase in observed inequality when multiple years of capital gains from an asset are bunched into a single year. The 2007 IRS Sale of Capital Assets data, shows that 97 percent of realized capital gains in 2007 were on assets held over one year and over 40 percent were on assets held for over a decade (Table 1). In contrast, accrued capital gains include the change in asset values in the year that the asset appreciates (or depreciates), which better reflects the timing of gains. This may, however, result in an increase or decrease in capital gains in any given year relative to realized gains, depending

⁶ This example follows the investment return of the S&P 500 over this period. \$10,000 purchased in 1990 would have been worth \$39,991 in 2000 and worth \$38,086 in 2010. Consistent with how capital gains appear on tax forms, these values are in nominal dollars and are not adjusted for inflation.

on the actual rate of return on assets as well as the level of capital gains realizations.

A second difference between the series is that taxable realized capital gains exclude important classes of capital gains. First, it excludes all realized capital gains occurring in tax-preferred accounts. In the case of IRA returns, these gains are deferred from appearing on tax returns until retirement when the funds are withdrawn from the account. In the case of Roth-IRA returns, the capital gains never appear on tax returns. It also excludes all realized capital gains on assets which are held until death, at which time the cost-basis of the asset adjusts to the value at death so decedents owe no capital gains on the asset upon the sale (except for gains occurring after the death). Furthermore, taxable realized capital gains exclude most capital gains on housing assets. Current tax laws exclude the first \$250,000 of capital gains on one's primary residence (\$500,000 for married couples) from tax and from reporting on tax returns. Since the median sales price on existing homes sold in August 2016 was \$240,200 (National Association of Realtors 2016), the vast majority of capital gains on housing are excluded from tax returns.⁷ In addition, taxpayers can exclude 50% (100% of new investment starting in 2010) of up to \$10 million of qualified business stock gains held at least 5 years and meeting various requirements. The exclusions for these asset classes lower the observed levels of capital gains captured as realized taxable capital gains in the tax record data, although the precise impact on the measure of the top 1 percent's income shares depends on where in the distribution these non-observed assets are held.

A third limitation of taxable realized capital gains is that the full value of net capital gains

⁷ Complicating long-term trends in taxable realized capital gains from housing is the changes to housing capital gains treatment from the Tax Reform Act of 1997. Prior to 1997, housing capital gains were subject to taxation if the seller did not purchase a new home of equal or greater value within two years, although because of the rollover of gains into new homes relatively few gains on housing were taxed. There also was a once-per-lifetime housing capital gains exclusion of \$125,000 for individuals who were age 55 or older. Cunningham and Engelhart (2008) and Shan (2008) describe these changes and discuss their impact on homeowner mobility.

are included in Adjusted Gross Income (with the exception of those on certain tax-preferred assets) while net capital losses are excluded to the extent that they exceed \$3,000.⁸ These capital losses may be carried forward to offset future capital gains but may not offset ordinary income. For housing assets, these capital losses (like housing capital gains) are never observed. This is particularly important during the Great Recession and its aftermath, when middle-class families who sold or experienced a foreclosure on their houses may have incurred substantial capital losses.⁹ The taxable realized capital gains series will miss this aspect of the recession.

Finally, a fourth limitation of taxable realized capital gains is that realizations are sensitive to the capital gains tax rate, which impacts the willingness of investors to sell appreciated assets and realize the gain (for example, Dowd, McClelland and Muthitacharoen 2012 estimate a long-run tax elasticity of realized capital gains of -0.79). This is particularly important in the 2000s, when capital gains marginal tax rate in the EGTRRA and JGTRRA tax reforms in 2001 and 2004 lowered the maximum tax rate for long term capital gains from 20.17 percent in 2001 to 15.7 percent in 2007. It can also be observed in 2013 when the large increase in the top capital gains rate (from 15% to 23.8%) caused an acceleration of realized gains from 2013 into 2012 (US Department of Treasury 2016). As a result, observed realized capital gains, and the top 1 percent income shares, will be sensitive to the behavioral responses of capital gains realizations to tax policies.¹⁰

Accrued capital gains have neither missing asset class concerns, missing capital loss

⁸ Realized capital losses in excess of the loss limit are fully reported on Schedule D, but are not carried to the 1040.

⁹ A portion of this debt may be observable in tax data using the 1099-C, which is the debt written off by lenders in foreclosure. However, this would only capture a small subset of all capital losses and to our knowledge no researchers have attempted to incorporate these losses into realized capital gains calculations.

¹⁰ Realized long-term capital gains also increased after 1993 when the top rate on ordinary income increased and in 1997 when the top capital gains tax rate was reduced from 28 to 20 percent. While occurring before the starting point of our analysis, substantial changes to the capital gains tax rate in the 1986 Tax Reform Act also influenced the timing of capital gains realizations. Auten, Splinter, and Nelson (2016) discuss taxpayer reactions to these changes in tax legislation, including shifting of income to minimize tax liabilities.

concerns, nor concerns regarding behavioral responses of realizations to tax policies. When considering accrued capital gains, gains or losses on all assets are included, although at the time the asset appreciates in value rather than when the asset is sold. However, since assets fluctuate in value from year to year, accrued capital gains do exhibit greater volatility than is seen for taxable realized capital gains. As such, top income shares when including accrued capital gains also exhibit higher levels of volatility.

4. Data

The primary data in this paper are from the Individual Tax Files from the IRS Statistics of Income division. These data are used directly for capturing tax return income (including wages, taxable and tax-exempt interest, dividends, self-employment and small business income, pension and retirement income, unemployment income, and Social Security income), taxable realized capital gains, and federal income and payroll tax liabilities of tax filers.

Although administrative tax return data is valuable for its high sampling rates at the top of the income distribution, it does not observe non-filers or capture all the income sources of those who do file. Adjustments and addition to the base tax data are made to address these concerns as follows.

A. Non-filers and dependent filers

Recognizing that not all individuals file a tax return, we incorporate non-filers by following the approach of Piketty and Saez (2003). They, and we, estimate the total number of

potential U.S. tax units each year based on Census Bureau survey data.¹¹ We also follow their assumption that the market income of non-filers is 20 percent of the mean market income of filers in each year.¹² Although this approach does not yield an actual distribution of non-filers in the population, over 80 percent of non-filers have income under \$50,000 (Cilke 2014) and it is generally believed that virtually all non-filers are well below the 90th percentile of income. Therefore, for measuring top income shares, assuming that non-filers are below the 90th percentile threshold, rather than knowing their full distributional characteristics, is sufficient to identify the number of non-filers and the total income they receive.

While we generally follow Piketty and Saez (2003) in our treatment of non-filers, we diverge with respect to non-resident filers, dependent filers and other filers who are under age 20. Piketty and Saez include these tax returns in the same way as all other tax filers, although based on the potential tax unit definition they are not included as potential tax units. This creates the unusual result in 2007 where (as a result of increased filing for stimulus payments), there are more tax units who file a return than there are potential tax units. To correct for this concern, we drop non-resident filers and dependent filers who are under age 20 from the sample prior to calculating results and adjust the estimated number of tax units by the number of dependent filers age 20 and over (primarily full-time college students).

B. Cash and in-kind transfers not reported on tax returns

¹¹ Under our approach, each single individual or married couple age 20 or older in the United States represents one potential tax unit, which roughly matches the definition from Piketty and Saez (2003) and Burkhauser et al. (2012). Tax units represent individuals who file a tax return together, and potential tax units represent individuals who either file together or would be expected to file together if they file a return. This should not be confused with households or families, which are common units of aggregation in survey-based research (see, e.g. Burkhauser, Larrimore, and Simon 2012, Bricker et al. 2016, and Larrimore et al. for discussions of these differences and their impacts on distributional statistics).

¹² While we follow the non-filer imputation of Piketty and Saez (2003), Auten and Splinter (2016) observe that this may understate the true income of non-filers and that their income levels are closer to 30 percent of the mean income of filers in each year. Increasing the imputed income for non-filers would decrease the observed top income shares in all years.

To incorporate income beyond that which appears on tax returns, we integrate data from the Internal Revenue Service, other administrative agencies, the Census Bureau's March Current Population Survey, and the Federal Reserve Board's Survey of Consumer Finances.

Social Security benefits of filers are captured directly on tax forms (including Form 1099-SSA). To incorporate the benefits of non-filers, we compare the total Social Security payment outlays reported by the Social Security Administration to the total reported on tax forms by filers, and assign the residual to the non-filing population.

Cash and in-kind transfers that are not reported on tax forms are added to the dataset using a statistical match to CPS data. Since tax units are not delineated in the CPS data, we divide households into tax units following the guidelines from Piketty and Saez (2003) for estimating potential tax units described above and in the data appendix.¹³ For each tax unit in the CPS data, we then determine their centile in the taxable income distribution, average their in-kind transfer income from each source for that centile of the distribution, and assign that in-kind transfer income to tax units in the IRS data in the same centile. Recognizing that major transfers, including health insurance provided through Medicare, are correlated with the respondent's age, when imputing their value for each tax unit we split the sample into those under- and over-age 65 prior to computing income centiles. Hence, for matching to the CPS data each individual's in-kind incomes are taken from the CPS data based on their centile within the income distribution of those in the same age class. As a result, respondents over age 65 have substantially higher estimated Medicare benefits than those under age 65. When incorporating these in-kind incomes, we follow the approach of Burkhauser, Larrimore, and Simon (2012) and CBO (2016) and assign

¹³ Similar guidelines have also been previously used to estimate tax units in the CPS data by Armour, Burkhauser, and Larrimore (2014) and Burkhauser, Larrimore, and Simon (2012), and Burkhauser et al. (2012).

tax units the full ex-ante value of employer and government provided health insurance.¹⁴

C. Accrued Capital Gains

Perhaps the most important addition to the tax data is the estimates of accrued capital gains for each tax unit, including the accrued gains from housing which is the primary financial asset for many families. The procedure used for estimating accrued gains builds off of the methods of Armour, Burkhauser, and Larrimore (2014), who estimated accrued capital gains as the product of the underlying value of each asset at the start of a period and the rate of return from that asset class. This approach builds off of the gross capitalization technique for relating wealth to the income it generates used, which has also been used by Piketty, Saez and Zucman (2016), Saez and Zucman (2016) and Smeeding and Thompson (2011).¹⁵

With respect to estimating annual accrued gains for owner occupied housing, it is important to take into account the diverse experiences of different regions and local areas with respect to the trends and timing of changes in home prices. Since home equity accounts for a large part of wealth holdings for many tax units, tracking changes in accrued capital gains and losses from housing is potentially important in measuring income over the time period of our data. In this paper, for what to our knowledge is the first time, we do so by taking advantage of the property tax deduction information available in the income tax data.

¹⁴ Based on the observation of Finkelstein, Hendren, and Luttmer (2015) that only 20 to 40 percent of the welfare benefits of Medicaid accrue to beneficiaries, some have argued that a more appropriate method for valuing health insurance benefits is to value them at 20 to 40 percent of their ex-ante value. Since Finkelstein, Hendren, and Luttmer's (2016) estimate comes in large part due to the uncompensated care that uninsured individuals receive, were an adjustment for this care to be included, we believe that it would be more appropriate to add the value of this uncompensated care to those without insurance than to subtract its value from those with Medicaid or Medicare. Were we to add a value of uncompensated care for the uninsured to our income definition, it would reduce the top 1 percent income share further relative to that reported here. Were we to only value Medicaid and Medicare at 20 to 40 percent of the ex-ante value, it would increase the top 1 percent income share from that reported here.

¹⁵ One concern with this approach is that those with higher incomes may be more knowledgeable or skilled at investing and therefore receive a higher rate of return. However, Saez and Zucman (2016) provide evidence that high income individuals do not, in fact, receive higher rates of return on their assets than those farther down in the distribution.

To calculate housing capital gains, we start by estimating the market value of houses among homeowners. We first estimate the ratio of property tax payments to home market values in each county using the county-level property tax and home values from the 1990 and 2000 Decennial Census and the American Community Survey since 2005 (The property tax ratios since 2005 using the ACS are from Harris and Moore 2013).¹⁶ This may differ from the statutory property tax rates in local areas to the extent that the assessed values of homes for property tax purposes do not match current market values as reported in the surveys.

For any tax units who file a tax return and itemize their deductions – which comprises the vast majority of high income taxpayers – we then multiply the property tax payments that they report on their tax return by the home value to property tax ratio for their county to obtain an estimate of the market value of their specific home. In order to further improve coverage for taxpayers who remained in the same zipcode over 3 or 4 years, and for whom property tax information is missing for the middle year, we also interpolate their property taxes based on the surrounding years and use that property tax estimate for estimating their home value. Since this approach uses information derived from the specific valuation of their house (property tax payments) along with the local level information on how these values relate to properties in their area of residence, it provides a more accurate assessment of home values than can be obtained using national level information.

While this approach provides improved estimates of home values for itemizers, it does not pick up the universe of homeowners since not all homeowners file a tax return and not all tax filers itemize their deductions. However, nearly all taxpayers in the top centiles itemize their

¹⁶ Recognizing that the market value of homes to property taxes paid within a county is relatively flat over time except for when the property tax rates are changed by state or local legislators, we use a weighted average of the closest observed years to determine this ratio in the intermediate years between the 1990 and 2000 Decennial Census and between the 2000 Decennial Census and the start of the American Community Survey in 2005. This procedure is modified for two states that had major school finance reforms that resulted in substantial decreases in the mid-decade. In these cases, the ratio from the two bounding decennial Census are used on each side of the reform.

deductions (96 percent of the top 1 percent in 2007), so the individuals for whom property-tax records are missing are almost exclusively outside of the top centiles of the distribution. In order to capture the market value of owner occupied homes for non-filers and non-itemizers, we observe the difference between aggregate home values captured among itemizers using the approach above and the aggregate home values reported by the Bureau of Economic Analysis' Integrated Macroeconomic Accounts (IMA). This residual home value is then distributed among non-itemizing tax units.¹⁷

Having estimated the current market value of houses owned by each tax unit, the accrued capital gains from housing for itemizers is then calculated by multiplying the home value by the home price appreciation rate from CoreLogic for their county of residence.¹⁸ For non-itemizers and non-filers, since we do not know which specific tax units are the homeowners to use local-level price trends, we use the national-level home price appreciation rate from CoreLogic. This, in turn, provides our best estimate of the capital gains from housing in each year among those who own a home.

For accrued capital gains from publicly traded and private business investments, the approach is similar. Following the procedure used by Armour, Burkhauser, and Larrimore (2014), accrued gains on investments build off of wealth data from the Survey of Consumer Finances (SCF).

A strong predictor of whether individuals have any business investments, which would generate capital gains, is whether they have any dividends, rents, or business income. Each tax unit is grouped based on whether they have neither of these types of income, just dividends (over

¹⁷ The precise distribution among the non-itemizers will not impact results unless the home values in this group are sufficiently concentrated to push individuals into, or out of, the top 1 percent of the distribution.

¹⁸ Not all counties have sufficient sales volume for CoreLogic to compute a county-level home price index. In these cases, the state level appreciation rate is used.

\$100), just rents/ business income (over \$500 in absolute value), or both. Within each group, they are then arrayed into centiles of their total income. For each centile within each of the four groups, the publicly and privately traded business assets are estimated to be the average holdings of individuals in the SCF data at the same point in the group-level income distribution.¹⁹

For each asset class, we then impute the rate of return based on the average return of that asset class in the given year. For stocks, we do so using the rate of return of the S&P 500 in the specified year. For private business wealth, we use the implied rate of return on non-corporate business equity from the revaluations series in the IMA.²⁰

Since the Survey of Consumer Finances is a triennial survey, in order to produce annual results the distribution of assets in non-survey years was estimated using a weighted average of the previous and subsequent survey. The rate of return for these intermediate years, is still the actual return from the specified year from the S&P 500 and IMA data.

5. Results

A. Trends in tax return income with and without capital gains

In Figure 1, we start by comparing the top 1 percent income shares of tax units for our tax return income series to the top 1 percent tax return market income shares that are observed by Piketty and Saez (2003), both with and without taxable realized capital gains. The inclusion of

¹⁹ The SCF organizes individuals into Primary Economic Units (PEU), which may consist of one or more tax units. As a result, in 2013 there are approximately 122 million PEUs, compared to 162 million tax units. Prior to computing the average asset holdings of those at each point in the distribution, it is necessary to split PEUs into tax units – which we do evenly throughout the income distribution.

²⁰ The Integrated Macroeconomic Accounts provides the revaluations of several asset classes, including nonfinancial noncorporate equity. These revaluations are similar in concept to our annual accrued capital gains. To determine the implied rate of return, we take the ratio of revaluations from nonfinancial non-corporate equity in each year to the prior-year end of year total asset value from nonfinancial noncorporate equity. This approach is a divergence from the rate of return for private business wealth assumed by Armour, Burkhauser, and Larrimore (2014) who used the S&P 500 for private wealth as well. Because the IMA implied return on non-corporate business equity was lower in the late 1980s than S&P returns for publicly traded businesses, using the IMA return lowers the top income shares using this approach at the early years in our period and makes top income share growth more positive. Results using the S&P 500 rate of return for private business wealth instead would show slower top income share growth.

all income sources that appear on tax returns, including Social Security and Unemployment Insurance as well as the other refinements described above result in top income shares that are between 1 and 2 percentage points lower in most years – both when excluding and including taxable realized capital gains.²¹

Considering the top income share trends for these baseline series, the top 1 percent income share for tax return income increased over the two-business cycles prior to the start of the Great Recession with or without the inclusion of taxable realized capital gains.²² However, as was observed previously by Piketty and Saez, the level of top incomes and its growth is accentuated when including taxable realized capital gains in the calculation. From the business cycle peak in 1989 to the peak in 2007 before the Great Recession, the top 1% share of taxable income without capital gains rose by 5.7 percentage points. In contrast, when including taxable realized capital gains, the top 1% share of taxable income rose by 9.1 percentage points. Thus, reflecting the importance of capital gains, over one-third (3.4 percentage points) of the 9.1 percentage point increase in top 1 percent income shares can be attributed to increases in the realized capital gains of those at the top of the income distribution.

During the Great Recession in 2008 and 2009, the top 1 percent income shares for these series fell – particularly when including taxable realized capital gains. But the trend then reversed and top 1 percent income shares rose through 2012 before falling again in 2013 when

²¹ When we only use the sources of income from the tax records that Piketty and Saez (2003) use in their tax return market income series, we are able to nearly perfectly replicate their top 1 percent income shares series shown in Figure 1, so this difference can be fully attributable to the fuller income measure and corrections to the tax record sample, rather than other methodological differences.

²² Throughout the paper, for the analysis of the period before the Great Recession we focus on the 1989 and 2007 business cycle peaks. This is, in part, because 1989 is the first year for which SCF data is available. However, since 1989 and 2007 are both peaks of business cycles, this comparison is also advantageous as it allows us to consider long-run trends in top income shares while avoiding conflating the comparison with business cycle effects.

capital gains tax rates were increased.²³

As discussed above, however, taxable realized capital gains are a poor reflection of both the level and timing of capital gains. Therefore, in Figure 2 we consider how our top income shares series differ if we incorporate gains in the year that they are accrued rather than in the year they are realized and reported on tax returns. To do so, we once again show our tax record income series with no capital gains and with taxable realized capital gains from Figure 1. To better show how housing versus investment gains impact top income share trends, we add them in two steps. We first add accrued capital gains from investments in publicly traded corporations and privately held businesses to our no capital gains series (dashed line with triangles) and then add the accrued capital gains from housing in a subsequent step (solid line with triangles).

Considering first the longer-term trend over the two full business cycles before the Great Recession (1989 to 2007), the growth in top 1% income shares using capital gains in the year they are accrued is slower than the growth found using taxable capital gains in the year that they are realized. This is the case irrespective of how inclusively accrued gains are measured. The top 1% income share including taxable realized capital gains rose by 9.1 percentage points from 1989 to 2007. Using our most inclusive accrued gains measure – which includes accrued gains from public investments, private business, and housing – the increase in the top 1 percent income share was just over 60 percent as large, rising by 5.5 percentage points from 1989 to 2007.

Both this longer-term trend, as well as the short-run fluctuations in it, are partially driven by the strength of the equities markets at any given time that result in increases or decreases in

²³ Ahead of the 2013 increase in both ordinary and capital gains top rates and the new 3.8 percent tax on net investment income, the highest income taxpayers – who were the only ones effected – shifted ordinary income and accelerated the realization of capital gains into 2012 (Auten, Splinter, and Nelson 2016, Saez 2016). This produced a spike in 2012 in the top 1 percent income share based on ordinary income or including realized capital gains. This can be seen in Appendix Table A1, as realized capital gains increased by 60 percent in 2012 and then decreased by over 20 percent in 2013. In contrast, stock prices increased by 30 percent in 2013 compared to only 13 percent in 2012. In 2014, Saez (2016) reports that the top 1 percent share increased, although not back to the level observed in 2012.

capital gains accruals. For example, the increase in the top 1 percent income share in 1995 corresponds with a 31 percent increase in the S&P 500 in that year, which was followed by continued strength in the equities market for much of the late 1990s (See Appendix Table A1). Similarly, the increase in top income shares in 2003 through 2005 resulted from strength in the rate of return on public equities in 2003 and on privately held businesses in 2004 and 2005. Overall, the average nominal return on the S&P 500 was 13 percent in the 1980s and 16 percent in the 1990s, it was only 1 percent in from 2000 through 2007. This decline in the rate of return on public equities reduces the growth in top income shares over the period coming from accrued capital gains when it is not offset by strength in other assets held by the top of the distribution such as privately held businesses (as was seen in 2004-2005). After a 38.5 percent decline in 2008, the equities market has been quite strong since 2009, with an average annual return on the S&P 500 of nearly 16 percent per year, which explains the more recent increases in the top 1 percent income share.

In addition to more accurately reflecting the timing of when capital gains are received, this series also includes capital gains from housing, which are almost completely absent from the taxable realized capital gains series. Since housing is the main asset of many tax units outside of the top income centiles, incorporating these gains into the income definition reduced the level of top income shares when housing values were increasing in the early 2000s (this can be observed by comparing the series with just capital gains from public and private investments to the most inclusive series that includes housing capital gains as well). But, even in 2007, when housing values began to decline, the top 1 percent income share is below that observed when only taxable realized capital gains are counted and its increase over the two business cycles since 1989 is slower than that observed when using taxable realized gains.

However, while incorporating accrued capital gains from housing mitigates the growth in top income shares prior to the Great Recession, using this more inclusive capital gains definition results in an enormous spike in top income shares during the first year of the Great Recession and accentuates the growth in top income shares during the recovery. The decline in top income shares that had previously been observed for the taxable realized capital gains series in 2008 came primarily from the decline in taxable realized gains among those at the top of the distribution. But it missed the scope of capital losses throughout the distribution, including the capital losses from housing. As seen in Appendix Table A2, these capital losses amounted to \$8.1 trillion (compared to tax return income excluding capital gains of \$8.5 trillion and compared to total comprehensive incomes excluding capital gains of approximately \$8.3 trillion). Because of the unprecedented scale of the capital losses in 2008 that almost completely counterbalanced national income from other sources in that year, once including accrued losses we observe that top income shares exhibited an enormous spike in 2008. In particular, the top 1 percent share of tax return income with our full measure of accrued capital gains was over 100 percent in 2008. In other words, the net income of many taxpayers was actually negative in 2008 because their capital losses were greater than their income from other sources. However, while the top 1 percent income share exhibited a dramatic spike in that year, we emphasize that this does not mean that very high income individuals were exempt from these capital losses. Since centiles of the distribution are always based on the income measure evaluated, the observed spike also reflects a reshuffling of who is in the top 1 percent of the distribution relative to that seen in the series with no capital gains since some individuals who have high tax return incomes

experienced substantial capital losses which caused them to drop out of the top 1 percent.²⁴

The spike in top income shares in 2008 proved to be a single-year event, as the income shares drops back to 17.1 percent in 2009. But in subsequent years of the economic recovery stock prices recovered more rapidly than house prices. As a result, the assets of those at the top of the distribution (as well as others with significant investment assets) recovered faster than the investments of those in the middle of the distribution (housing assets). As a result, in 2013 the top 1 percent income share using our accrued capital gains measure was at its highest point other than that seen in 2008, slightly exceeding their income share in the early 2000s. Notably, in 2013 when the top income share using taxable realized capital gains fell due to artificial timing shifts in realizations to avoid the tax increases and 3.8 percent net investment income tax that began in 2013 (Auten, Splinter and Nelson 2016, Saez 2016), when using the accrued capital gains series the top income share continued to rise – which reflects the continued strength of the rate of return on public and private business investments.

B. Trends in comprehensive income with and without capital gains

While tax return income is useful for understanding the distribution of income as captured by the tax code – including that from labor market and investment activities - it presents an incomplete picture of the full distribution of resources to Americans beyond just its incomplete treatment of capital gains. This is because cash and in-kind transfers that do not appear on tax returns, along with in-kind employer benefits and tax credits and liabilities, are important components of resources for many tax units even though they do not show up in

²⁴ This issue reflects a broader challenge with measuring income shares for a single year. Auten, Gee, and Turner (2013) for example, observe that in any given year only about two-thirds of those in the top 1 percent of the income distribution on tax returns are also in the top 1 percent in the following year. Since Auten, Gee, and Turner (2013) focus on taxable realized capital gains rather than accrued capital gains, the rates of persistence that they observe will likely differ from those using our measures. In 2008, in particular, persistence of the top 1 percent from the prior year and subsequent year are likely lower using our accrued gains series due to the magnitude of the accrued losses.

income as observed on tax returns. In addition, tax credits including the EITC, the Child Tax Credit, the 2008 stimulus rebate, the 2009 and 2010 Making Work Pay Credit and homebuyer tax credit, the 2011 and 2012 payroll tax holiday, and the American Opportunity Tax Credit all have material impacts on the financial resources of their recipients.

Figure 3 illustrates the impact of including taxes, transfers, and in-kind benefits on the top 1 percent income share, excluding capital gains. Using a more inclusive income definition lowers the top 1 percent income share and slows its growth. Reassuringly, progressive taxes and transfers mitigate income inequality to some degree. The top 1 percent share in 2013 was 17.4 percent based on the Piketty-Saez narrower tax return market income definition (excluding capital gains). As observed previously in Figure 1, including other pre-tax cash income that is captured on the tax return lowers this share to 15.9 percent. When broadening the income definition even further by including taxes, in-kind transfers, and non-taxable cash transfers, it lowers the top 1 percent income share in 2013 to 11.3 percent. Thus, even before evaluating the impact of capital gains, using a more comprehensive income measure reduces the top 1 percent income share in 2013 by 6.2 percentage points relative to the Piketty-Saez income measure and by 4.6 percentage points relative to the tax return income measure.

Just as important as its impact on levels is the impact that including additional income sources has had on the trend of top incomes. Using only tax return income (excluding capital gains), the top 1 percent income share increases by 5.7 percentage points between over the two business cycle period between 1989 and 2007. Using our comprehensive income definition, the growth over the two business cycles prior to the Great Recession is slower than that for tax return income (and slower still than the growth in top income shares for market income seen in Figure 1) – increasing by only 3.4 percentage points from 1989 through 2007. Top income shares

over the period from 2007 through 2013 fell by 1.7 percentage points from 2007 through 2013 using the more comprehensive income measure.

While top income shares are now lower, the impact of each of the potential capital gains treatments on our comprehensive income series is substantively similar to that observed previously when we added capital gains to tax return income. Adding taxable realized capital gains to comprehensive income (Figure 4), increases the level of inequality as well as its growth over time. Adding capital gains at accrual also increases the level of top income shares in most years relative to the no capital gains series. But, using accrued capital gains rather than taxable realized capital gains results in a slower growth from 1989 through 2007 in the top 1 percent income share. Using our preferred income measure – comprehensive income with accrued capital gains from all sources including housing – the top 1 percent income share only rose by 2.7 percentage points from 1989 through 2007.²⁵

While observed inequality growth is slower in the two business cycles prior to the Great Recession when using accrued gains rather than realized taxable gains, we again see that at the start of the great recession the top 1 percent income share increases sharply in 2008 due to our better ability to capture capital losses, including those from housing, with this measure. Once again, this reflects the fact that when measured at accrual the capital losses in 2008 exceeded income from other sources for many taxpayers.

Finally, looking at more recent years, we observe a steady growth in the top 1 percent share of our most comprehensive income measure during the economic recovery since 2009. The

²⁵ Although the inclusion of accrued capital gains from housing brings our income measure closer to the Haig-Simons measure than that seen in earlier research, Haig-Simons also includes the imputed rents from owner occupied houses (reflecting the rent that would have been generated from the home were the individual to rent it out rather than live in it). Few distributional researchers have included these imputed rents in their income measures, with Piketty, Saez, and Zucman (2016) being a notable exception – although they do not also include capital gains from housing. Since the Haig-Simons measure suggests that both of these income flows should be incorporated. In Appendix Figure 1 we add an estimate of imputed rents to our comprehensive income measure including accrued capital gains. Doing so reduces the top 1 percent income share by approximately one-half percentage point in most years. However, in 2008 when including imputed rents the top 1 percent share still increases sharply but not to the same extent as is observed when excluding imputed rents from the income measure.

18.6 percent top 1 percent income share using this series in 2013 is the highest of any year since 1989, other than spike-year 2008. However, despite the increase in the share of comprehensive income going to the top 1 percent, this 2013 level of the top 1 percent share is still below the 22.8 percent share observed by Piketty and Saez in 2012 and the 20.0 percent top income share that they observe in 2013 as reported in Figure 1. Hence, when considering the full 24 year period for which we have data, using a more comprehensive income measure results in lower levels of top income inequality in most years and slower inequality growth than was previously believed from 1989 through 2007, but more rapid inequality growth from 2007 through 2013.

6. Conclusion

Researchers are using Internal Revenue Service (IRS) tax record data to trace U. S. levels and trends in income and its distribution. Yet for the most part studies using these data have not addressed the sensitivity of their results to the income sources they measure. When we compare the top income shares found in the Piketty-Saez tax return market income series to those for tax return income and comprehensive post-tax, post-transfer income including in-kind income – but excluding capital gains – we see that top income shares are generally lower and rise at a slower pace when using these broader income definitions. This provides evidence that the tax and transfer system along with the inclusion of in-kind benefits have equalizing effects on the observed distribution of incomes.

The more substantial impact on top income share levels and trends, however, comes from using a capital gains measure that is more closely related to Haig-Simon income principals for measuring economic income. Under the most common approach of using taxable realized capital gains, we observe – as others have – that top income shares rose substantially over the two

business cycles prior to the Great Recession (from 1989 through 2007) before falling in the early years of the Great Recession.

In contrast, when incorporating capital gains on assets that do not appear on tax returns and more closely aligning capital gains with when they are earned using our Haig-Simon based accrued gains measures, top income share growth during the two business cycles leading up to the Great Recession was slower. But the contrast between a taxable realized capital gains series and our series including accrued capital gains is even more clearly shown during the Great Recession and its aftermath. During the initial year of the Great Recession, using accrued gains more fully encapsulates the magnitude of the recession, as the capital losses from equities, private businesses, and housing in that year more than offset income from other sources for many tax units. This observation results in an enormous spike in the top 1 percent income share in that year that is not observed in a taxable realized capital gains series. Additionally, during the economic recovery from 2009 through 2013 – which exhibited particular strength in the equities markets – the top 1 percent share increased by more than previously observed using a taxable realized capital gains series.

These divergences suggest that in the unsettled question of the place of capital gains in the income literature, it is not sufficient to simply focus on the question of *whether* to include capital gains but if so, *how* to include them. Only by including capital gains as they accrue, and incorporating capital gains and losses that do not make it onto tax records, are we able to fully observe the experience of tax units within and outside the top 1 percent of the income distribution during the Great Recession.

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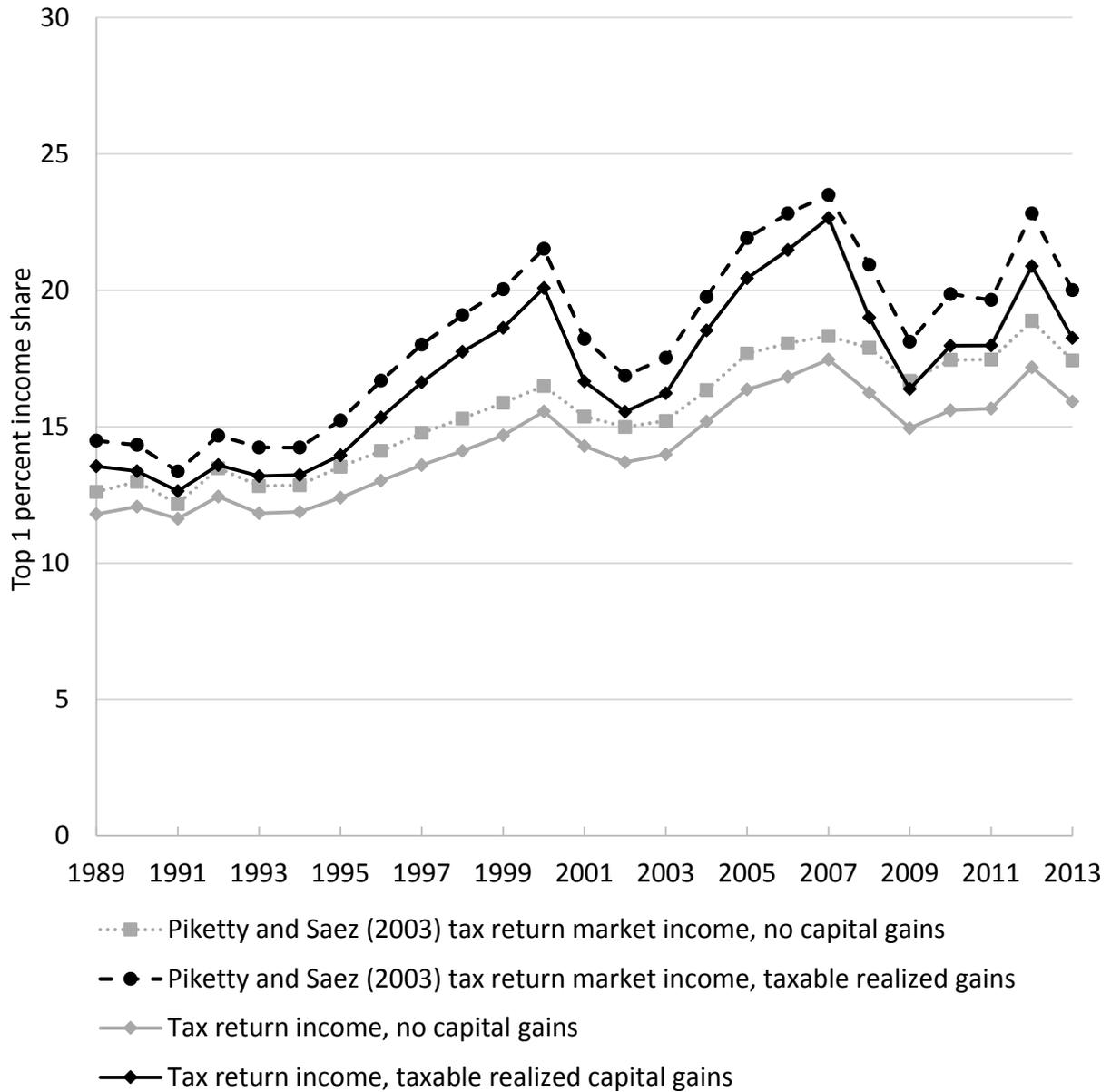
Table 1: Realized Capital Gains in 1997 through 2007, by length of time holding the asset before sale

Holding period	Percent of realized capital gains
less than 1 year	2.8
1 to 2 years	13.3
2 to 5 years	21.2
5 to 10 years	19.6
10 to 20 years	23.4
20 years or more	19.8

Source: IRS Sale of Capital Asset data, 1997 to 2007 (Schedule D)

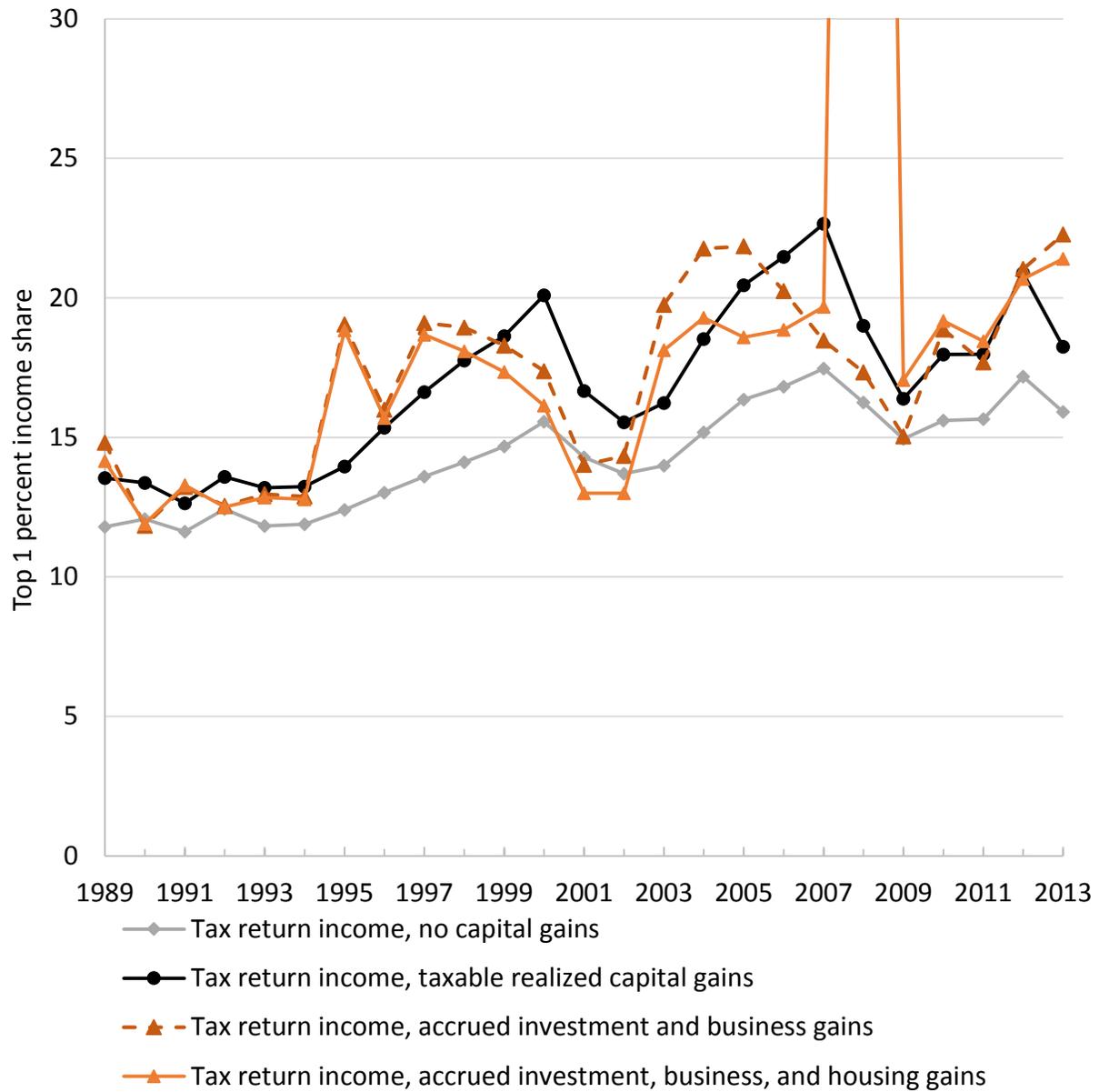
Note: Short-term gains of unknown holding period are included as less than one year. Long term gains with unknown holding period are excluded.

Figure 1: Top 1 percent income share for tax return income with and without realized taxable capital gains



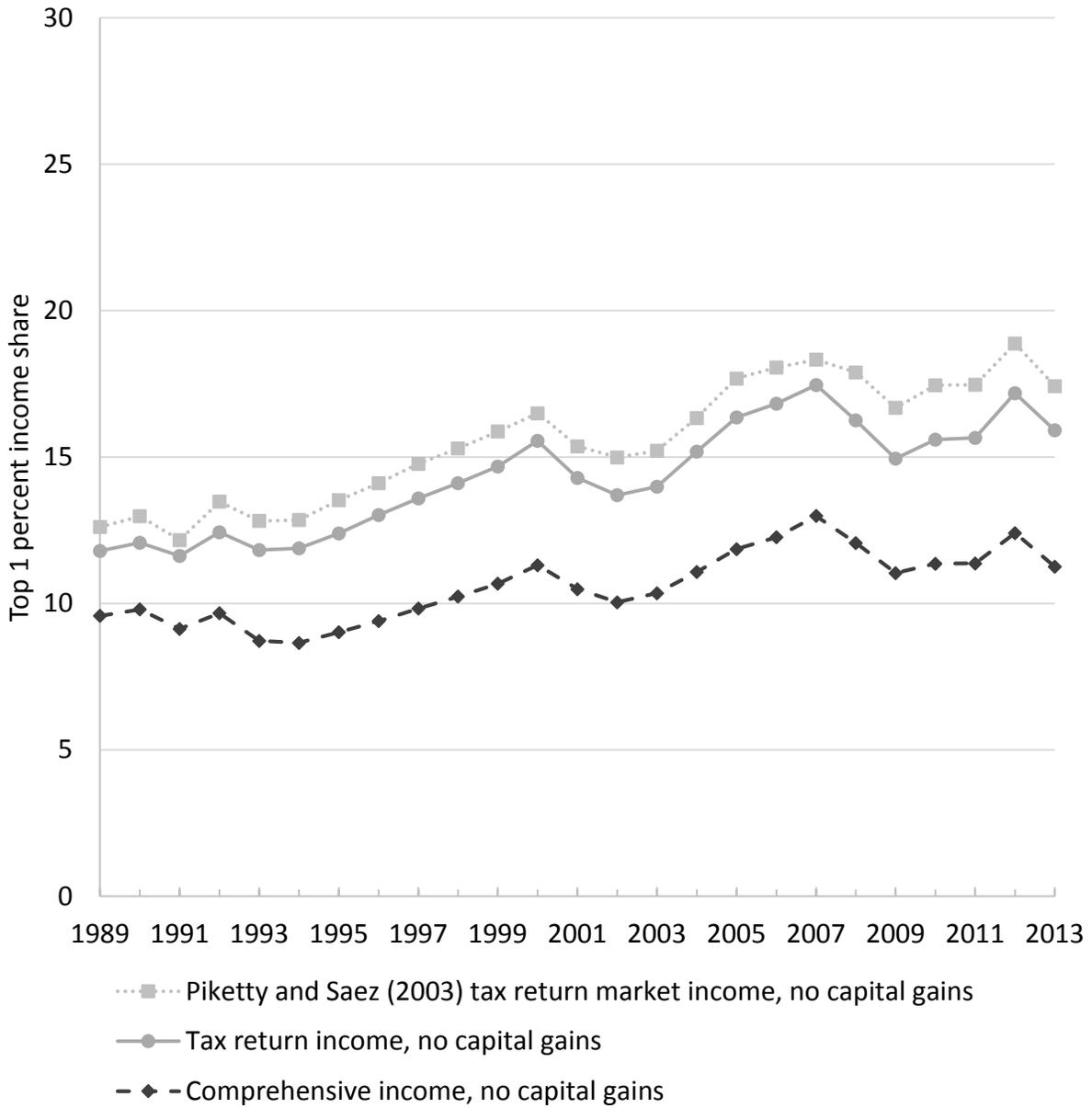
Source: Piketty and Saez (2003) and authors' calculations using IRS tax return data

Figure 2: Top 1 percent income share for tax return income with various treatments of capital gains



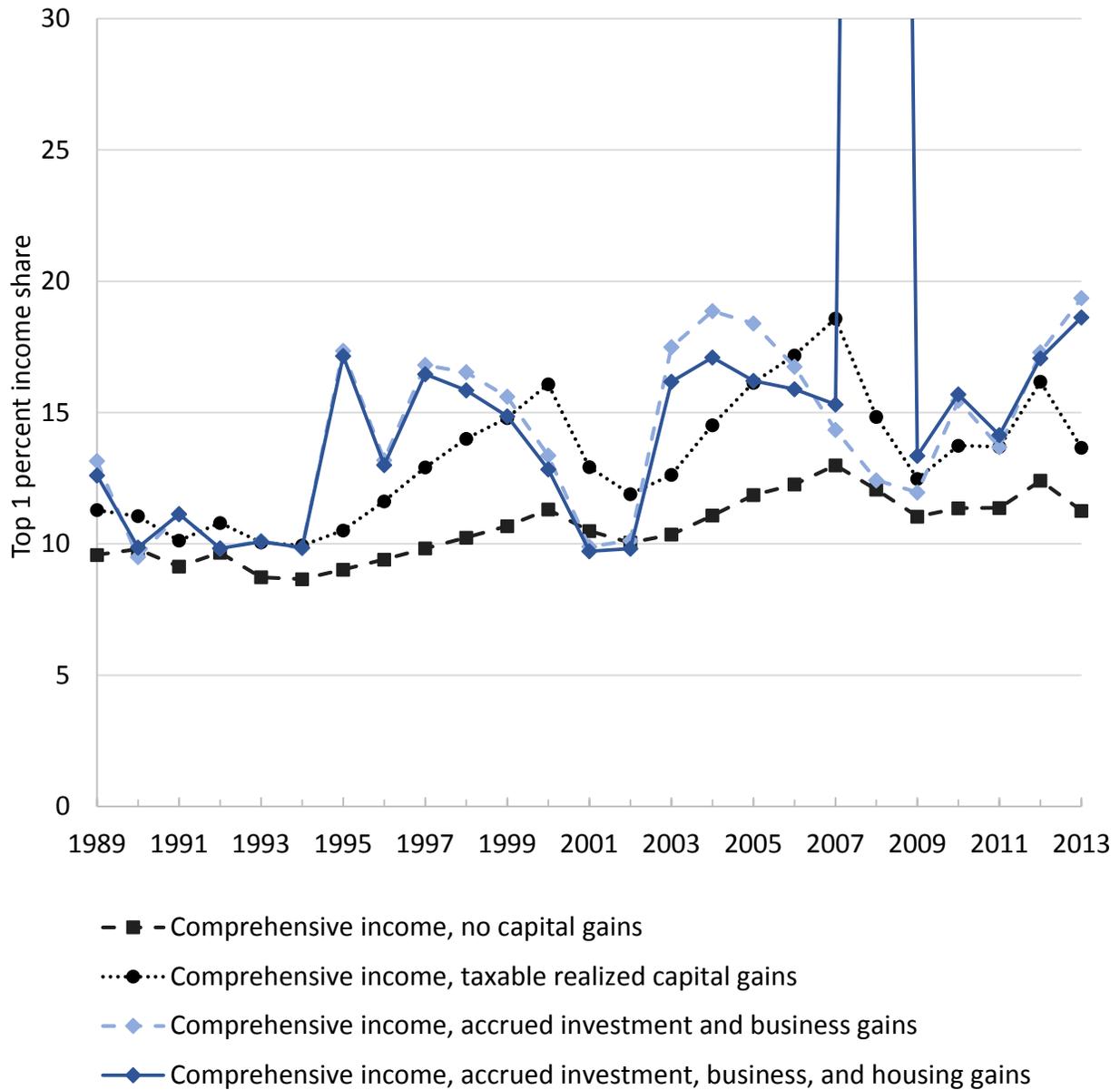
Source: Authors' calculations using IRS tax return data, the Survey of Consumer Finances, the American Community Survey, and the Decennial Census.

Figure 3: Top 1 percent income share for various income definitions, excluding capital gains



Source: Piketty and Saez (2003) and authors' calculations using IRS tax return data and the March CPS.

Figure 4: Top 1 percent income share for comprehensive income with various treatments of capital gains



Source: Authors' calculations using IRS tax return data, the Survey of Consumer Finances, the American Community Survey, and the Decennial Census.

Data Appendix

1. Determining the population of tax units and the number of non-filers

The total number of tax units for this paper starts with the number of potential tax units in each year from Piketty and Saez (2003) and their subsequent updates. This count is based on Census Bureau data of the total number of individuals or married couples who are over the age of 20. The Census resident population of the United States includes people whose usual residence is in the 50 states and the District of Columbia and does not include members of the Armed Forces overseas, their dependents, or other U.S. citizens residing outside the United States. We then remove from the total count of potential tax units the dependent filers who are over age 20, since they do not represent independent entities. As a result, in each year we have somewhat fewer tax units than is observed by Piketty and Saez.

The total number of tax units that file a return in each year is the total number of non-dependent resident tax filers who submit a return covering the specific income year. This approach differs from that taken by Piketty and Saez in three ways. The first is that this approach removes tax filers who report their residence as being outside of the United States. The second is that it removes all dependent filers from the data whereas Piketty and Saez include them. However, while we remove all dependent filers, removing those under age 20 does not impact the total number of (filing plus non-filing) tax units under their definition since these young dependent filers were not counted as potential tax units in their Census based population count.²⁶

The third way in which our count of the number of filing tax units differs from Piketty and Saez is that we focus on the year in which income is received rather than the year in which the tax return is filed. For example, if an individual files their tax return for income year 2000 in the spring of 2002, we treat this return as reflecting their 2000 income whereas the data that Piketty and Saez use will consider this income with the other returns filed in 2002 that reflect 2001 incomes (the calendar year prior to filing). Additionally, if the same taxpayer files an amended return in the spring of 2003, then their income from 2000 would appear in the data used by Piketty and Saez twice. We correct this problem by reassigning late filed returns to the income year for which the income was reported and use only the most recent tax return submitted.

The number of non-filing tax units in each year reflects the residual between the total number of non-dependent tax units for that year and the total number of non-dependent tax units who file a return.

2. Incorporating non-taxable income sources for comprehensive income

Most income of tax units is determined based on the incomes reported on annual tax return forms, such as the Form 1040. However, there are several cash and in-kind transfers and employee compensation which do not appear on tax returns but are captured by the Census Bureau's March Current Population Survey (CPS). The cash income items that are included in the March CPS but not the IRS data are public assistance income (such as AFDC/TANF),

²⁶ The problem with dependent filers under age 20 is particularly notable in 2007, when there were more tax returns filed – including dependent filers – than there are potential tax filers under the Piketty and Saez (2003) approach.

supplemental security income, child support, education and financial assistance income, veteran's income and worker's compensation. The in-kind resources which we value at market value and include with income are food stamps, school lunches, housing assistance, Medicare, Medicaid, and employer provided health insurance (See Burkhauser, Larrimore, and Simon 2012 for a broader discussion of the decision to value health insurance resources at their market value).

To incorporate these additional sources of income into the comprehensive income measure, we first construct tax units in the CPS data using the approach described in the main text, whereby all individuals over age 20 and their spouses are considered separate tax units (along with any dependent children that they may have who are under age 20). These tax units are then split into two groups based on whether any individual in the tax unit is over age 65. The split by age is intended to recognize that several of these items, such as Medicare, are substantially more prevalent among older adults. Within the two age groups, the tax units are then arrayed based on their income (incorporating only those components which appear on tax returns) and split into 100 centiles based on their position in the income distribution within their age group. A similar procedure is undertaken on the IRS side as well, to create centiles of the income distribution within the two age groups in the tax data.

Using the March CPS, we compute the mean value of each income source that does not appear in the tax data for each centile of the population within the two age groups. This mean value is then assigned to individuals in the same centile and age group in the IRS data and added to the resources of that tax unit when computing comprehensive income.

3. Determining asset values for use in accrued capital gains calculations

A. Housing Values, itemizers

Among taxpayers who itemize their taxes, estimates of home values start with line 6 of Schedule A of the IRS 1040 – the deduction for real estate taxes paid. Recognizing that some individuals may not itemize every year, for individuals who remain in the same zip-code for 3 consecutive years and itemize in years $t-1$ and $t+1$, but not in year t , their real estate tax payments in year t are assigned the average of their real estate tax payments in the two adjoining years. The real estate tax is interpolated for individuals who fail to itemize for two years but remain in the same zipcode all four years. After these adjustments, taxpayers who remain in the same zipcode are assumed to have the same amount of real estate tax for up to three additional years. While this procedure may slightly understate the tax paid, it provides a close approximation and helps identify additional home-owners.

To convert real estate tax payments to home values, we use self-reported property tax payments and home values from the Decennial Census (1990 and 2000) and from the American Community Survey (ACS) (2005 through 2013). In these surveys, respondents report the

estimated market value of their house as well as the property tax payments.²⁷ Using these data, we compute the ratio of the average property value to the average property tax payment for each county using the following approach:

(1) For years since 2005, when ACS data is available, the ratio of property values to property tax payments is taken from the analysis by Harris and Moore (2013) of county level property taxes using this data. Not all counties have data available using the one-year ACS, so a hierarchical approach is taken, where one-year ACS data is used for counties where it is available, if the one-year ACS data is not available for a county then the three-year data is used, and if the three-year ACS data is not available then the five-year data is used. When multi-year ACS data is used for a county, the value-to-tax ratio for a year is the multi-year estimate with a midpoint closest to the year of interest.

(2) For the two Decennial Census years (1990 and 2000), the ratio of property values to property tax payments is computed using the IPUMS public use microdata sample. Since IPUMS data does not report the county, we compute the property tax and property values at the PUMA level and then calculate the county level result as the population-weighted average of overlapping PUMAs using the PUMA-County crosswalk files from the Missouri Census Data Center.²⁸

(3) For years between decennial census years the ratios in each county are computed as the weighted average of the two decennial censuses – so the ratio for a county in 1991 will equal 90 percent of the ratio from that county in 1990 plus 10 percent of the ratio from that county in 2000. Similarly, for years between the 2000 decennial census and the start of the ACS data in 2005, the ratio for each county is computed as the weighted average between the 2000 decennial census and the 2005 ACS.

The county-level ratios of home values to property tax payments are then assigned to each zip code (since zip codes are reported on tax forms whereas counties are not) using the county-zip crosswalk file from the Department of Housing and Urban Development.²⁹ In the case where a zip code includes multiple counties, the zip code is assigned the results from the county in which the largest fraction of the zip code's residents reside.

Individual-level property values are then computed as:

$$Value_{i,t} = Tax_{i,t} * \frac{\overline{Value}_{county,t}}{\overline{Tax}_{county,t}}$$

²⁷ For the Decennial Census, property tax payments are reported in ranges, and we use the mid-point of each range and 1.5 times the topcode value (4,500 in 1990 and 9,100 in 2000) for the highest category. We similarly assign topcoded property values (above 600,000 in 1990 and above 1 million in 2000) 1.5 times the topcode threshold.

²⁸ http://mcdc.missouri.edu/allabout/geo_pumas.shtml

²⁹ https://www.huduser.gov/portal/datasets/usps_crosswalk.html

where $Value_{i,t}$ is the taxpayer-level home value for itemizers in year t , $Tax_{i,t}$ is the taxpayer-level property tax payment in year t , $\overline{Value}_{county,t}$ is the county-level average home value in year t , and $\overline{Tax}_{county,t}$ is the county-level average property tax payment in year t .

This approach for valuing houses using the individual level property tax payments and the county level home value to property tax ratio uses an assumption that even if different counties assess properties in different ways, within a county there is general uniformity in the relationship between property taxes and home value. There are two notable ways in which this assumption could fail. The first is if counties offer tiered property tax rates, such as exempting a fixed dollar amount of property values from taxation. This would result in low-priced homes paying lower property taxes than would be seen if all homes were taxed at the mean rate for the county. As a result, our approach will underestimate the value of low cost homes in these areas and overestimate the value of high cost homes in these areas. The second way in which this assumption could fail is when counties fail to have horizontal equity in their property tax rates. The most notable example of this occurs in California, where Proposition 13 limits restricts the magnitude of reassessments except when a sale or construction occurs. As a result, a long tenured homeowner will typically have a lower tax bill than one who purchased their home more recently – even if the market value of the two homes is identical. Our approach for valuing homes using property taxes in this case will result in an overestimate of the value of homes of new homeowners (whose property taxes are above the mean for a home with their value) and will underestimate the value of homes for long-term homeowners.

Each of these limitations will not impact the total estimated home value in a county, but will impact who is estimated to have higher value homes. To the extent that it results in an underestimate or overestimate of home values of taxpayers in the top 1% of the distribution, it could therefore result in an underestimate or overestimate of our top income shares. However, despite this limitation, we believe that this approach – and the potential error that it introduces – is superior to the alternative approach for estimating home values based purely on one’s position in the income distribution, which can similarly result in an underestimate or overestimate of top income shares. Estimated home values are capped at \$100 million. While advertised prices for homes for sale sometimes exceeds this amount, in most case such large values likely reflect multiple homes which may be in areas with different tax rates. In addition, such large homes may be unique or idiosyncratic homes that reflect the tastes of the current owner. The values of such homes may not change in the same way as area average homes.

B. Housing Values, non-itemizers

While nearly all taxpayers in the top centile of the income distribution who own a home itemize their taxes, many lower income taxpayers do not. As a result, property tax payments are not available for these non-itemizers to compute their estimated home value.

Since the non-itemizers are assumed to be outside of the top centile of the income distribution, for calculating top income shares it is not necessary to know precisely who the non-itemizing homeowners are and only the total amount of their real estate assets. In each year, we calculate the total home values that are assigned to itemizing taxpayers from section 3.A of the data

appendix above and compare it to the total value of real estate owned by households and non-profits serving households from the Integrated Macroeconomic Accounts. The residual home values that are not assigned to itemizers are then assigned to non-itemizers. The assignment of this home value is done quasi-randomly, but ensuring that the estimated home values do not push any non-itemizers into the top 1 percent of the distribution.

C. Equities and business assets

The value of equities and business assets are computed using data from the Survey of Consumer Finances (SCF) using a statistical match based on their receipt of dividends, business ownership, and income. First, since the SCF aggregates individuals to the Primary Economic Unit (PEU) rather than the tax unit, it is necessary to map PEUs into tax units – which we do by assuming that the PEUs that contain multiple tax units are evenly distributed through the distribution.

Tax Units in both the SCF and IRS data are then categorized into 4 groups based on whether they have (1) at least \$100 of dividend income (2) at least \$500 of rental and/or small business income or losses (3) both dividend and rental/small business income above these thresholds, or (4) neither dividend nor rental/small business income above these thresholds. These categories of separation were chosen to reflect that tax units with dividends and/or small business income are more likely to have capital asset holdings than those who do not. Within these four categories, tax units are then arrayed based on their total tax return income, excluding capital gains, and assigned a centile based on their position in the income distribution within their category group.

For each centile of the income distributions within the four groups outlined above, we compute the average value of all equity assets (including stocks and mutual funds in both taxable and non-taxable accounts) and the average value of all privately held businesses based on the reported values from the SCF. Since the SCF is only conducted every 3 years, for years between the SCF years, the asset values for each centile are set as the weighted average of the two nearest SCF years. Tax units in the IRS data are then imputed to have equity and business asset values from this SCF data based on their dividend/business income characteristics and based on their centile of the income distribution of those with these characteristics.

4. Determining rates of return for use in accrued capital gains calculations

A. Housing rate of return

Among taxpayers who own a home and itemize their deductions, the rate of return on the real estate assets are based on year-over-year change in the CoreLogic Home Price Index for their county of residence (based on the zip-county crosswalk described in section 3.A of the data appendix). For counties where CoreLogic produces a county-level home price index, the yearly change in this county level value represents the rate of return for housing assets. For counties where a county-level home price index is not available, the state-level value is used. County-level rates of return are available and used for approximately two-thirds of all zip codes.

Among non-itemizing homeowners, since we are unable to determine precisely which non-itemizers are homeowners and the home values are assigned to the non-itemizers collectively, the

rate of return on housing in each year is determined using the national level change in the CoreLogic Home Price Index.

B. Equities and private business assets rate of return

The rate of return for equities and private business assets are both assumed to be uniform for all individuals in each year. This is consistent with the assumption made by Saez and Zucman (2016) when estimating asset values using information from tax return data. For all equity holdings, the rate of return in each year is estimated to be the year-over-year change in value of the S&P 500 index. For private business assets, the rate of return in each year is estimated to be the implied rate of return on non-corporate business holdings of households and non-profits serving households from the Integrated Macroeconomic Accounts. This implied rate of return is computed as the revaluation of equity in non-corporate business in the calendar year divided by the prior year end-of-year value of non-corporate business holdings. The annual rates of return on publicly traded investments and non-corporate business investments are available in Appendix Table A1.

5. Computing accrued capital gains

Accrued capital gains for each asset type are determined based on:

$$CG_{i,t} = AssetValue_{i,t} * ROR_{i,t}$$

Where $CG_{i,t}$ is the capital gains from an asset type for the taxpayer, $AssetValue_{i,t}$ is the total value of the type of asset by the taxpayer from Section 3 of the data appendix, and $ROR_{i,t}$ is the rate of return that the asset receives from Section 4 of the data appendix. The total capital gains and losses observed through this approach from equities, privately held business assets, and housing, can be seen in Appendix Table A2.

6. Imputed rents for owner occupied housing (Appendix only)

A strict interpretation of the Haig-Simons income measure will include imputed rents along with the other income sources described in the paper. However, most researchers have opted against estimating imputed rents when calculating income distributional measures (a notable recent exception is Piketty, Saez, and Zucman 2016). In Appendix Figure 1 we re-estimate our most inclusive income measure – comprehensive income plus accrued gains – with the addition of imputed rents to the income measure.

For this purpose, we compute imputed rents by starting with the aggregate level of imputed rents in each year from the Bureau of Economic Analysis' Gross Domestic Product calculations. We then distribute these imputed rents to homeowners in proportion to their estimated home values (calculated using the procedure from section 3a of the data appendix and as discussed in the main text) to reflect that homeowners with more expensive homes will also have higher levels of imputed rents.

In most years, the inclusion of imputed rents reduces the top 1 percent income share by approximately one-half percentage point. This reflects that imputed rents (and housing wealth) is

less concentrated among the top 1 percent than is the rest of comprehensive income. The inclusion of imputed rents has a larger impact on the top 1 percent income share in 2008. In this year, the fuller income measure substantially reduces the spike in top 1 percent income shares, since the addition of this income source has a larger relative impact on the overall levels of income than it does in other years. With the inclusion of imputed rents as part of income the top 1 percent income share still spikes in 2008 but not to the same degree as seen in the series excluding these values from income.

Appendix Table A1: Annual rate of return on selected assets and percentage change in realized capital gains, 1989-2013

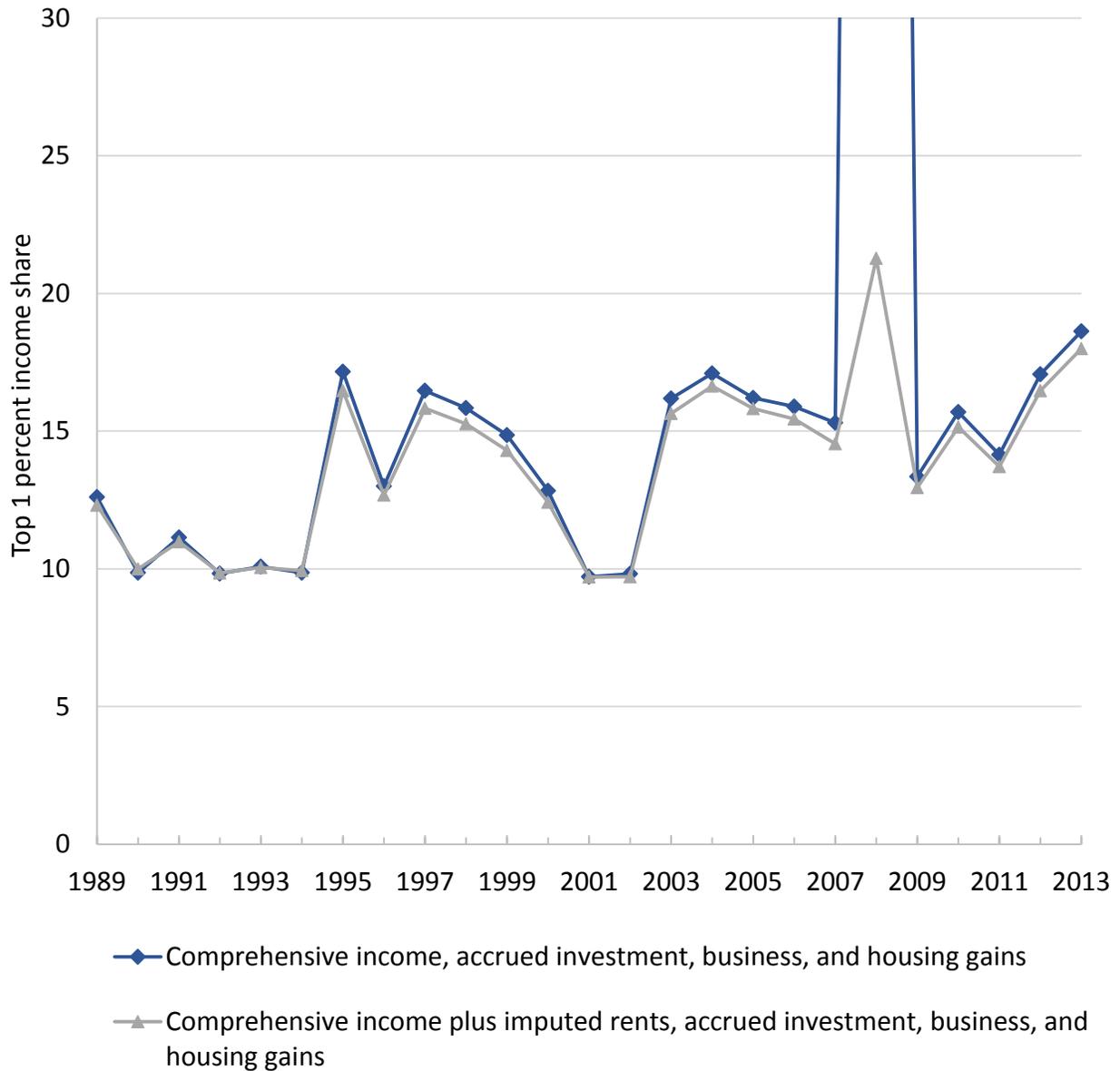
	S&P 500	Non-corporate business (IMA)	Realized Gains in AGI	CoreLogic House Price Index
1989	27.3	5.4	-5.3	8.6
1990	-6.6	1.2	-19.6	2.8
1991	26.3	-2.2	-9.8	-1.2
1992	4.5	-1.4	13.5	0.0
1993	7.1	3.2	20.2	1.5
1994	-1.5	5.4	0.3	2.2
1995	34.1	4.7	17.9	1.9
1996	20.3	3.5	44.7	2.9
1997	31.0	11.0	39.9	3.3
1998	26.7	6.9	24.8	7.0
1999	19.5	7.1	21.4	7.3
2000	-10.1	10.8	16.6	9.8
2001	-13.0	4.1	-45.8	9.5
2002	-23.4	7.6	-23.1	8.8
2003	26.4	9.5	20.4	9.8
2004	9.0	18.8	54.4	14.7
2005	3.0	16.3	38.3	16.7
2006	13.6	5.1	15.7	6.6
2007	3.5	1.2	15.8	-4.9
2008	-38.5	-13.4	-46.1	-13.2
2009	23.5	-15.1	-47.1	-11.6
2010	12.8	7.3	49.6	-0.6
2011	0.0	6.1	2.6	-3.8
2012	13.4	9.1	60.0	3.9
2013	29.6	11.8	-21.1	11.1

Notes and Sources: The IMA returns to non-corporate business is from the Federal Reserve Integrated Macro Accounts. The House Price Index is from the CoreLogic data. Realized capital gains are positive capital gains in Adjusted Gross Income as reported in U.S. Treasury (2016)

Appendix Table A2: Total comprehensive income and accrued gains, by year (millions of dollars)

	Comprehensive income (excluding capital gains)	Accrued gains from equities	Accrued gains from private business holdings	Accrued gains from housing	Total comprehensive income, including accrued gains
1989	3,160,858	372,675	157,601	286,278	3,977,413
1990	3,390,747	-101,761	34,655	191,739	3,515,379
1991	3,615,107	457,635	-64,808	-126,155	3,881,780
1992	3,747,182	86,661	-41,732	43,772	3,835,883
1993	3,864,867	164,074	97,894	102,176	4,229,011
1994	4,080,285	-35,791	177,605	185,294	4,407,394
1995	4,281,691	1,420,656	265,418	150,457	6,118,222
1996	4,502,767	864,863	134,236	267,505	5,769,371
1997	4,739,183	1,673,745	470,751	342,915	7,226,594
1998	5,029,329	1,739,266	319,384	724,457	7,812,435
1999	5,268,100	1,472,021	377,938	858,753	7,976,812
2000	5,612,871	-869,145	644,699	1,309,743	6,698,169
2001	5,927,001	-1,256,118	268,639	1,343,406	6,282,927
2002	6,053,273	-2,272,569	539,391	1,351,123	5,671,218
2003	6,364,901	2,571,011	722,134	1,748,688	11,406,734
2004	6,825,114	873,739	1,522,035	2,938,073	12,158,962
2005	7,236,847	314,427	1,534,295	3,796,302	12,881,870
2006	7,677,335	1,540,742	548,363	1,746,482	11,512,922
2007	7,824,891	430,294	150,165	-756,837	7,648,512
2008	8,294,840	-4,455,120	-1,533,665	-2,138,270	167,785
2009	8,176,949	2,567,744	-1,602,716	-1,873,820	7,268,158
2010	8,618,399	1,319,665	714,329	-225,444	10,426,949
2011	8,986,456	-358	623,306	-651,393	8,958,010
2012	9,477,660	1,634,242	957,276	415,183	12,484,361
2013	9,436,799	3,896,799	1,298,740	810,366	15,442,704

Appendix Figure A1: Top 1 percent income share for comprehensive income with accrued capital gains, with and without imputed rents



Source: Authors' calculations using IRS tax return data, the Survey of Consumer Finances, the American Community Survey, and the Decennial Census.