Income Inequality in the United States:
Using Tax Data to Measure Long-Term Trends

February 18, 2022

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Abstract

Top income share estimates based only on individual tax returns (Piketty and Saez, 2003) are biased by tax-base changes, major social changes, and missing income sources. Addressing these issues requires numerous assumptions, especially for broadening income beyond that reported on tax returns. This paper shows the effects of adjusting for technical tax issues and the sensitivity to alternative assumptions for distributing missing income sources. Our estimates of the distribution of national income suggest that since 1980 top income shares are lower and have increased less than other tax-based studies. Since the early 1960s, increasing government transfers and tax progressivity have resulted in little change in after-tax top income shares.

JEL Codes: D3, E01, H2, H5, J3

Auten: Views and opinions expressed are those of the authors and do not necessarily represent official Treasury positions or policy. Splinter: This paper embodies work undertaken for the staff of the Joint Committee on Taxation, but as members of both parties and both houses of Congress comprise the Joint Committee on Taxation, this work should not be construed to represent the position of any member of the Committee.

The idea that U.S. income inequality has increased dramatically since the 1960s has become one of the most powerful narratives of our time, fueled by the conclusions of studies using income tax data (Piketty and Saez, 2003; Piketty, Saez, and Zucman, 2018). Broad acceptance of this view has raised concerns that increasing inequality could indicate greater concentration of political power and increased rent-seeking (Stiglitz, 2012; Lindsey and Teles, 2017) or increased bargaining power of top earners (Piketty, Saez, and Stantcheva, 2014). In turn, such concerns have led to speculation that inequality could lead to decreasing institutional accountability, reduced economic efficiency, and stagnating middle-class wages.

These profound implications emphasize the importance of correctly measuring income inequality. Estimating the income distribution over long time periods, however, is complicated by major challenges. These include changes in social conditions (marriage rates, household size and composition) and demographics (age distribution). Rising education standards and increased college attendance resulted in higher earnings but later entry into the labor force. Retirement incomes have changed due to expanded Social Security benefits and the shift from defined benefit to defined contribution plans. Periods of high inflation have distorted the measurement of income, and business cycles have had differential effects on income groups.

Compared to survey data, tax data better represent top income groups but introduce additional challenges. Tax rules and incentives for reporting income have changed over time as the result of tax legislation. Differential declines in marriage rates and changing household structures lead to biased results when tax units are the unit of observation.[1] While many adults do not file tax returns, many returns are filed by individuals under age 20, other dependents, and non-residents. Important sources of income are missing in tax data, including government transfer payments and non-taxable employer-provided benefits. The share of income missing in tax data has increased over time, so that income on tax returns accounts for only about 60 percent of national income in recent years. In addition, there are many technical issues with respect to differences between what is reported on tax returns and what economists regard as current-year economic income. Prior studies may have been misleading as a result of failure to adequately account for these challenges.

This paper presents new estimates of the levels and trends of U.S. top income shares that address these challenges. We start with income as reported on tax returns and develop an improved measure of market income—also referred to as fiscal income—that corrects for tax reforms and technical tax issues as well as social issues such as declining marriage rates. Fiscal income misses a large share of national income, which includes essentially all labor and capital income and thus many income sources not reported on tax returns. We account for total national income with estimates of pre-tax and after-tax income, showing the step-by-step effects of each adjustment and addition of missing income sources. Our approach extends earlier studies estimating national account distributions (Pechman and Okner, 1974; Reynolds and Smolensky, 1977). Even earlier studies are discussed by Rockoff (2020). We also estimate a broader pre-tax income measure that includes cash and in-kind transfers, which are excluded from national income, as well as a measure of income after taxes and transfers.

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[1] A tax unit includes all individuals filing a tax return together or who would file together in the case of non-filers. Tax units differ from households by including some dependents living elsewhere but excluding other unrelated adults living in the household. For example, cohabiting couples are considered as the same household but are separate tax units.

While our results are similar to these prior studies and other recent studies, they do suggest lower top income shares and less upward trend than the fiscal income series in Piketty and Saez (2003) and the modified national income series in Piketty, Saez, and Zucman (2018, hereafter PSZ). We discuss why our results differ from PSZ and the implications for considering the distribution of economic growth and tax burdens. We also provide sensitivity analysis of our assumptions in allocating income not on tax returns.

Using income reported on individual tax returns, the influential paper by Piketty and Saez (2003 and updates) argued that the top one percent share more than doubled from 9 to 20 percent between 1962 and 2019. About 40 percent of this increase, however, occurred in the years just before and after the Tax Reform of 1986 (TRA86). This major reform lowered statutory tax rates and broadened the tax base, thereby substantially changing tax rules and incentives for reporting income and organizing businesses.[2] Concerns about the potential for TRA86 to affect measures of U.S. inequality were raised by Feenberg and Poterba (1993), Slemrod (1996), and Gordon and Slemrod (2000). Our analysis addresses this issue by accounting for corporate retained earnings as well as base-broadening reforms that reduced tax-shelter losses. Without these corrections, top income shares are understated in the 1960s and 1970s, when high individual income tax rates created strong incentives to shelter income inside corporations. In recent years, basing income groups on tax units produces upward bias in top income shares because marriage rates decreased disproportionately more among lower-income groups.

Accounting for these issues causes our results to differ substantially from Piketty and Saez (2003, hereafter PS). Figure 1 shows that between 1979 and 2019 our pre-tax top one percent shares increased by 4.4 percentage points, or about one-third of that estimated by PS. For after-tax income, which includes transfers, we estimate that they increased by only 1.4 percentage points. Over the longer period since the early 1960s, we find that the top one percent pre-tax share increased 2.7 percentage points, less than one-quarter as much as PS. For after-tax income, our top income shares were nearly unchanged since the early 1960s.[3]

Why do our results differ from PS and PSZ? The main reason is methodological differences, and this paper provides a detailed decomposition of their effects. Some of the largest differences are from correcting income due to tax-reporting changes and allocating underreported business income and accrued retirement income. These differences are not merely differences in opinion. Instead, each of our allocations result in a more consistent income definition over time (due to better accounting for tax policy and demographic changes) or use data ignored by PSZ (such as representative audit study data that is used to estimate national income aggregates). For example, our estimates correct the tax sample to remove non-resident filers and dependent filers who receive most of their support from others as well as other filers under age 20. Our analysis accounts for increases in the share of single-parent households and changing family size, as well as for falling marriage rates. We also correct for many special features of how income is reported on individual and corporate tax returns and how this has changed over time. While many improvements have

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[2] For discussions of TRA86, see the online appendix and Auten, Splinter, and Nelson (2016). Geloso et al. (2018) examine earlier reforms, showing that pre-WWII top income shares are overestimated when not correctly accounting for tax policy changes.

[3] We still find significant increases in pre-tax income shares for the highest groups between 1979 and 2019: from 3.1 to 5.6 percent for the top 0.1 percent and 1.1 to 2.4 percent for the top 0.01 percent. See appendix Figure A1 and online data.

only small or offsetting effects on top income shares, their cumulative effects can be significant and have varying effects on different parts of the income distribution.

Different treatments of business losses and pension income prove to be particularly important. Our analysis corrects for the large tax shelter losses prior to TRA86 and adds back net operating loss carryovers from prior years, which are not current-year income. Our approach also accounts for business losses when allocating underreported income because detailed IRS audit studies show that returns with business losses account for a significant share of underreported income. PSZ, however, ignored losses and allocated underreported income amounts only by positive reported income, thereby overstating top income shares. Our retirement income allocation methodologies also produce quite different results, in part because PSZ (2018) treated non-taxable pension and retirement account amounts as income when almost all reflect rollovers of assets from one account to another.[4]

We are not alone in finding lower levels and smaller increases. Other studies find similar levels and changes in U.S. top income shares when using broad measures of income. Combining tax return and Census data, Fixler, Gindelsky, and Johnson (2019) estimated a top one percent share of personal income in 2012 of 13 percent, similar to our pre-tax estimate of 15 percent. Using Survey of Consumer Finance data, Bricker et al. (2016a) found that the top one percent share increased 3 percentage points between 1988 and 2012, compared to our estimated increase of 4 percentage points. Using tax return and Census data, the Congressional Budget Office (2018) found that the top one percent share of before-tax income increased 6 percentage points from 9 to 15 percent between 1979 and 2013, compared to our pre-tax income share increases of 4 percentage points from about 9 to 13 percent over this period. Using internal Census data to overcome top-coding issues and over an earlier period of 1967 to 2006, Burkhauser et al. (2012) estimated that the top one percent share increased only 2 percentage points from 10 to 12 percent between 1967 and 2004.

Our paper makes several important contributions to the U.S. income inequality literature. First, we provide the only distributional estimates that are based on administrative microdata, follow the national income definitions, account for major tax reforms, and are informed by IRS detailed audit data. Our estimates take particular care to address technical issues of using tax data that, if ignored, can result in biased estimates. Second, we address the uncertainty created by the need to impute components of national income not reported in tax data by showing our step-by-step adjustments and imputations as well as sensitivity tests of less certain assumptions. This allows other researchers to see the effect of each adjustment and consider alternative estimates based on different combinations of assumptions. Third, we compare our methodology with PS, PSZ, and the Congressional Budget Office so that readers will have a better understanding of why our results (and those of other researchers) differ.

The following section briefly describes our income measures. Sections II and III discuss the data and adjustments used to construct these measures. Sections IV and V presents the main results and sensitivity analysis. Section VI provides a summary and conclusions.

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[4] Saez and Zucman (2020) revised the original PSZ estimates to partially address this problem.

I. Measuring Top Income Shares with Consistent Definitions of Income

Using annual tax microdata, we start with PS *fiscal income* and sample definitions because these were seminal estimates that are still being updated and remain widely cited. Our first step is to estimate *corrected fiscal income* that adjusts for major tax law changes (primarily TRA86), sample issues, and changing family structures (declining marriage and increasing single-parent rates). We then sequentially develop three income measures: *pre-tax income* that excludes government transfers, *pre-tax income plus transfers* that includes government transfers, and *after-tax income* that includes government transfers and deducts federal, state, and local taxes.

Pre-tax income is consistent with the national income concept and therefore excludes transfer payments.[5] Pre-tax income plus transfers adds government transfers, which grew from 5 to 16 percent of national income between 1960 and 2019. This measure provides a more complete estimate of the economic resources available for consumption, saving, and paying taxes—especially for households receiving Social Security and unemployment insurance benefits, as well as other cash and in-kind transfers. This is our broadest definition of income and the most appropriate for estimating average tax rates. This follows a long-standing public finance tradition of using broad measures of income for this purpose (Pechman and Okner, 1974; Office of Tax Analysis, 1987) and parallels the approach of federal government agencies.[6] This measure is also consistent with gross income in the Luxembourg Income Study and transfer-inclusive income definitions used by the Census Bureau. Starting with pre-tax income plus transfers, after-tax income is estimated by subtracting federal, state, and local taxes and adding government deficits and government consumption to equal national income.

The most significant tax reform in the period studied was TRA86, which lowered individual tax rates and broadened the tax base. The base-broadening was targeted at high-income taxpayers, including limiting deductions for losses on rental income and passive investments. The reform also motivated some corporations to switch from C to S corporations and to start new businesses as passthrough entities (S corporations, partnerships, or sole proprietorships). Before TRA86, the top individual tax rate was higher than the top corporate tax rate (50 percent vs. 46 percent), allowing certain sheltering of income in C corporations with retained earnings. The incentive for such sheltering was even larger when the top individual rate was 70 percent in the 1970s and 91 percent before 1964. TRA86 lowered the top individual tax rate below the top corporate tax rate (28 vs. 34 percent), creating strong incentives to organize businesses as passthrough entities.[7] This resulted in more business income being reported directly on individual

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[5] National income equals GDP less capital depreciation plus net income from abroad. Smith et al. (2019) refer to Imputed National Income (INI). PSZ use the term Distributional National Income (DINA), but PSZ pre-tax income differs from national income because it includes Social Security benefits and unemployment compensation and deducts the associated payroll taxes (making it a partially after-tax measure). Stiglitz, Sen, and Fitoussi (2009) discuss shortcomings of national income. Personal income used in some distribution studies, such as Fixler et al. (2016), includes transfer payments but does not include earnings retained inside businesses.

[6] For average tax rate income denominators, Treasury's Office of Tax Analysis includes both cash and near-cash transfers (including Medicaid). The Joint Committee on Taxation includes social insurance benefits but not means-tested transfers (which are not reported in tax data). The Congressional Budget Office follows a similar approach to use the same income denominator for both taxes and transfers (although a broader measure is usually preferred for tax rates).

[7] This simple comparison ignores the double taxation of corporate income at the individual level. TRA86 also increased the maximum long-term capital gains tax rate from 20 to 28 percent, which may have further lowered the value of C corporations relative to passthrough businesses. Gordon and Slemrod (2000), Goolsbee (2004), and Auten, Splinter, and Nelson (2016) reviewed the effects of relative tax rates on business organization.

tax returns because all passthrough income is reported on individual tax returns while C corporation retained earnings are not. Our analysis accounts directly for the limitations on deducting losses and indirectly for the shift into passthrough entities by including corporate retained earnings. This leads to important findings for the 1960s and 1970s, when high individual income tax rates created strong incentives to shelter income inside corporations. Without these corrections, top income shares are understated before 1987.[8]

TRA86 also dramatically increased the number of dependent filers, which are inappropriately treated as separate low-income units if no adjustments are made. In the two years following TRA86, the number of dependent filers and filers younger than 20 years old increased from about 8 million to 13 million (Auten, Gee, and Turner, 2013). To address this issue and make our sample consistent over time and between tax and Census data, we remove dependent filers, other filers under age 20, and non-resident filers from the sample and increase the number of non-filing tax units accordingly. Without this correction non-filing tax units are under-counted and top income shares overstated, especially since 1987.

Declining marriage rates outside the top of the distribution also explain part of the increase in measured top income shares. This is because, holding all else equal, as the marriage rate in the bottom of the distribution decreases, more adults file separate returns. This increases the total number of tax units, thereby increasing the number of high-income tax units in the top one percent. Another important social change is the increase in single-parent households. To address both issues, we follow the approach used in studies by the Congressional Budget Office. This takes account of the two adults in married tax units, as well as dependents, and bases income groups on the total number of individuals. That is, each percentile has an equal number of individuals rather than an equal number of tax units. Without this correction there are too many individuals in the top one percent, overstating top income shares in recent decades.

Some sources of market income are not included on individual tax returns. To address this issue and fully account for national income, pre-tax income includes tax-exempt interest, corporate retained earnings and taxes, employer-paid payroll taxes and insurance, imputed rental income on housing, underreported income, and other taxes and income. These excluded sources increased from an average of 34 percent of national income in the 1960s to 39 percent since 2000. Because of the declining importance of corporate retained earnings and taxes and the growing importance of employer-paid taxes and health benefits, a larger share of these excluded sources goes to those below the top of the distribution. Between 1962 and 2019, the top one percent share of capital income excluded from fiscal income decreased from 4 to 2 percent of national income, due primarily to declining corporate retained earnings. Meanwhile, the bottom 90 percent share of labor income excluded from fiscal income increased from 4 to 12 percent of national income.[9] Without these corrections top income shares are understated in the 1960s and overstated in recent decades.

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[8] Studies in other countries have also found that inequality trends based on tax returns are biased when failing to account for tax reforms that changed incentives for corporate retained earnings. Wolfson, Veall, and Brooks (2016) estimated that including retained earnings of private corporations increased the Canadian top one percent income share in 2011 by about a third. Alstadsæter et al. (2015) found that an increase in the dividends tax rate caused a dramatic increase in corporate retained earnings in Norway. After the reform, tax return–based top one percent income shares were underestimated by about a third. Atkinson (2007) estimated that during the 1950s and early 1960s, including retained company profits increased United Kingdom top one percent income shares (excluding capital gains) by about half.

[9] Types of capital income excluded from fiscal income includes tax-exempt interest, accrued retirement investment income, undistributed fiduciary income, imputed rents, and corporate retained earnings and taxes. The bottom 90 percent share of excluded capital income was unchanged at 12 percent. See online appendix Figure B16.

II. Data

Our analysis uses annual samples of individual income tax returns from 1960 to 2019. Each cross-section sample includes between 80 and 360 thousand tax returns, with oversampling of tax returns with high incomes and weights to make the sample representative. Public use individual income tax files are used for years before 1979. Beginning with 1979, we use internal IRS Statistics of Income (SOI) individual income tax samples and Social Security Administration data including dates of birth. Non-filer income, excluded combat pay, and the distribution of employer-provided health insurance, are estimated using IRS administrative data, which include the universe of tax returns and information returns. We also use the Survey of Consumer Finances and Census Bureau's March Current Population Survey in estimating the distribution of several types of income and transfers not on tax returns.

Target totals for income not reported or partially reported on income tax returns are from the Bureau of Economic Analysis National Income and Product Accounts (NIPA). Note that corporate retained earnings are defined as undistributed C corporation profits and calculated as profits with inventory value and capital consumption adjustments less taxes and net corporate dividends. These amounts include reinvested earnings of incorporated foreign affiliates of U.S. corporations, that is, unrepatriated foreign earnings.

III. Distributing U.S. National Income Using Tax Data

This section describes each of the adjustments made to the individual income tax data. Our analysis starts by replicating PS fiscal income excluding capital gains. For filers, fiscal income equals adjusted gross income, plus statutory adjustments, less taxable Social Security and unemployment benefits and Schedule D capital gains. For non-filing tax units, PS fiscal income is 20 percent of the average income of filers. *Corrected fiscal income* is developed as an intermediate step. Our measure corrects the sample, adjusts for the effects of tax reform on tax shelter losses, adds tax-exempt interest, makes additions and corrections to various income components, and bases income groups on the number of individuals rather than tax units. Then we estimate pre-tax and after-tax income measures that target national income. Tables 1 and 2 show the impact of each adjustment on top one percent income shares in selected years. Additional details are provided in the online appendix and online data. While some adjustments lower top income shares, many others increase top shares including ranking by size-adjusted incomes and adding tax exempt interest, corporate retained income and taxes.

A. *Corrected Fiscal Income*

1. Correct sample: Limit Returns to Adult Residents. It is important to start by ensuring that our sample is consistent with the U.S. Census resident population age 20 or older. Census data are the basis for the PS estimate of the total number of filing and non-filing tax units, which we also target. Some tax filers, however, live abroad or are younger than 20 years old and therefore not included in the baseline Census numbers. To limit the sample of tax returns to adult residents, these returns are removed, thereby increasing the number of non-filer tax units. In addition, some filers age 20 and over are claimed as dependents on other tax returns, primarily college students. Since these

filers are not independent economic units, they are also dropped from the sample.[10] The income of dependent filers is allocated among tax returns with dependent children. We also correct for the effect of married couples filing separate returns, as the number of total tax units counts all married couples as one tax unit, but these married couples file two returns. These corrections have significant effects on the sample since 1987. For example, in 2019 there were 6.7 million filers under age 20, 4.6 million other dependent filers, 1.0 million non-resident filers, and 1.9 million married filing separately returns, altogether about 9 percent of all returns filed.

Non-filer incomes are based on information returns filed by third parties such as employers. Information returns have been used to estimate non-filer incomes in other studies (e.g., Mortenson et al., 2019; Heim, Lurie, and Pearce, 2014). We include income from the following information returns: SSA-1099/RRB-1099 (Social Security and disability insurance benefits), 1099-R (retirement distributions less rollovers), W-2 (wages and amounts withheld for income and payroll taxes), 1099-DIV (dividends), 1099-INT (interest), 1099-G (unemployment insurance benefits), 1099-MISC, and K-1s (partnerships and S corporation distributions). To account for non-filer income heterogeneity, we use information return data for resident individuals not observed on tax returns for 56 groups (2 marriage, 4 age, and 7 income groups).[11] This approach avoids the incorrect assumption that non-filers always have less income than their applicable filing thresholds, which is often applied when using survey data. Instead, it is consistent with the Treasury Inspector General for Tax Administration (2020) finding that some non-filers have incomes much higher than their filing threshold.

2. Impose Post-TRA86 Loss Limits. To make our income measure consistent over time by accounting for the base-broadening reforms of TRA86, we apply post-TRA86 limitations on deductions of losses for rent and other business income to years before the reform. We use data from tax returns just after TRA86 to estimate that up to 85 percent of high-income business losses would have been non-deductible. Prior to 1987, this increases the incomes of those taking advantage of tax shelters. The largest effects occur just before the reform when this increases top income shares by 0.5 percentage points from 1984 through 1986. This adjustment also helps correct for generous accelerated depreciation rules enacted in 1981 that increased the use of tax shelters and reported losses on tax returns, especially for real estate.[12]

3. Add Tax-Exempt Interest. Tax-exempt interest income reported on tax returns since 1987 is added to income. For earlier years, we rely on interpolations using the Survey of Consumer

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[10] Dependent filers age 19 years or older are generally full-time students who receive more than half of their support from taxpayers claiming an exemption for them. Thus, they are not comparable to fully independent tax units and typically have low incomes. The importance of this correction is illustrated by the increase between 1960 and 2012 in school enrollment by those age 20 to 24 from 13 to 40 percent (National Center for Education Statistics, 2018). Some elderly parents are also claimed as dependents.

[11] "Married" non-filer tax units are created by matching non-filing males and females living at the same address. Since information returns of non-filers are only available since 1999, we use information returns for 2000, 2010 and 2018 and interpolate for other years. As discussed in the online appendix, this approach of separate demographic and income groups approximates other estimates of non-filer incomes reasonably well.

[12] Other TRA86 base-broadening effects are accounted for in other steps. The post-TRA86 incentive to shift business organization from C corporations to S corporations and partnerships is accounted for by including retained earnings. Adding back net operating losses corrects for tax shelter losses carried over to later years. As seen in the results, even after correcting for various TRA86 effects there remains a jump in top one percent income shares between 1986 and 1988. This is largely due to shifting of reported income from 1986 to 1987 and 1987 to 1988 due to taxpayers taking advantage of the decrease in the individual income tax rate from 50 percent to 38.5 percent and then to 28 percent.

Finances and the 1962 Survey of Financial Characteristics of Consumers. The inclusion of tax-exempt interest modestly increases top income shares (0.3 percentage points) in the 1960s when holdings of tax-exempt securities were highly concentrated among the highest income taxpayers but has smaller effects in recent years due to broader holdings of these securities.

4. Correct Income Definition. Several corrections make the income definition more consistent with annual economic income. Excluded dividends before 1987 and tax-exempt combat pay are added to filer incomes. Net operating loss carryovers from prior years are added back because they reflect prior-year losses rather than current income. Gambling losses (up to the amount of gambling income) and taxable state and local income tax refunds are deducted. Capital gains distributions reported directly on Form 1040 and ordinary gains from the sale of business property are also subtracted.[13] Retirement contributions, including IRA, Keogh, SEP, SIMPLE and other qualified plan contributions, are subtracted to parallel the treatment of excluded employee contributions to other defined contribution accounts, such as 401(k) plans, and to follow the definition of national income. In addition, we remove taxable distributions of retirement accounts upon death and shift alimony payments from payors to recipients. Note that these corrections are based on amounts reported on individual tax returns or in some cases on information returns. These adjustments can result in large income changes for particular tax returns, substantially changing their rank in the income distribution and potentially affecting top income shares.

5. Set Groups by Number of Individuals and Rank by Size-Adjusted Income. To obtain a measure more relevant to the distribution of economic welfare, we follow Congressional Budget Office (2018) in defining income groups based on all individuals (including primary and secondary taxpayers and dependents) and rank tax units using size-adjusted incomes. Compared to groups based on tax units, setting groups by the total number of individuals helps control for the bias introduced from differential declines in marriage rates and declining tax-unit size. Size-adjusting incomes accounts for the costs of supporting dependents and the economies of scale from shared resources, such as housing.[14]

Marriage rates among tax filers declined from 67 to 37 percent of tax units between 1960 and 2019 (after removing filers younger than 20 years old, dependent filers, and non-residents). However, marriage rates among the top one percent have remained consistently high in these years: 90 and 85 percent, respectively. Holding all else constant, declining marriage rates outside the top of the income distribution increase top income shares of households and tax units. For example, Larrimore (2014) estimated that declining marriage rates explain 23 percent of the increase in household income Gini coefficients between 1979 and 2007.

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[13] Adding back net operating loss carryovers prevents counting the same loss multiple times and moves some taxpayers from the bottom centiles into the top one percent. Since gross gambling winnings are reported as other income but gambling losses (up to the amount of winnings) are an itemized deduction, failing to make this adjustment would overstate the economic income of these taxpayers. Taxable state and local income tax refunds are an adjustment for an over-deduction in the prior year rather than income. Ordinary gain from the sale of business property and should be subtracted when calculating income net of capital gains because it is comparable to capital gain income and tax reforms have changed the definition of capital vs ordinary gain over time. These adjustments are needed to be consistent with the definition of national income.

[14] Controlling for both the falling marriage rate and tax-unit size helps account for the rising share of children under 18 years old living in single-parent households, which Census data show increased between 1960 and 2015 from 9 to 27 percent (see Table CH-1 at www.census.gov/data/tables/time-series/demo/families/children.html).

When ranking tax units, we account for size differences by dividing tax unit income by the square root of the number of individuals in the unit. This equivalence scale is used by the Congressional Budget Office (2018) and similar to that used by the Census Bureau to set poverty thresholds and estimate equivalence-adjusted income inequality (Cronin, DeFilippes, and Yin, 2012). The square root of the number of individuals in the sharing unit is between the extremes of assigning the full tax-unit income to each individual (complete economies of scale) and per capita income (equal sharing but no economies of scale) and implicitly assumes equal sharing among all individuals in the tax unit.[15] Note that size-adjusted incomes are only used to rank tax units and determine income groups in the income distribution. Income shares are calculated using total tax-unit incomes, such that they sum to national income.

Basing income groups on individuals and ranking by size-adjusted income have offsetting effects on top income shares. Changing from income groups based on tax units to individuals decreases top one percent income shares by 1.6 percentage points in 1960 and 3.0 percentage points 2019 (see Table 1).[16] This is because ranking by size-adjusted income moves tax units with more individuals out of the top one percent and replaces them with more tax units with higher per-person income. As a result, ranking by size-adjusted income *increases* top one percent income shares by about one percentage point in earlier decades and 1.4 percentage points in 2019. The net effect of these two changes is a decrease in recent top one percent shares of 1.6 percentage points. Other studies have found similar reductions in top one percent income shares when moving away from tax units as the unit of observation (Larrimore, Mortenson, and Splinter, 2021; Bricker et al., 2016b).

B. *Pre-Tax Income: Expansions*

The next step in computing pre-tax income is to add sources that are not captured on individual tax returns: (1) fiduciary retained income, (2) corporate retained earnings, (3) corporate taxes, (4) business property taxes, (5) the inflationary component of business interest deductions and other inflation adjustments, (6) underreported income, (7) imputed rental income on housing, (8) the employer portion of payroll taxes, (9) employer-provided insurance costs, (10) retirement account income, and (11) other sources of national income, primarily sales taxes. Table 1 and Figure 2 show the impact of these adjustments on top one percent income shares. The effects of adding retained earnings and corporate taxes decrease over time as the share of business conducted by C corporations decrease. Meanwhile, the effects of payroll taxes and insurance increase over time.

1. Fiduciary Retained Income. Fiduciaries, which include estates and trusts, distribute much of their income each year and this income is included on individual tax returns. Some fiduciary income, however, is retained and therefore missing from individual returns. Retained fiduciary income and taxes are allocated to individual tax returns by taxable fiduciary income.

2. Corporate Retained Earnings. Pre-tax corporate profits are treated as income to capital owners regardless of whether profits are distributed, retained, or paid out in taxes. Corporate profits

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[15] This approach differs from income shares of individuals, which result in higher measured inequality due to unequal spousal earnings (Saez and Veall, 2004). While individual-level estimates may make sense for the distribution of earnings, it is inappropriate for broad measures that include income from shared assets, such as imputed rent from housing.

[16] Growth in cohabitation explains some of this change. While there was relatively little cohabitation before 1970, more than 27 percent of couples currently living together are unmarried (Lundberg, Pollak, and Stearns, 2016). The rise in non-married couples means tax unit incomes may understate the economic welfare of many single or head of household filers because the income of other members of the household is not included (Larrimore, Mortenson, and Splinter, 2021).

distributed as dividends are already included in taxable income. Since retained earnings are not reported on individual tax returns they must be allocated among various corporate owners: retirement accounts, non-profits/governments, and private individuals.[17] With the growth of retirement savings, the retirement account share of corporate ownership increased dramatically from 4 percent in 1960 to around 50 percent since 1985. This portion of retained earnings is allocated by earned income for the share of corporate ownership by defined benefit (DB) plans and otherwise by the share of defined contribution (DC) account wealth using the Survey of Consumer Finances.[18] The portion of retained earnings reflecting ownership by non-profit organizations and domestic governments, which ranges between 5 and 9 percent, is allocated half per capita (equally across all individuals including dependents) and half by wages to account for both the redistribution and consumption spending of non-profits and governments.

The remaining retained earnings associated with non-retirement private ownership are allocated to individual tax returns. Three-quarters of retained earnings are allocated based on a tax unit's share of dividends and one-quarter based on their share of realized capital gains. As shown in the sensitivity analysis, our results are robust to a broad range of alternative assumptions. Since our goal is to attribute retained earnings accrued in a given year to the owners of corporations, we favor using dividends received as the primary indicator of corporate ownership. The portion allocated to capital gains reflects the fact that some corporations do not pay dividends and a substantial portion of capital gains is from the sale of corporate stock. The timing of realized capital gains can differ substantially from that of retained earnings, in some cases by decades, but over the long run they tend to equalize (Pechman, 1985; Clarke and Kopczuk, 2016).[19]

3. Corporate Taxes. Pre-tax income includes taxes paid by businesses allocated based on assumptions of economic burden. Following Joint Committee on Taxation (2013) and Congressional Budget Office (2012), we allocate 25 percent of corporate taxes to wages.[20] The rest is allocated to individual tax returns based on the ownership of corporate capital (allocated like retained earnings) and interest-bearing assets (allocated by taxable interest).[21] Note that since the after-tax income measure subtracts all taxes, allocation assumptions for corporate taxes have little or no effect on the distribution of after-tax income.

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[17] Note that corporate passthrough entities (S corporations and REITs) are removed before estimating ownership shares because they have little or no undistributed profits. Our approach to attributing ownership of C corporations among these three groups closely follows that of Rosenthal and Austin (2016) and PSZ.

[18] For this allocation, earned income is wages, self-employment income, and up to $15,000 of taxable retirement distributions. These amounts are limited at the bottom of the distribution to account for low-wage employees usually not being part of DB plans and limited at the top of the distribution to account for DB limitations.

[19] Larrimore et al. (2021) take the alternative approach of using annual accrued capital gains. The use of accrued gains produces a more volatile series and, in combination with other methodological differences such as basing income groups on tax units, results in the top one share being several percentage points higher on average from 1989 to 2016.

[20] There are various reasons for believing a portion of the burden falls on wages, including reduced labor productivity from a smaller capital stock. In addition, bonuses of executives are often based on corporate profits and their wages include and are affected by stock option values. Some empirical estimates support this view, though estimates vary widely. In the U.S., Suárez Serrato and Zidar (2016) estimated that wages bear one-third of state corporate taxes and Liu and Altshuler (2013) estimated that the average wage share is between 60 and 80 percent. Following Joint Committee on Taxation (2013), we also allocate 5 percent of passthrough business income taxes to wages.

[21] The Congressional Budget Office (2012), Joint Committee on Taxation (2013), and Office of Tax Analysis, U.S. Treasury Department (Cronin et al., 2013) all distribute the corporate tax burden in part by interest received by individuals.

4. Business Property Taxes. Business property taxes are allocated to tax filers by business income (dividends, capital gains, interest, and passthrough income). The larger effect of business property taxes on top shares in 1960 is due to the substantial fraction allocated to individual corporate equity owners. This fraction declines as corporate ownership shifts to retirement accounts.

5. Inflation Correction for Interest. High inflation rates, most importantly in the 1970s and early 1980s, distort the measurement of income and deductions. Since inflation can affect real incomes differently across the income distribution, correcting for inflation provides a more consistent measure of income over time, as well as across individuals with different types of income and assets. Inflation causes an overstatement of real interest income and an understatement of real business profits, which are net of deductible interest payments (Steuerle, 1985). To account for fluctuating inflation rates, we make three adjustments to interest flows (for a similar approach, see Feldstein, 1988). First, we decrease household net interest receipts by the fraction accounted for by inflation, estimated as the PCE inflation rate divided by the Aaa corporate bond rate. Second, we increase business income by the inflation component of net interest payments. Third, we estimate the value of inflation on government interest payments as the difference between household interest decreases and business income increases so that total income is unchanged by the inflation adjustment. Since lower real government interest payments likely decrease current or future taxes, we allocate this effect by federal and state income taxes. These inflation adjustments increase top one percent income shares by an average of 0.4 percentage points in the 1970s and early 1980s when inflation was high, but only 0.2 percentage points in other years.

6. Underreported Income. There are gaps between national income and amounts reported in tax data, largely due to estimates of underreported income included in national income but also from differences in income definitions such as the treatment of depreciation. The importance of this adjustment is illustrated by the addition of underreported income more than doubling sole proprietor and partnership net income. Our allocation of underreported income is based on the IRS National Research Program (NRP) and Taxpayer Compliance Measurement Program (TCMP) detailed audits of stratified random samples of tax returns. The Bureau of Economic Analysis bases estimates of underreported income included in national income on these studies.

Reporting gaps, proprietor misreporting, and additional proprietor income differences are allocated separately. Reporting gaps are estimated as the difference between amounts already in pre-tax income and NIPA totals, calculated separately for wages and salaries, rental income, farm income, and S corporation net income. These estimated reporting gaps are broadly consistent with underreporting estimates in NRP and TCMP studies (see the online appendix for a detailed discussion). For proprietor income we use the misreported amounts as reported in the national accounts. Five percent of these amounts is allocated to non-filers because the audit studies only include filers. The main portion of reporting gaps and proprietor misreporting is allocated to filers based on the analysis of TCMP and NRP audit studies covering six periods from 1988 through 2013 by Auten and Langetieg (2020). To capture the heterogeneity of misreporting across filers, the ratio of detected misreporting to reported income is provided for ten ratio groups and 11 reported income groups, including two negative income groups. The appropriate share of tax returns in each reported income group is randomly allocated to each ratio group and appropriate misreporting ratios are applied, including a large no change group. This method replicates prior NRP-based estimates of the distribution of underreporting in Johns and Slemrod (2010) and DeBacker et al. (2020), as shown in Figure B5 of the online appendix. Proprietor misreporting

included in national income also includes estimates of underreporting not detected in the audit studies. To account for this undetected underreporting, we apply the distributionally consistent gradient multipliers proposed in Auten and Splinter (2021).[22] Finally, we separately account for other differences between tax-data and NIPA nonfarm proprietor income, such as faster depreciation in tax data than in national accounts, which is mostly allocated by expensing claimed on tax returns. See the online appendix for more details about these computations.

7. Imputed Rent (including property taxes). Imputed rental income from owner-occupied housing is primarily allocated in proportion to deductions for real estate taxes. NIPA imputed rent is pre-tax and thus includes property taxes. Non-housing rents from consumer durable goods, such as cars and washing machines, are excluded from national income and thus not included. Including this other rental income would slightly reduce top income shares.

8. Employer Payroll Taxes. The full burden of employer payroll taxes is generally assumed to fall upon workers and considered part of their pre-tax economic income. Payroll taxes are estimated based on wages up to taxable maximum thresholds reported on tax returns for filers and on Form W-2 for non-filers.

9. Employer-Provided Insurance. Employer-provided insurance is non-taxable income and thus another important addition to tax-based incomes. These benefits include health and life insurance and workers' compensation and between 1960 and 2019 increased from 1 to 5 percent of national income. Since the value of employer-provided health insurance makes up most of these benefits, the allocation is based on health insurance amounts reported on Form W-2. Bureau of Labor Statistics data presented in Warshawsky (2016) suggest that while the magnitude of these benefits has increased substantially, the distribution of this benefit was very similar in 1992 (see the online appendix).

10. Retirement Account Income. The treatment of retirement savings and income presents difficult choices when thinking about measuring income (Nelson, 1987). The usual options are to count retirement income when it accrues or when it is distributed. Under the accrual approach, contributions to retirement accounts are counted when the income is earned and investment income on retirement savings is counted as it accrues. This approach implies that many retired people have very little income. In contrast, counting retirement income only when distributed provides a better measure of the current incomes of retired people and their ability to consume. The distribution approach to retirement income is therefore used in most studies of income inequality. Besides being more consistent with the functioning of retirement systems and current-year welfare, a distribution basis matches the timing of tax burdens. Therefore, we start with a distribution approach that includes taxable income from pensions, retirement account distributions, and annuities but excludes retirement account contributions to prevent double counting. Undistributed

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[22] Undetected underreporting is based on detection controlled estimation (DCE), which accounts for differences between each auditor's detected underreporting and that of the most effective (aggressive) auditor. The overall misreporting resulting from DCE is used for amounts included in national accounts, but at the micro level, applying simple DCE multipliers to all detected underreporting will result in distributionally inconsistent results because they ignore differences in auditor effectiveness. Johns and Slemrod (2010) and DeBacker et al. (2020) express similar concerns about simple DCE multipliers that are applied without regard to the effectiveness of that return's auditor. The distributionally consistent gradient multipliers used in this paper indirectly account for auditor effectiveness.

income accruing to retirement accounts is also included to fully account for retirement account income totals in national income, as described next.

Since accumulations of retirement account income have outpaced distributions, the difference is included to match national income. Dividend and interest income of retirement accounts, also referred to as inside buildup, is therefore added to pre-tax income. Note that corporate retained earnings and taxes have already been allocated to retirement account owners. The difference between current-year retirement account contributions and taxable distributions is also added to conform to national income retirement totals. These adjustments are on an accrual basis, allocated by earned income (described above) for the share of corporate ownership by DB plans and otherwise by the share of DC wealth.

11. Remaining Indirect Taxes and Other Income. Remaining indirect taxes—mostly sales taxes—are allocated by disposable income (defined below) less savings. Saving rates are substantially higher for higher income groups. We use Surveys of Consumer Finance estimates presented in Dynan, Skinner, and Zeldes (2004). Small amounts of business transfers and subsidies, surplus of government enterprises, and dividends and interest income of non-profits and governments are allocated half per capita and half by wages.

C. *Pre-Tax Plus Transfers Income*

National income can be misleading as a measure of economic welfare because it omits government transfers. We therefore provide an additional income measure that includes government cash and non-cash transfers: pre-tax income plus transfers (Table 2). To provide a sense of relative magnitudes in 2019: Social Security benefits were $1.03 trillion, unemployment benefits $30 billion, other cash transfers $400 billion, Medicare benefits less premiums $820 billion, and Medicaid benefits $670 billion. Social Security benefits reported on tax returns are added to income. Prior to these becoming taxable, the 1980s distributions are used. The remaining NIPA Social Security benefits not reported on tax returns are allocated to non-filer demographic groups based on Social Security Administration Form SSA-1099. This approach is also used to allocate unemployment compensation. The NIPA value of other cash transfers is allocated using the distribution from Census Bureau's March Current Population Survey (CPS) estimated by Larrimore et al. (2021). For this allocation, tax units are divided into ten demographic groups based on: age of the oldest person in the CPS-constructed tax unit (younger than 40, 40–64, and 65 years or older), presence of any dependent children, and marital status. Each demographic group is then divided into one hundred income percentiles by corrected market income plus Social Security benefits. These cash transfers include federal supplemental security income, as well as cash transfers from state and local governments. Medicare benefits less premiums are allocated proportionally to filers and non-filers age 65 and older, except for high-wage filers likely receiving insurance through their employers. Finally, the NIPA value of remaining non-cash transfers, such as Medicaid and food stamps, is allocated like other cash transfers using CPS data. Following the national accounts, non-cash transfers are valued at cost. As shown in Table 2, the inclusion of transfers decreases top one percent income shares with a growing effect over time: 0.5 percentage points in 1960, 0.7 in 1979, and 1.7 in 2019. Similarly, Bricker et al. (2016b) and Congressional Office (2018) both estimate that including transfers decreased the 2010 top one percent share by more than 2 percentage points.

D. *After-Tax Income*

Taxes are subtracted from pre-tax income plus transfers sequentially to show the effect of each tax on top one percent shares. To match national income, two final adjustments fully account for the government sector by including government deficits/surpluses and government consumption (Table 2).

Several adjustments are needed for federal individual income tax liabilities. Foreign tax credits, which reflect foreign withholding taxes paid, are added back to federal income taxes. Refundable portions of tax credits, including earned income and additional child tax credits results in negative average income tax rates in lower-income groups. Federal income taxes include the Additional Medicare Tax and Net Investment Income Tax, which began in 2013.

Since the estate tax encourages planning over many years prior to actual payment of the tax, we assume that estate and gift taxes are borne by decedents over the decade before death. Using population tax data, we track the income group of decedents in the ten years prior to their death to estimate the share of estate tax paid by decedents in these income groups. The estimated share of estate tax is then allocated to observations in these income groups each year. This approach accounts for year-to-year income variability among high-wealth individuals and is consistent with Joulfaian (2001) and Cronin and Eiler (2018), who found a higher correlation between wealth at death and income five years prior to death than the last full year before death. Relative to alternative approaches, such as the Piketty and Saez (2007) assumption that decedent income and wealth rankings are the same or the PSZ current-year income capitalization approach, our approach reflects the complex relationships among income dynamics, wealth, and estate tax planning.

State and local income taxes and residential real estate taxes are based on itemized deduction amounts. Since nearly all tax returns at the top of the distribution itemize deductions, the deducted amounts provide good measures for top income groups, account for state-level heterogeneity, and capture most state income taxes (about 70 percent in early decades and 90 percent in recent decades).[23] Corporate income taxes and property taxes are those previously calculated for pre-tax income. Payroll taxes include employee and employer taxes, as well as self-employment taxes reported on tax returns. The employee portion of payroll taxes uses previously calculated employer taxes except for three years with special rates (1984, 2011, and 2012). Sales and other taxes are allocated by disposable income (after-tax income at the stage above after subtracting payroll taxes) less savings. Public utility payments and fuel taxes are excluded from both taxes and government consumption because they are closer to "user fees" than taxes, a long-discussed perspective (Shoup, 1934). Government deficits/surpluses are allocated by federal payroll and income taxes paid because almost all deficits are at the federal level.

Government consumption includes expenditures valued at cost for national defense, education, streets and highways, and other non-transfer programs. Prante and Chamberlain (2007) argued for an equal per household allocation. The Congressional Budget Office (2013) considered the effects of allocating government consumption either all per capita or all by market income, suggesting both rely on problematic assumptions. For example, police and military spending may be considered to have a large public good component, while higher-income individuals may derive

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[23] Between 1960 and 2017, generally at least 95 percent of the top one percent itemized deductions. The 2017 distribution is applied in later years due to deduction limitations. For recent years, state refundable tax credits are estimated as shares of federal refundable credits on a state-by-state basis. Details of allocations to non-itemizers are provided in the online appendix.

more benefits from government spending for public universities. Reynolds and Smolensky (1977, p. 50) allocated this spending half per capita and half by income, arguing that "households benefit on some equalitarian basis as well as in proportion to income." We also allocate government consumption half per capita and half by after-tax income to account for the mixture of types of government spending. Because the incidence of government spending is uncertain, we present alternative allocations in the sensitivity analysis.

IV. Results

This section summarizes our basic findings and compares our top income share estimates to PS, PSZ, and the Congressional Budget Office. While only top one percent income shares are discussed here, we also find that increases in income shares for the top 10 percent and top 0.1 percent are smaller than PS and PSZ some prior estimates for pre-tax income and trends are relatively flat for after-tax incomes (Figure A1). This section also discusses implications for estimating the distribution of economic growth, tax progressivity, and overall redistribution.

A. *Moving from Fiscal Income to National Income Measures*

To summarize the effects of broadening the income measure from fiscal income to national income, consider the effects on top one percent shares in 1960 and 2019. In 1960, our sample and income corrections reduce the top one percent income share of fiscal income from 9.0 to 8.1 percent. Income expansions to reach national income increase this share to 10.2 percent (Table 1 and Figure 2). The most important factor in this higher share is the addition of pre-tax C corporation income (including corporate retained earnings and taxes) in place of realized capital gains. This reflects the sheltering of income inside corporations to avoid high individual income tax rates. For 2019, while the fiscal income share is 20.0 percent, our pre-tax income share is 13.7 percent, about 6 percentage points (pp) lower. The most important reasons for this difference are controlling for the decrease in the marriage rate of lower-income tax units (3.0 pp), replacing realized capital gains with pre-tax C corporation income (1.3 pp), including employer-provided insurance (0.9 pp), including the employer share of payroll taxes (0.5 pp), and including misreported income (0.4 pp).[24]

Our measure of pre-tax plus transfer income includes government transfers, the largest of which is Social Security benefits. Relative to pre-tax national income, this measure avoids the problem of treating a large share of older retired individuals as having almost no income. In 1960, the top one percent income share is 9.7 percent, only half a percentage point lower than the pre-tax national income share because transfers were relatively small. In 2019, the top share is reduced by almost 2 percentage points from 13.7 to 12.0 percent (see Table 2). These differences are consistent with the increase in earned income inequality being offset by increasing amounts of transfers.

After-tax income accounts for taxes and all government spending. Progressive taxes, discussed more below, further decreased top one percent income shares: by 1.5 percentage points in 1960 and 2.4 percentage points in 2019. After-tax top one percent income shares fluctuate with the business cycle, but have remained relatively unchanged over the last six decades. The estimated increase in the top one percent after-tax income share since 1962 is a modest 0.2 percentage point.

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[24] The adjustment for misreported income resembles estimates in recent studies. DeBacker et al. (2020) found that including misreported income detected in NRP audits decreased top one percent filer shares by 0.3 percentage points and Guyton et al. (2021) found that it lowered top one percent shares by 0.5 percentage points.

It is also important to consider the bottom half of the income distribution. Figure 3, left side, shows that the pre-tax income shares of the bottom 50 percent decreased 5 percentage points since 1962. The decrease was only 2 percentage points after accounting for transfers and 1 percentage point after taxes and transfers. Figure 3 shows that real per capita pre-tax incomes of the bottom half of the distribution increased 132 percent since 1962. Real after-tax incomes nearly tripled (increased 189 percent). Since 1979, real per capita pre-tax incomes increased 36 percent and after-tax incomes increased 67 percent. Similarly, Congressional Budget Office (2018) found that real per capita incomes after taxes and including transfers of the bottom two quintiles increased 62 percent from 1979 to 2015.

A more comprehensive view shows that taxes and transfers have kept most income shares relatively unchanged. Figure 4 shows the combined effects of taxes and transfers on income shares of the top, middle and bottom income quintiles. While the top-quintile share of income before taxes and transfers increased 6 percentage points since 1962, after taxes and including transfers it was essentially unchanged: decreasing in the late 1960s but increasing since 1979. The middle-quintile share declined slightly since 1962, but after taxes and transfers it increased slightly. The bottom-quintile share declined about 2 percentage points since 1962, but increased less than 1 percentage point after accounting for taxes and transfers. In other words, increasing transfers and tax progressivity offset increases in top income shares of pre-tax income. Figure 4 also shows Gini coefficients, which give greater weight to the middle of the distribution. While increasing redistribution over time is still clear, the Gini coefficient shows a milder effect because redistribution has been targeted at the bottom and to a lesser extent the top of the distribution.

B. *Comparison with PSZ Estimates*

This section discusses the similarities and differences between the methodologies in our paper and those in the original PSZ paper.[25] It is important to note that our pre-tax income analysis closely follows the NIPA definition of national income while PSZ uses a modified measure that includes Social Security benefits and subtracts the associated payroll taxes. This section compares our results through 2014, the latest year reported in the original PSZ series. Figure A2 compares our estimates with updated PSZ estimates through 2019.[26]

Many of our adjustments have similar effects to those in PSZ. Our income groups based on all individuals and ranking by size-adjusted income and PSZ income groups based on the number of adults reduce top income shares by similar amounts. We both remove filers younger than 20 years old (PSZ since 1979), most of whom are dependent filers. There is little uncertainty about the distribution of some amounts because they are reported on tax returns (income taxes, and Social Security benefits and tax-exempt interest in recent decades) or calculated from reported

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[25] Piketty, Saez and Zucman have criticized our work, often in misleading ways. For example, critiques in Piketty, Saez, and Zucman (2019) were based on a "simplified" approach for allocating income missing from tax returns. An important limitation was their assumption that income not reported on tax returns has the same distribution as that reported on tax returns. This missing income, however, is much more evenly distributed. For our more detailed response, see the online appendix.

[26] While this section compares our analysis to PSZ (2018) as published, Saez and Zucman (2020) presented revised estimates that partially addressed a problem we discuss below regarding retirement income. Revised PSZ estimates as of October 2021 lowered top one percent income shares by about one percentage point in recent years. Figure A2 shows that revised PSZ national income top one percent shares remained at similar levels as for PS fiscal income since 1988, despite many differences that imply lower national income top shares.

values (payroll taxes, and imputed rent and property taxes in recent decades). Other allocations have similar effects on top shares because the top of the distribution receives only a small amount (transfers) or because data sources suggest similar distributions (employer-sponsored insurance).

In earlier decades, our estimated changes in top one percent income shares are similar to PSZ. As seen in Table 3, from 1962 to 1979, the original PSZ pre-tax share decreases 1.4 pp and ours decreases by 1.8 pp. This similarity is because during these decades most of the income excluded from tax returns was from retained earnings and our allocation approaches have similar distributional effects.

However, differences in how to allocate national income components not on tax returns result in quite different conclusions about levels and trends in top income shares since 1979. For pre-tax income, PSZ estimated the top one percent share increased 9.0 pp (11.2 to 20.2 percent) from 1979 to 2014, while our analysis shows 4.5 pp (9.3 to 13.8 percent).[27] For after-tax income, the PSZ share increased 6.5 pp compared to our estimate of only 1.5 pp (7.3 to 8.8 percent). Over the full period from 1962 to 2014, the PSZ pre-tax top one percent share increases by 7.6 pp, while our share increases 2.8 pp. For after-tax income, the PSZ share increases 5.6 pp, while our share increases only 0.2 pp.

To understand the effects of specific differences in our approaches, Table 4 shows the change in the top one percent share for each difference independently so that the results are not affected by the order of changes. In 2014, our top one percent pre-tax income share is 13.8 percent, 6.4 pp lower than PSZ estimate. As discussed below, the largest differences are from our approaches in allocating underreported income (1.9 pp) and retirement income (1.2 pp). Other differences include our allocations of corporate income taxes (0.7 pp) and other taxes (0.7 pp), our corrections for how income is reported on tax returns (0.4 pp), our basing income groups on individuals and ranking by size-adjusted income (0.4 pp), and our corrections to the sample definitions (0.2 pp).

Nearly one-third of our difference in 2014 is due to PSZ attributing much more underreported income to those with the highest reported incomes than found by the detailed IRS audits. This is primarily due to PSZ allocating underreported business income in proportion only to positive reported business income. The PSZ approach ignores the significant share of underreported business income found on tax returns with reported business losses, thereby overstating amounts on returns that do report large profits. It also ignores evidence that underreporting rates tend to decline at higher levels of reported income as seen in estimates by Johnston (2008) and discussed in the online appendix. In 2014, the PSZ approach implies distributing about 50 percent of underreported business income to the top one percent. However, audit data suggest that only about 15 percent should go to the final top one percent after re-ranking. The PSZ approach effectively removes underreported income found lower in the distribution and transfers it to the top.[28]

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[27] While reduced in magnitude, readers will notice there is still a jump in the top one percent share between 1986 and 1988. This remaining jump is largely due to shifting of ordinary income from 1986 to 1987 and larger amounts from 1987 to 1988 when taxpayers had a full year to plan how to take advantage of the decrease in the top individual tax rate from 50 percent to 38.5 percent and then 28 percent.

[28] Saez and Zucman (2020) pointed out that differences in the treatment of proprietor depreciation in tax data and the national accounts should largely be allocated by expensed amounts. We now follow that approach, but it has little effect on top one percent income shares because expensing decreases net incomes, which can result in negative reported net incomes. See Splinter (2020b) for additional discussion.

Differences in allocating private retirement income explain about one percentage point of the difference in pre-tax top one percent shares. Our 2014 retirement income is about half from taxable distributions (of which the top one percent receives about 2 percent) and half from non-taxable inside buildup, which we allocate by retirement account ownership (the top one percent receives about 7 to 8 percent). Overall, the top one percent receives up to 6 percent of taxable and non-taxable retirement income. In comparison, PSZ online data suggest they allocated more than twice this share to the top one percent. One factor explaining the high PSZ share is that they used both taxable and non-taxable IRA distributions and pension income reported on tax returns to allocate "investment income payable to pension funds"—i.e., inside buildup. While some pension and IRA income can be non-taxable, almost all of the non-taxable amounts on tax returns reflect rollovers from one account to another and, in recent years, the basis portion of Roth conversions.[29] Since these amounts are asset values rather than income, they should not be mixed with income flows to allocate retirement income. In 2014, the PSZ rollover-inclusive approach results in a top one percent share of pension wealth of 14 percent. This is much higher than the Federal Reserve's Distributional Financial Accounts comparable estimate that the top one percent share has been only about 6 to 7 percent of pension entitlements since 2008.[30]

For after-tax income, the PSZ estimate of the top one percent share in 2014 is much higher than ours (15.7 percent vs. 8.8 percent), but most of this difference is explained by pre-tax differences. After accounting for pre-tax differences, only 0.5 percentage points of difference remains. The largest after-tax effect is 1.4 percentage points due to PSZ allocating all government consumption by after-tax income. This assumption ignores the redistributive and public goods aspects of government consumption, which are captured by our half per capita allocation. Another half a percentage point is due to the allocation of government deficits. Our allocation of deficits by current taxes is more consistent with the historical evidence than the PSZ partial allocation by current transfers.[31] These two effects, which lower our top share estimates relative to PSZ, are partially offset by differences in the distribution of corporate and other taxes.

C. *Comparison with Congressional Budget Office Estimates*

The Congressional Budget Office (CBO) also produces widely cited estimates of top income shares using tax data that are widely cited. While our estimates are similar in 1979, CBO's top one percent income share was about 3.6 pp higher than ours in 2014. As estimated in Auten and Splinter (2019), our national income approach results in lower top shares due to several factors:

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[29] When traditional IRAs are converted to Roth IRAs, non-deductible contributions are considered basis and thus non-taxable and included as such on Form 1040. Pensions can also be rolled over into other pension plans or retirement accounts. Some rollovers from one pension plan or retirement account to another can be quite large, with the largest reflecting pension rollovers by executives. In 2014, for example, 79 percent of pension distributions reported by taxpayers with AGI of $1 million or more were tax-exempt. See the online appendix for more details.

[30] These estimates are based on the Survey of Consumer Finances, which is better suited to estimating pension wealth than annual distributions reported on tax returns. Estimates accessed on Oct. 28, 2021 from www.federalreserve.gov/releases/z1/dataviz/dfa/distribute/chart

[31] Ferriere and Navarro (2020) explain that historical government spending shocks were financed with higher tax progressivity and Auten and Splinter (2020, p. 135) note that "federal surpluses have been followed by tax cuts (e.g., 1964 and 2001) and large federal deficits have preceded tax increases (e.g., 1982, 1984, and 1991)." In contrast, the PSZ approach implies that deficits result in cuts to Social Security benefits, Medicare and Medicaid, and refundable tax credits, which is inconsistent with historical experience.

1.8 pp from replacing realized capital gains with retained earnings,[32] 0.7 pp from CBO excluding the institutionalized population and the non-taxable employee portion of employer-sponsored insurance, 0.7 pp from CBO allocating corporate taxes using only capital income reported on tax returns and ignoring retirement account ownership of corporate stock, 0.5 pp from our national income measure including state and local taxes while the CBO measure does not, and 0.4 pp from national income including underreported income and imputed rental income on owner-occupied housing. These reductions are offset by 0.7 pp from our size-adjustments being at the tax-unit level and CBO's at the household level. Both CBO's and our estimates for 2014 suggest that including transfers and deducting tax reduces top one percent shares by about 3 pp.

D. *Distribution of Economic Growth*

Improved income distribution estimates can help us better understand the distribution of U.S. economic growth over time. The cross-sectional approach of PS implies that 58 percent of the increase in fiscal income between 1979 and 2019 went to the top one percent of tax units. PSZ pre-tax income estimates imply 31 percent went to the top one percent. In comparison, our estimates imply that only 22 percent of the increase in pre-tax income went to the top one percent. Using this cross-sectional approach, our income measures thus suggest that economic growth has been shared more equally.

A more fundamental issue is that such cross-sectional computations of the distribution of economic growth convey the impression that it is the same people at the top of the distribution over time. The beneficiaries of economic growth, however, *cannot* be determined by comparing two cross-sections because the membership of income groups changes substantially over time. More than one-third of 1979 adults filing tax returns died by 2014 and were replaced by a larger cohort of new adults and immigrants. This new cohort of adults earned more than half of adjusted gross income in 2014. Income mobility studies also show that it is not the same people at the top across years and that the incomes of the majority of those in top income groups in a given year decline in later years. For example, Kopczuk, Saez, and Song (2010) estimated that about 40 percent of individuals in the top one percent of wages drop out after five years. Auten, Gee, and Turner (2013) found that over half of tax units in the top one percent of income drop out after three years.

Mobility studies also find that incomes of those in the lowest income groups increase by the largest percentages in following years while incomes of those in top income groups decline (Auten and Gee, 2009; Splinter, 2021). These results show that economic growth is shared more equally if one tracks the incomes of individuals over time rather than comparing cross-sections in different years. Even when controlling for life-cycle effects, as discussed in Splinter (2019b), tax return panel data still show a progressive distribution of growth.

E. *Tax Burdens*

The top statutory federal individual income tax rate has fallen dramatically from 91 to 37 percent between 1960 and 2019. But top tax rates present only a limited picture of the true tax burden of the top one percent. In the 1960s, only a tiny fraction of taxpayers were actually subject to the top tax rates (fewer than five hundred tax returns in 1962). Before TRA86, high-income

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[32] The Canberra Group (2001) argued that when included, capital gains should be real accrued amounts, not nominal amounts on a realization basis as in CBO's income definition; but for national accounts capital gains are excluded to avoid double counting of capital income.

taxpayers could take advantage of various tax shelters. TRA86 closed many high-income tax shelters or made them uneconomic with lower tax rates. When top tax rates were increased in 1991 and 1993, this legislation further increased progressivity by including additional base-broadening provisions targeted at high-income taxpayers (Auten, Splinter, and Nelson, 2016). Meanwhile, the bottom 90 percent has benefitted from increased tax credits and receives an increasing share of its income from tax-preferred and tax-exempt sources. These considerations suggest it would be useful to examine overall tax burdens using a consistent measure of broad income.

Figure 5 shows how total tax burdens by income class have changed over time. These average effective tax rates include federal, state, and local taxes (including payroll taxes for social insurance programs) and are as a percent of the pre-tax income plus transfers measure. The progressive pattern in Figure 5 resembles that for federal income taxes burden estimates by the Congressional Budget Office, the Joint Committee on Taxation, Treasury's Office of Tax Analysis, Piketty and Saez (2007), and the Tax Policy Center (Splinter, 2020a). Average tax rates among the top half of one percent and the top 0.01 percent were higher in 2000 and 2019 than in 1962 and 1979. Average tax rates for the bottom three quintiles, and especially the bottom quintile, were relatively constant between 1962 and 2000, but then fell dramatically over the last two decades, an indication of increased tax progressivity. The Kakwani index of tax progressivity shows similar results, changing little between 1962 and 1985 but then increasing dramatically between 1985 and 2019 from 0.07 to 0.23 (see the online appendix).

Average tax rates by type of tax are shown in Figure 6 for the top one percent (upper figure) and the bottom 90 percent of individuals (bottom figure). Total tax burdens of the top one percent ranged from 33 to 46 percent over this period, averaging 38 percent with no clear trend. Indeed, the 1960 and 2019 average tax burdens were similar—38 and 42 percent. While a constant tax burden with falling statutory tax rates may seem surprising, it is consistent with earlier analyses of tax burdens in the 1960s.[33] Despite the persistence of the overall tax burden for the top one percent, the type of taxes paid has changed substantially. In 1960, about one-third of their taxes were from federal individual income taxes, one-third from corporate income taxes, and one-third from state and local taxes. In 2019, nearly two-thirds were from federal individual income taxes. Corporate and property taxes decreased substantially as a percent of income, while state and local income taxes increased for the top one percent.

The variation in average effective tax rates of the top one percent is primarily due to factors affecting federal individual income tax liabilities. First, top incomes are procyclical, moving a larger fraction of their incomes into higher tax brackets during expansions and lower brackets during recessions. Second, top tax rates have changed frequently. Especially prominent are the 1968–1970 Vietnam War surtax and the top rate increases in 1993 and 2013. Third, individual income taxes include realized capital gains taxes, even though pre-tax income replaces these with corporate retained earnings. The 1986 spike in taxes paid by the top one percent was due to the unlocking of unrealized gains before capital gains tax rates increased with TRA86.

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[33] For the top one percent in 1966, Okner (1975) estimated that total federal, state, and local taxes ranged from 32 to 39 percent of his measure of adjusted family income using a broad range of incidence assumptions. Our estimate of 36 percent for 1966 falls in the middle of this range. This situation of high statutory but low effective tax rates in the 1960s has been described as "dipping deeply into great incomes with a sieve," a phrase originally used by Simons (1938, pp. 218–219) for similar policies in the 1930s, which he also described as "the result of a decorative sort of progression, yielding much discussion, much indignation, and very little revenue."

Results in Figure 6 suggest that taxes reduce inequality of after-tax income more in recent decades. Average tax rates for the top one percent fluctuated around 38 percent with no clear trend. In contrast, tax rates for the bottom 90 percent of the distribution have decreased from 25 to 20 percent since 1979 in spite of increased payroll taxes. Congressional Budget Office and income tax data indicate that this was primarily due to the growth in low-income tax credits (Splinter, 2019a, 2020a). Thus, the increase in overall tax progressivity was driven primarily by individual income tax reductions.

Payroll taxes and the associated Social Security benefits and disability insurance, Medicare, and unemployment insurance also have important effects on the distribution of income. Employment-related social insurance transfers are dependent on having paid payroll taxes, and in the case of Social Security, increase with the number of years and amounts of income subject to tax. While payroll taxes appear regressive relative to annual income, the transfer side of these programs is progressive.[34]

The distributional asymmetry of social insurance transfers and associated payroll taxes suggests they should be considered jointly, as in Figure 7. From 1960 through 1985, social insurance benefits and payroll tax rates were about equal, and both benefit and tax rates increased dramatically for both the bottom 90 and top one percent. For the bottom 90 percent, benefit rates continued to increase while their payroll tax rates leveled off after the 1980s. For the top one percent, however, benefits remained roughly constant while payroll tax rates jumped in 1994 with the uncapping of the 2.9 percent Medicare tax. These changes increased the overall progressivity of the combined taxes and benefits of social insurance policies.

To consider the overall effects of taxes and transfers on the income distribution, Figure 9 shows average net redistribution rates by income group for selected years. Net redistribution rates are similar to average tax rates but deduct transfers from taxes in the numerator and use pre-tax income in the denominator. The top income quintile has similar net redistribution rates as tax rates because transfers are small relative to income. The bottom quintile, however, receives substantial transfers and their redistribution rate "increased" from –42 to –78 percent between 1962 and 1979. Redistribution for the bottom quintile persisted at this higher level until the Great Recession, when it increased again before settling at –147 percent in the following economic expansion.[35] While only the bottom quintile received net transfers in all years, the second quintile received net transfers only since the 1980 recession. Similarly, the middle quintile has gone from being a net taxpayer to roughly breaking even since the Great Recession. These changes resulted from the decreasing share of the population paying income taxes as well as increasing amounts of transfers. Thus, increasing tax progressivity and transfers both contributed to increasing redistribution.[36]

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[34] The OASDI tax base is capped and the Medicare (i.e., HI) tax base was capped before 1994. Earnings are taxed at a flat rate up to these caps. Social Security benefits are based on average adjusted earnings using a progressive formula that replaces 90 percent of initial earnings, but only 32 and then 15 percent of higher earnings. Accounting for differences in longevity attenuates the system's progressivity, but it is still progressive from a lifetime perspective (Congressional Budget Office, 2006). Since 1984, up to 50 percent of Social Security benefits are subject to income tax for those with incomes over $25,000 ($32,000 for joint filers) and up to 85 percent for those with incomes over $34,000 ($44,000 for joint filers). If these taxes were included here, the progressivity of the social insurance system would be even larger.

[35] Congressional Budget Office data would imply a much larger redistribution rate. This is due to our much broader pre-tax income definition (Splinter, 2020a).

[36] Redistribution can also be measured by the Reynolds–Smolensky index, which captures the difference between the Gini coefficient before and after taxes and transfers. Before 1985, this index was countercyclical but relatively stable.

V. Sensitivity Analysis

This section presents sensitivity tests of alternative assumptions and a discussion of offshore wealth. These sensitivity tests, shown in Table 5, suggest that while alternative assumptions can result in modestly higher or lower top income shares, they are within about a percentage point of our main results. As discussed in the online appendix, our tax-based analysis likely underestimates some economic resources of low-income households and there are additional uncertainties beyond those examined here.

The incidence of the corporate income tax has long been controversial and researchers have drawn different conclusions. As discussed earlier, our analysis distributes 25 percent of the corporate tax burden by wages and 75 percent by corporate capital and interest-bearing assets. Using this approach, the top one percent shares of pre-tax income increased by 2.7 percentage points (11.0 to 13.7 percent) between 1962 and 2019. Distributing half of the corporate tax by wages (as suggested by some recent studies) and half by corporate capital and interest-bearing assets results in a larger increase of 2.9 percentage points (10.7 to 13.6). Distributing only by corporate capital and interest-bearing assets results in a higher top one percent pre-tax income share in 1962 and a smaller increase of 2.3 percentage points (11.4 to 13.7).[37]

Corporate retained earnings can also be allocated in different ways. Rather than distributing the portion not in retirement accounts 25 percent by capital gains and 75 percent by dividends, distributing 50 percent by capital gains and 50 percent by dividends increases top one percent after-tax income shares by only about two-tenths of a percentage point. Allocating it all by dividends has nearly identical results, likely due to re-ranking effects.

To account for economies of scale in tax units, our baseline estimates rank tax units by size-adjusted income. Note that this is only for ranking purposes as each unit retains its full income. Our size-adjustment uses the standard square-root equivalence elasticity of 0.5, which implies partial economies of scale. The assumption of no economies of scale (elasticity of 1) implied by the PSZ equal-split approach, increases top one percent income shares by 0.4 and 0.1 percentage point in 1962 and 2019 relative to our baseline estimates. Assuming full economies of scale (elasticity of 0) for ranking would reduce top one percent shares by 1.2 and 0.5 percentage points in these years. Our baseline estimates are thus in between these two extreme assumptions.

Wage and investment income as reported on individual tax returns generally reflect *gross* income rather than *net* income. Distributional analysis of national income would better measure economic income of individual households if expenses of earning this income were consistently netted against income. Employee business expenses and investment interest expenses are only deductible as itemized deductions and therefore not accounted for in fiscal income. In recent years, unreimbursed employee business expenses have been about $100 billion and investment interest expenses about $30 billion. Employee business expenses tend to be more important in certain

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Between 1985 and 2019, the Reynolds-Smolensky redistribution index increased by about half, from 0.09 to 0.13, indicating greater redistribution (see the online appendix).

[37] Distributing the corporate tax to all non-housing capital, including non-C corporation capital implies an infinite elasticity of substitution between different forms of business organization or a long-run equilibrium. While there was some immediate switching from existing C corporations to S corporation status following TRA86, most of the shift into the passthrough form occurred gradually from more new businesses forming as S corporations or partnerships. This suggests significant frictions for switching between the C corporation and other forms of business, especially for large publicly traded corporations. See the online appendix and Auten, Splinter, and Nelson (2016).

middle-income occupations (e.g., construction and over-the-road truck driving) while investment interest expenses are more concentrated at the top. As a result, accounting for both has no significant effect on the top one percent shares shown in Table 5.

Since the economic incidence of government consumption is inherently uncertain, it is important to examine alternative assumptions. Our main approach allocates 50 percent per capita and 50 percent by after-tax income. Distributing only 25 percent per capita (smaller public good effects) would increase the top one percent share by about 0.6 percentage points in all years shown while distributing 75 percent per capita (larger public good effects) would decrease it by a smaller amount.

A more robust sensitivity test combines several allocations that increase (decrease) top income shares, with an emphasis on those that are more uncertain. Changes to our approach that would *increase* 2019 after-tax top shares are: including no underreported income or government deficits/surplus and allocating government consumption 25 percent per capita and 75 percent by income. Changes that would *decrease* 2019 after-tax top shares are: size adjust using households rather than tax units, allocate non-retirement retained earnings by 50 percent capital gains/50 percent dividends, and allocate government consumption 75 percent per capita and 25 percent by income. Using these two sets of assumptions the 2019 top one percent after-tax share ranges between 7.8 and 9.2 percent, almost one percentage point below and half a percentage point above our main estimate of 8.7 percent.[38]

How might long-run changes in tax compliance affect top income shares? Nearly all state governments began income tax withholding in the 1950s or 1960s (along with third-party reporting) and intergovernmental agreements for coordinating audits. Troiano (2017) estimated that these policy changes caused large increases in reported top income shares. This implies larger pre-1970 high-income underreporting rates than the 1988 audit data on which our early estimates are based. Accounting for half of the Troiano (2017) effect—because just over half of states had implemented these policies by the early 1960s—would increase our 1962 top one percent income share by 0.7 percentage points, suggesting a half a percentage point *decrease* for the after-tax share between 1962 and 2019.

How might including income from unreported offshore wealth affect top income shares? Saez and Zucman (2016) estimated that offshore wealth would increase top one percent wealth in 2013 by about $1.2 trillion (online appendix Table B.6). Assuming this wealth earns a 5 percent return and is owned by the same individuals in the top of the income distribution, it would increase our top one percent pre-tax income shares by only one-third of a percentage point. But this may overstate the effect. Johannesen et al. (2020) found an average nominal rate of return of only 3 percent on recently reported offshore wealth and Zucman (2013) estimated an average yield of 3.5 percent. In addition, reporting of foreign accounts to U.S. tax authorities has increased substantially with new information-sharing and enforcement efforts, suggesting a smaller effect in recent years (Auten and Splinter, 2021). It is also important to note that unreported offshore wealth is not a new phenomenon and could increase estimated inequality in all years. For example, one early response to offshore wealth was the enactment of subpart F rules for controlled foreign

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[38] Adding the extreme assumptions of either no economies of scale or full economies of scale for ranking, the range in top one percent shares is 6.9 to 9.3 percent in 2019. Our main estimate of 8.7 percent is near the high end of this range.

corporations in 1962 (Hellerstein, 1963). A 1981 Treasury and IRS report discussed the growing use of tax havens in the 1970s.[39] There is of course uncertainty about offshore wealth and other forms of evasion.

In summary, sensitivity tests suggest that alternative assumptions can result in modestly higher or lower top income shares. Our findings of lower levels of inequality and smaller increases in top income shares appear robust to the use of alternative assumptions.

VI. Summary and Conclusions

Using administrative tax data, this paper develops new estimates of the distribution of income in the U.S. since the 1960s, including levels and trends in top income shares. Our estimates for pre-tax income, based on distributing total national income, suggest that the top one percent share declined from 11.0 percent to 9.3 percent from 1962 to 1979 and then increased to 13.7 percent by 2019. Viewed over the full period, the top share increased by only 3 percentage points. While our pre-tax income includes labor and investment income, it provides an incomplete picture of resources available to individuals. A broader measure that includes Social Security benefits and other transfers shows lower shares and an increase of only 2 percentage points. Our estimates for after-tax income suggest that the top one percent share increased 1.4 percentage points since 1979 and 0.2 percentage points since 1962. These corrections also have implications for lower-income changes. Instead of real per capita incomes of the bottom half of the distribution appearing unchanged since 1979, we find that after taxes and transfers they increased by more than two-thirds.

Using tax return data, Piketty and Saez (2003) argued that the top one percent income share more than doubled since 1962. This analysis, however, did not account for the effects of major tax reforms, transfers and other income sources not reported on individual income tax returns, or for changes in marriage rates. Thus, it gave a distorted view of income inequality levels and trends. Piketty, Saez, and Zucman (2018) reached similar conclusions after addressing some of these issues but introduced new problems with their assumptions about allocating income not reported on tax returns. Our analysis shows that their conclusions are not robust to using more data-driven allocations and correcting for changes in how income is reported in tax data.

The large share of income not reported in tax data and the challenges of accounting for major social and economic changes means that there is considerable uncertainty associated with estimating income distributions over time. While noting these challenges, our analysis highlights the importance of attention to detail in using tax data, accounting for tax reforms, and including income not reported on tax returns. It also shows the sensitivity of top income share estimates to the assumptions used to allocate income not reported on tax returns. Our analysis makes an important contribution to better understanding the evolution of the income distribution since the 1960s.

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[39] This report estimated about $30 billion of income in tax havens in 1978. This was 1.5 percent of national income. See pg. 38 of Internal Revenue Service and U.S. Treasury Department (1981).

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Table 1: Effects of adjustments on top 1% market and pre-tax income shares

Adjustments	Top 1% income shares					Top 1% share changes				
	1960	**1979**	**1985**	**1989**	**2019**	**1960**	**1979**	**1985**	**1989**	**2019**
Piketty-Saez fiscal income (with CGs)	9.0	9.0	11.1	13.8	20.0	----	----	----	----	----
Piketty-Saez fiscal income (no CGs)	8.3	8.1	9.2	12.8	18.0	-0.7	-0.9	-1.9	-1.0	-1.9
Adjustments to PS fiscal income & income groups										
Correct sample	8.3	8.1	9.2	12.6	17.3	*	*	*	-0.2	-0.8
Impose post-TRA86 loss limits	8.4	8.3	9.7	----	----	*	0.2	0.5	----	----
Add tax-exempt interest	8.7	8.6	10.1	12.9	17.4	0.3	0.3	0.4	0.3	0.1
Correct income definition	8.7	8.6	9.9	12.8	17.0	*	*	-0.1	-0.2	-0.4
Set groups by number of individuals	7.1	6.8	8.4	10.8	14.0	-1.6	-1.8	-1.5	-1.9	-3.0
Rank tax units by size-adjusted inc.	8.1	7.8	9.3	11.6	15.4	1.1	1.0	0.9	0.8	1.4
Corrected fiscal income & total chg.	**8.1**	**7.8**	**9.3**	**11.6**	**15.4**	**-0.9**	**-1.2**	**-1.8**	**-2.2**	**-4.5**
Expansions to PS fiscal income										
Fiduciary retained income	8.3	8.1	9.6	11.9	15.6	0.2	0.3	0.3	0.3	0.2
C-corporation retained earnings	10.6	9.8	10.5	12.2	16.2	2.3	1.8	0.9	0.3	0.6
C-corporation taxes	11.4	10.2	10.6	12.3	16.2	0.8	0.3	0.1	*	0.1
Business property tax	11.6	10.3	10.7	12.4	16.4	0.2	0.2	0.1	0.1	0.2
Inflation correction for interest	11.7	10.8	11.0	12.7	16.5	0.1	0.5	0.3	0.3	0.1
Underreported income	11.4	10.7	10.9	12.6	16.1	-0.3	-0.2	-0.1	-0.1	-0.4
Imputed rent	11.2	10.5	10.8	12.4	15.8	-0.2	-0.1	-0.1	-0.2	-0.3
Employer payroll tax	11.0	10.1	10.3	11.9	15.3	-0.2	-0.4	-0.4	-0.5	-0.5
Employer insurance	10.9	9.8	10.0	11.4	14.5	-0.1	-0.3	-0.4	-0.5	-0.9
Retirement account income	11.0	10.1	10.3	11.7	14.7	0.1	0.2	0.3	0.3	0.3
Indirect taxes, non-profits, etc.	10.2	9.3	9.3	10.7	13.7	-0.8	-0.8	-1.0	-1.0	-1.0
Pre-tax income & total changes	**10.2**	**9.3**	**9.3**	**10.7**	**13.7**	**1.2**	**0.3**	**-1.8**	**-3.1**	**-6.3**

Notes: Total changes are relative to the Piketty and Saez series with capital gains (thresholds set without capital gains). Sample corrections remove non-adult, dependent, and non-resident filers and adjust the number of non-filers and their income. Imposing post-TRA86 loss limits makes many high-income losses non-deductible in earlier years. Correcting the income definition adds back net operating losses among other changes. Setting the groups by the number of individuals means each percentile has the same number of individuals (rather than tax units) and ranking tax units by size-adjusted income controls for differences in the size of tax units. Expansions add income missing from the PS fiscal income definition: fiduciary income from trusts and estates, corporate retained earnings (undistributed profits), corporate taxes that are part of pre-tax income and allocated to labor and capital owners, business property taxes, an inflation adjustment that increases business income due to lower real interest payments, misreported income allocated based on special random audits, imputed rent on owner-occupied housing allocated by property taxes, employer-paid payroll taxes and insurance that are part of pre-tax income, retirement account income missing from tax returns that is allocated by retirement wealth, and various taxes and income sources (non-profits) that are included in national income but not in fiscal income. See the online appendix for detailed description of adjustments. * denotes changes between -0.05 and 0.05 percentage points.

Sources: Authors' calculations and Piketty and Saez (2003 and updates).

Table 2: Effects of transfers, taxes, and government spending on top 1% income shares

Adjustments	Top 1% income shares					Top 1% share changes				
	1960	1979	1985	1989	2019	1960	1979	1985	1989	2019
Pre-tax income	10.2	9.3	9.3	10.7	13.7	----	----	----	----	----
Pre-tax Income Plus Transfers, Add transfers										
Social Security benefits	9.9	9.0	9.0	10.3	13.0	-0.2	-0.3	-0.3	-0.4	-0.7
Unemployment benefits	9.9	8.9	9.0	10.3	13.0	-0.1	*	*	*	*
Other cash transfers	9.7	8.8	8.9	10.2	12.9	-0.2	-0.1	-0.1	-0.1	-0.2
Medicare	----	8.7	8.8	10.0	12.5	----	-0.1	-0.1	-0.1	-0.4
Other non-cash transfers	9.7	8.6	8.6	9.8	12.0	*	-0.2	-0.2	-0.2	-0.5
Pre-tax income plus transfers & total changes	**9.7**	**8.6**	**8.6**	**9.8**	**12.0**	**-0.5**	**-0.7**	**-0.7**	**-0.9**	**-1.7**
After-tax Income, Remove taxes										
Federal indiv. income & estate tax	8.7	7.7	7.5	8.7	9.9	-1.0	-0.9	-1.1	-1.2	-2.1
State/Local individual income tax	8.6	7.5	7.3	8.4	9.4	-0.1	-0.1	-0.2	-0.3	-0.5
Corporate income tax	7.9	7.2	7.2	8.3	9.3	-0.7	-0.3	-0.1	-0.1	-0.1
Property tax	7.7	7.1	7.1	8.2	9.1	-0.2	-0.1	-0.1	-0.1	-0.2
Payroll tax	7.9	7.5	7.6	8.8	9.4	0.3	0.4	0.5	0.6	0.4
Sales and other taxes	8.2	7.7	7.8	8.9	9.6	0.2	0.2	0.2	0.2	0.2
After-tax Income, Add rest of government sector										
Government deficit/surplus	8.6	7.8	7.8	9.0	9.2	0.4	0.1	*	*	-0.4
Government consumption	8.0	7.3	7.2	8.3	8.7	-0.6	-0.6	-0.5	-0.7	-0.5
After-tax income & total changes	**8.0**	**7.3**	**7.2**	**8.3**	**8.7**	**-1.7**	**-1.3**	**-1.4**	**-1.5**	**-3.3**
Total changes: pre-tax to after-tax	----	----	----	----	----	**-2.2**	**-2.0**	**-2.1**	**-2.4**	**-5.0**

Notes: Tax totals are based on NIPA amounts. Fuel and utility taxes are not included. See the online appendix for detailed description of adjustments. * denotes changes between -0.05 and 0.05 percentage points.
Source: Authors' calculations.

Table 3: Comparison of top 1% income shares and changes

	1962	1979	2014	1962–1979 Change	1979–2014 Change	1962–2014 Change
Piketty-Saez-Zucman						
Pre-tax	12.6	11.2	20.2	-1.4	9.0	7.6
After-tax	10.1	9.1	15.7	-0.9	6.5	5.6
Auten-Splinter						
Pre-tax	11.0	9.3	13.8	-1.8	4.5	2.8
Pre-tax plus transfers	10.6	8.6	12.1	-2.0	3.4	1.4
After-tax	8.5	7.3	8.8	-1.3	1.5	0.2

Notes: Adjustments used to estimate various definitions of income are shown in Tables 1 and 2 and described in detail in the online appendix.
Sources: Authors' calculations and Piketty, Saez, and Zucman (2018).

Table 4: Decomposition of top one percent income shares by approaches

Auten-Splinter approach	PSZ approach	Percentage point level difference			Percentage point difference in changes	
		1962	1979	2014	1979–2014	1962–2014
Pre-tax income						
Underreported income by IRS audit data	Underreporting by positive reported income	0.4	1.3	1.9	0.6	1.5
Include distributed & other retirement income	Retirement alloc. partly includes rollovers	-0.1	*	1.2	1.3	1.4
Other taxes by disposable income less savings	Other taxes by factor income less savings	0.2	0.2	0.7	0.5	0.4
Non-retirement pre-tax corporate income	PSZ non-retirement pre-tax corp. income	0.7	0.3	0.7	0.4	*
Various corrections to tax income definition	Use uncorrected tax return market income	*	-0.1	0.4	0.5	0.4
Imputed rent by property tax deductions	Imputed rent by housing wealth estimates	0.3	0.2	0.3	0.1	-0.1
Limit returns to non-dependent U.S. residents	No adjustment	-0.3	-0.3	0.2	0.5	0.5
Groups by individuals/size-adjusted incomes	Groups by adults/equal-split married inc	0.3	0.2	0.4	0.2	0.1
Non-profits/govt. income half per capita	Non-profits/govt. income all by income	*	*	*	*	*
Inflation correction	No correction	-0.1	-0.5	*	0.5	*
Social insurance benefits/deficit excluded	Social insur. ben./def. incl., taxes deducted	*	*	-0.1	-0.1	-0.1
Subtotal: Pre-tax differences (PSZ less AS) & totals		**1.5**	**1.9**	**6.4**	**4.5**	**4.9**
After-tax income						
Govt. consumption allocated half per capita	Govt. consumption all by after-tax income	0.8	0.6	1.4	0.7	0.6
Non-SS deficits by federal income taxes	Half by government transfers, half taxes	-0.2	*	0.4	0.5	0.6
Estate tax by prior decade decedent income	Estate tax by wealth distribution	-0.3	-0.2	*	0.2	0.3
Government transfers as described in text	PSZ transfers distribution	*	*	*	*	*
Corporate taxes by wages/corp. ownership	Corporate taxes by capital ownership	-0.2	-0.2	-0.2	*	-0.1
Other taxes by disposable inc. less savings	Other taxes by factor income less savings	*	*	-0.3	-0.3	-0.3
After-tax differences (PSZ less AS) & totals		*****	*****	**0.5**	**0.5**	**0.5**
Total after-tax differences (PSZ less AS)		**1.5**	**1.9**	**6.9**	**5.0**	**5.4**

Notes: Auten-Splinter approach is described in text and in detail in the online appendix. Percentage point differences are from changing each assumption independently (as opposed to stacking changes) and therefore may not sum to the PSZ less AS difference. Results shown are the average changes in top one percent income shares of going from AS to PSZ and PSZ to AS assumptions (see online data for details). Note also that the total after-tax difference is after netting out the pre-tax differences. * denotes changes between -0.05 and 0.05.
Sources: Authors' calculations and Piketty, Saez, and Zucman (2018).

Table 5: Sensitivity analysis, changes in top 1% income shares

Alternative Allocation Assumptions	1962	1979	2019	1979–2019 Change	1962–2019 Change
Corporate tax burden alternatives (pre-tax income)					
25% wages/75% corporate capital (baseline)	11.0	9.3	13.7	4.4	2.7
50% wages/50% corporate capital	10.7	9.1	13.6	4.5	2.9
0% wages/100% corporate capital	11.4	9.4	13.7	4.4	2.3
Corporate retained earnings (after-tax income)					
individuals: 25% capital gains/75% dividends (baseline)	8.5	7.3	8.7	1.4	0.2
individuals: 50% capital gains/50% dividends	8.8	7.5	8.8	1.3	*
Economies of scale for ranking (after-tax income)					
Partial: square-root, equivalence elast=0.5 (baseline)	8.5	7.3	8.7	1.4	0.2
No economies of scale: equivalence elast=1	9.0	7.6	8.8	1.2	–0.2
Full economies of scale: equivalence elast=0	7.3	6.4	8.2	1.7	0.9
Missing deductions (after-tax income)					
Include employee/investment expenses (baseline)	8.5	7.3	8.7	1.4	0.2
Deduct employee/investment expenses	8.5	7.3	8.7	1.4	0.2
Government Consumption (after-tax income)					
50% per capita /50% after-tax income (baseline)	8.5	7.3	8.7	1.4	0.2
25% per capita /75% after-tax income	9.2	7.8	9.2	1.4	*
75% per capita /25% after-tax income	8.4	7.1	8.4	1.3	*
Multiple Changes (after-tax income)					
Changes increasing 2019 top share	8.5	7.4	9.2	1.8	0.7
Baseline	8.5	7.3	8.7	1.4	0.2
Changes decreasing 2019 top share	8.1	6.8	7.9	0.9	–0.3

Notes: Baseline assumptions are described in text and in detail in the online appendix. Assumptions for sensitivity analysis are described in the text. * denotes changes between -0.05 and 0.05.
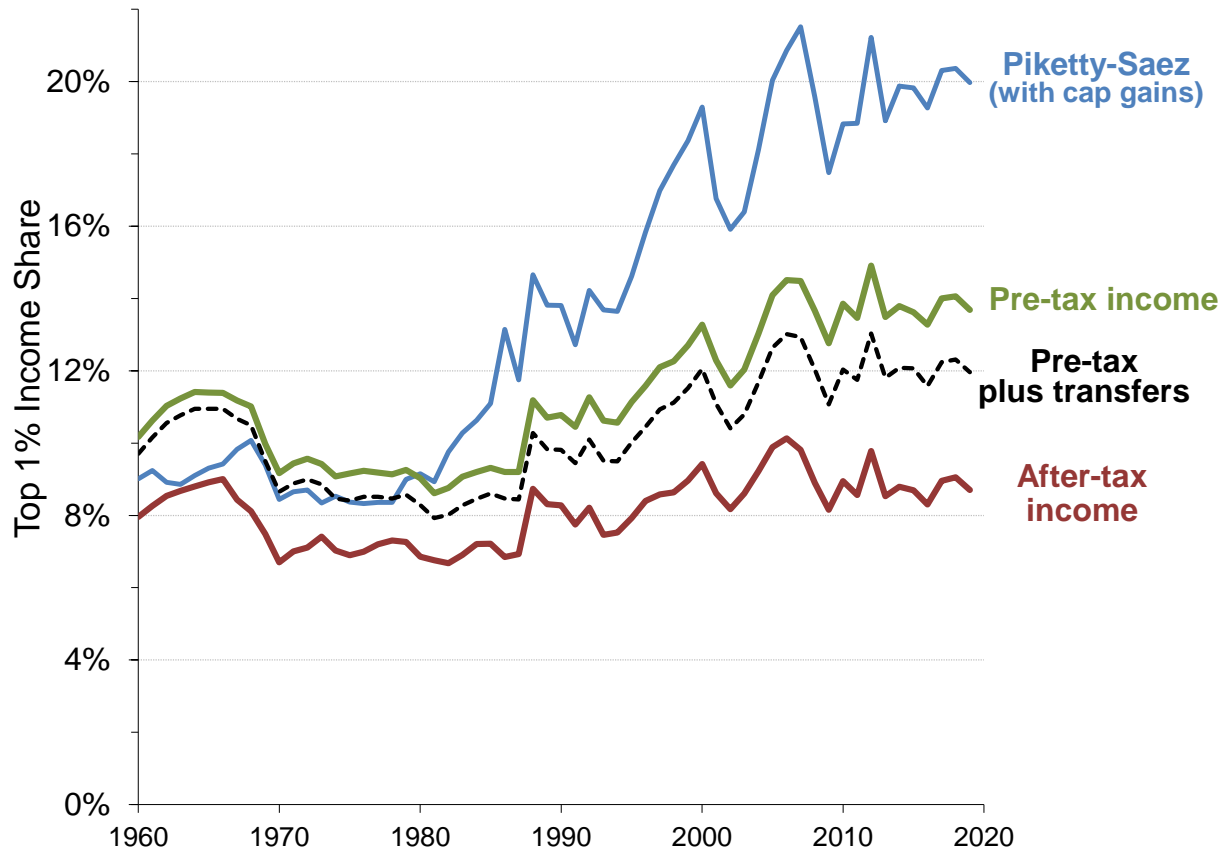*Sources:* Authors' calculations.

Figure 1: Top 1% income shares

Notes: Piketty and Saez series includes capital gains (thresholds set without capital gains). Adjustments used to estimate pre-tax, pre-tax plus transfers, and after-tax income are listed in Tables 1 and 2 and described in detail in the online appendix.

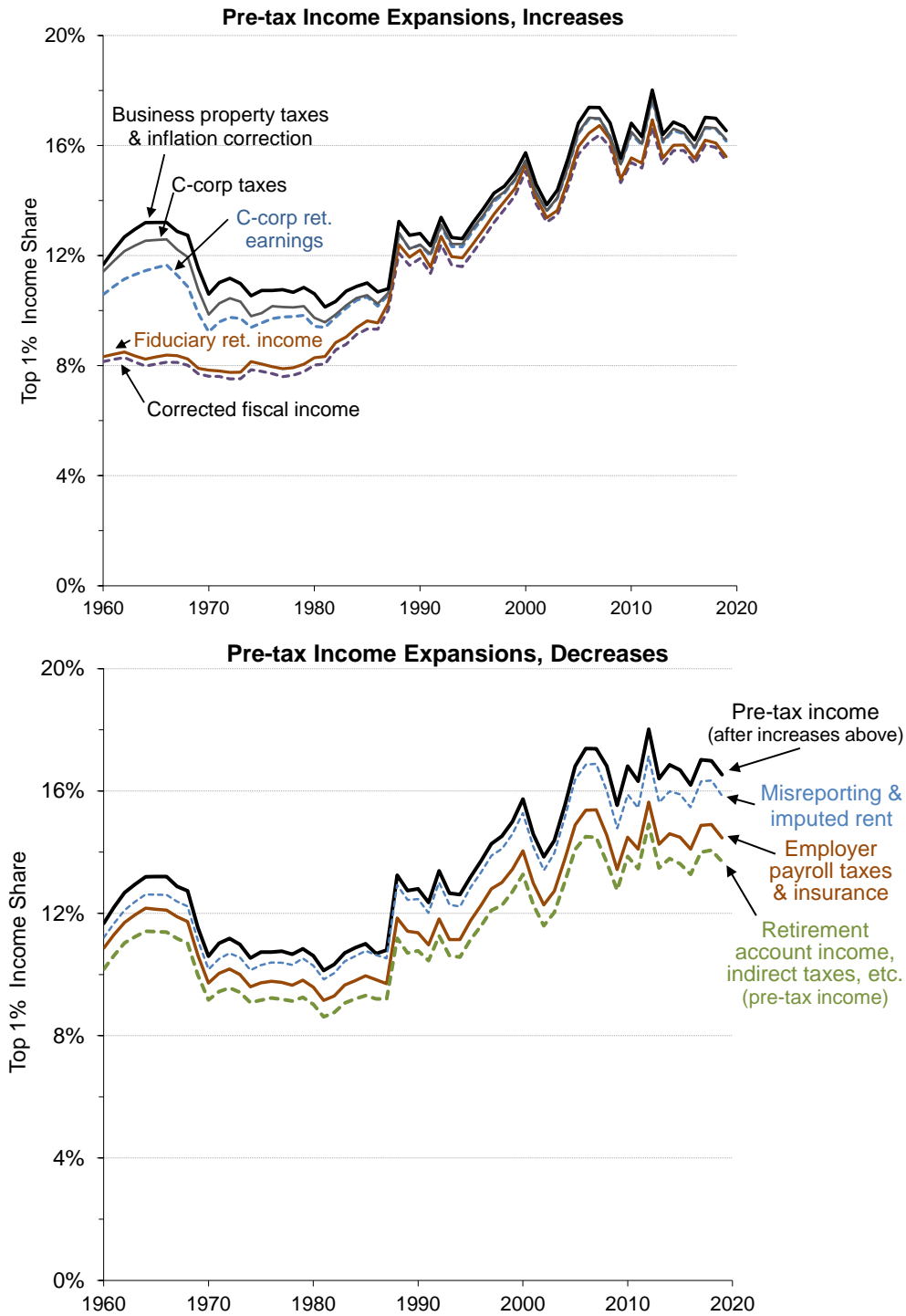*Sources:* Authors' calculations and Piketty and Saez (2003 and updates).

Figure 2: Top 1% income shares: Pre-tax income expansions

Notes: Income expansions start with corrected fiscal income, which is PS fiscal income excluding capital gains after sample corrections, imposing TRA86 loss limits, adding tax-exempt interest, grouping by the number of individuals, and other income corrections. See text and Table 1 for description of adjustments.

Sources: Authors' calculations.

Bottom 50% income shares

Bottom 50% avg. real per capita income ($2019)
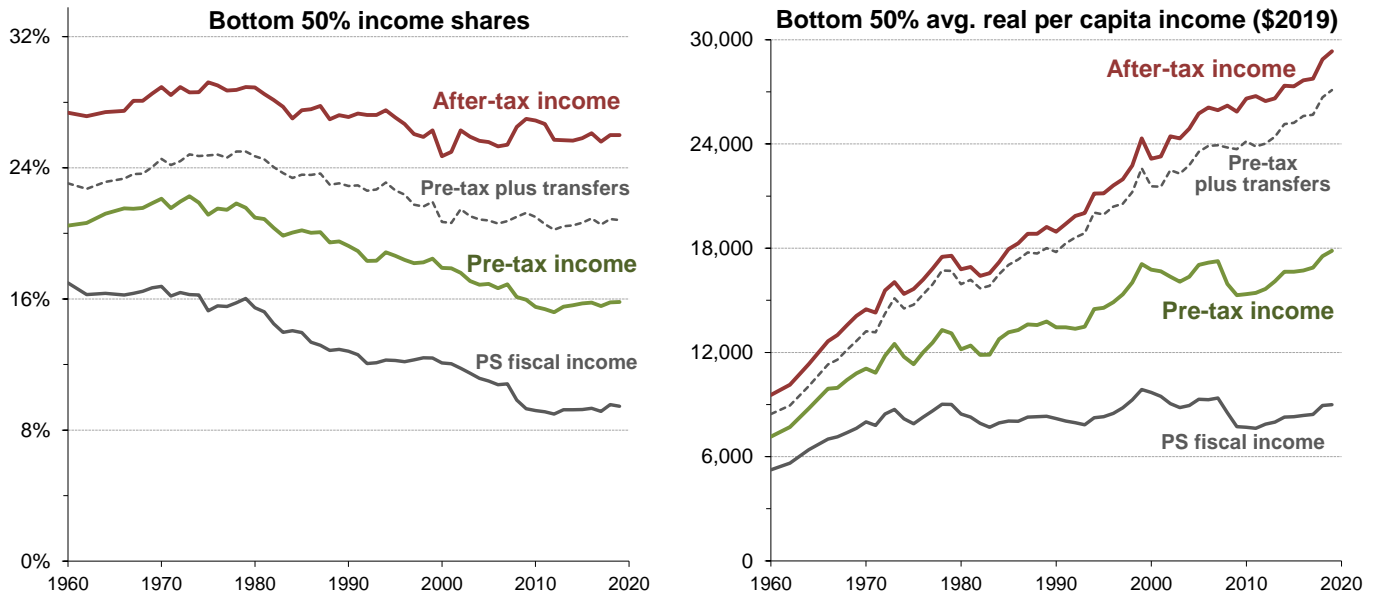
Figure 3: Bottom 50 percent income shares and average per capita real incomes
Notes: PS fiscal income excludes capital gains. Real incomes are indexed by the PCE.
Sources: Authors' calculations.

Income Shares
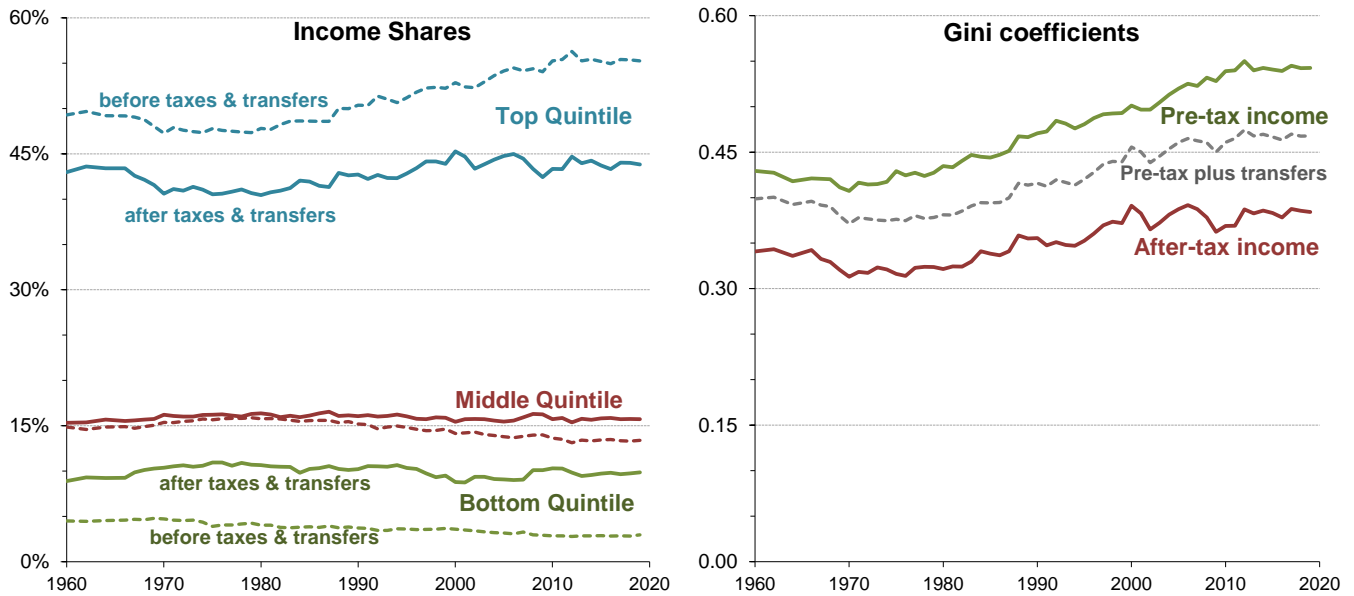
Gini coefficients

Figure 4: Income shares by quintile and Gini coefficients
Notes: Adjustments used to estimate pre-tax (before taxes and transfers), pre-tax plus transfers, and after-tax (after taxes and transfers) income are listed in Tables 1 and 2 and described in detail in the online appendix. Bottom quintile excludes negative incomes.
Sources: Authors' calculations.
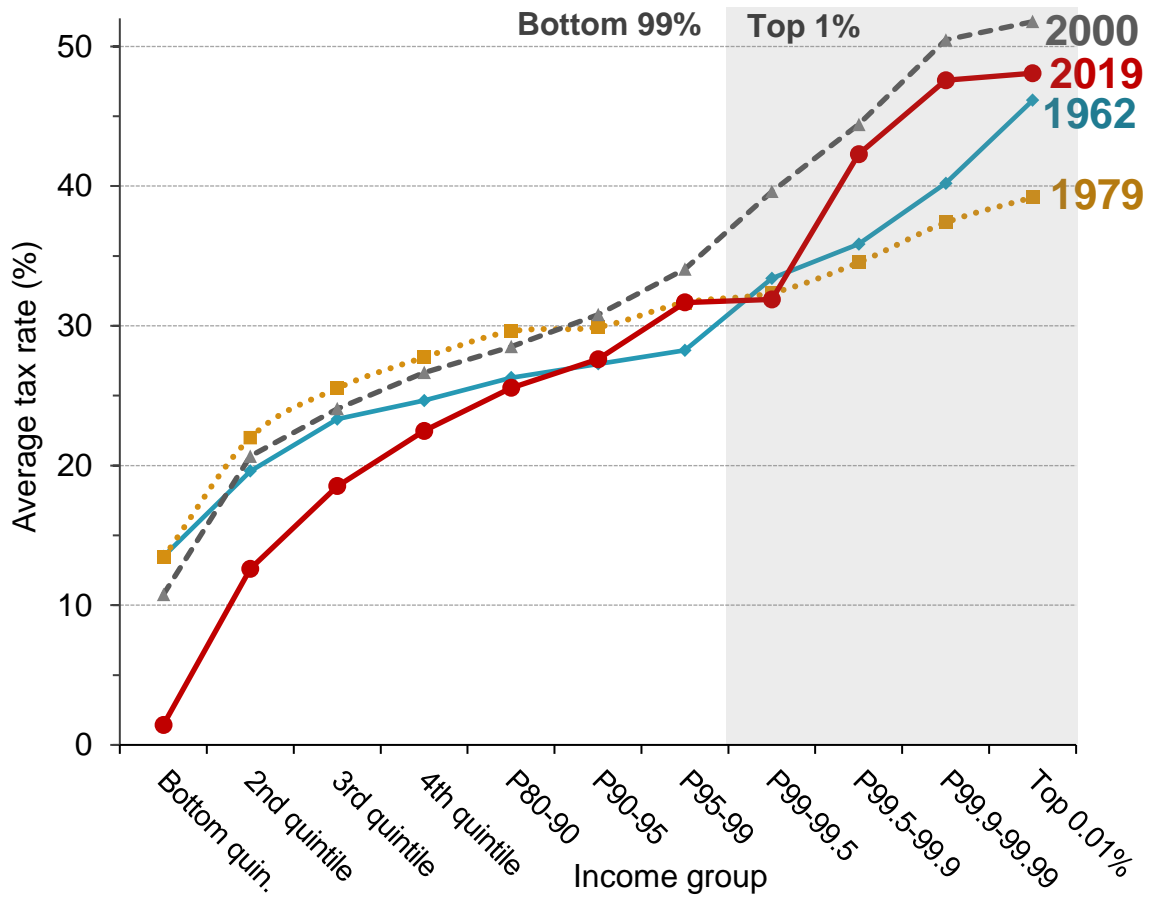
Figure 5: Tax progressivity increased over time

Notes: Average tax rates are taxes (federal, state, and local taxes, including payroll taxes) divided by the pre-tax income plus transfers measure. The bottom four quintiles are proportional along the x-axis, but the top quintile is disaggregated such that it is not proportional along the x-axis. 1962 is the first non-recession year available and other years are business cycle peaks.
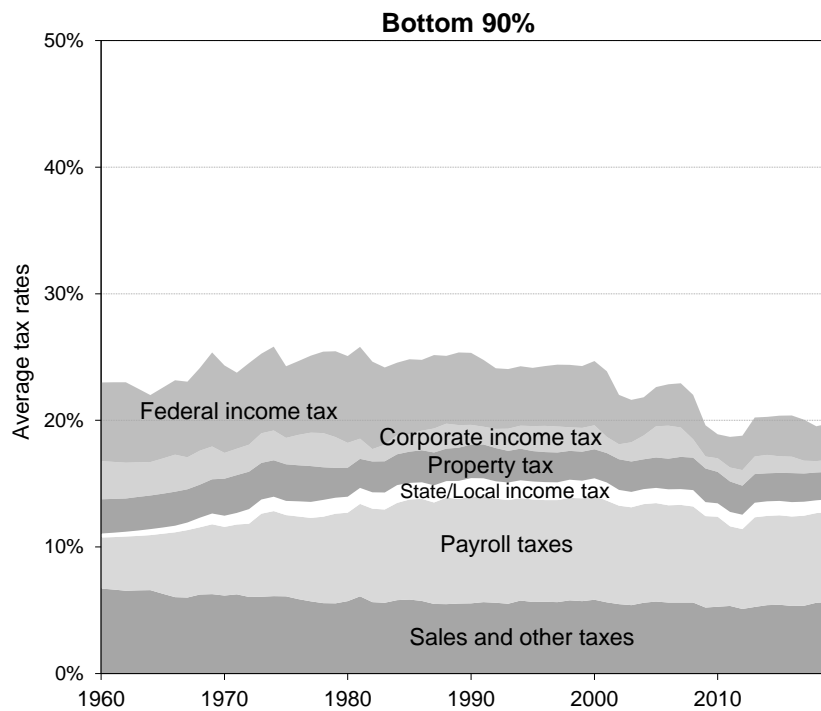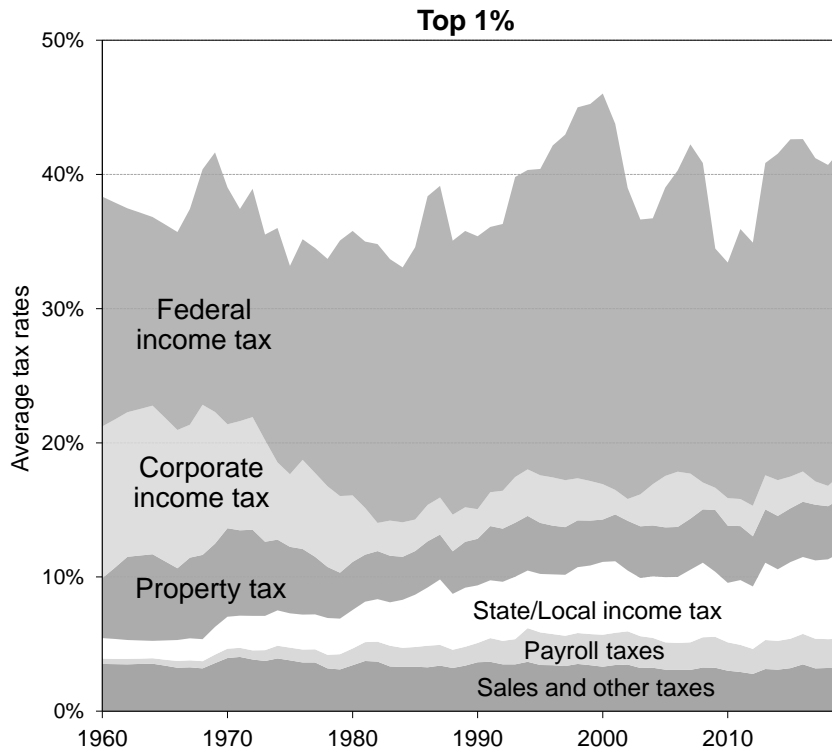*Sources:* Authors' calculations.

Top 1%

Bottom 90%

Figure 6: Tax rates by source, 1960–2019

Notes: Tax rates are taxes as a share the pre-tax income plus transfers measure. Income groups are by pre-tax income plus transfers.
Sources: Authors' calculations.
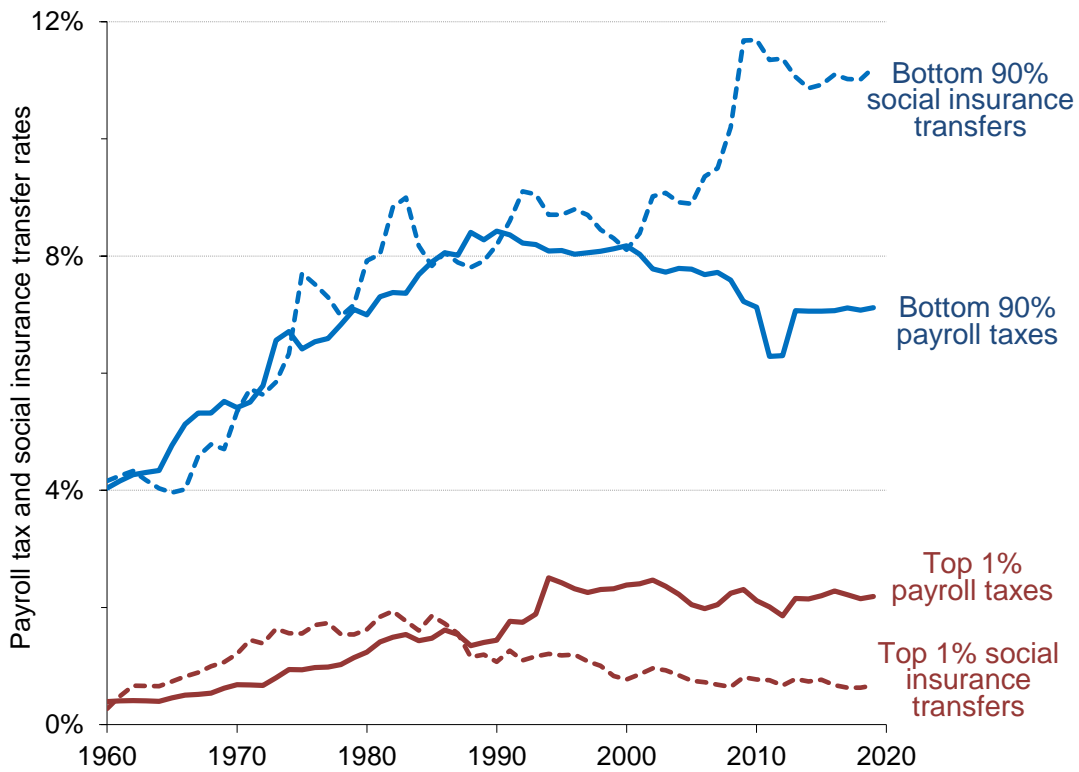
Figure 7: Payroll tax and social insurance transfer rates, 1960–2019

Notes: Average tax and transfer rates are taxes or social insurance transfers divided by the pre-tax income plus transfers measure. Social insurance transfers include benefits from Social Security, Medicare, disability, and unemployment insurance. Surtaxes beginning in 2013 are included with income taxes rather than payroll taxes.
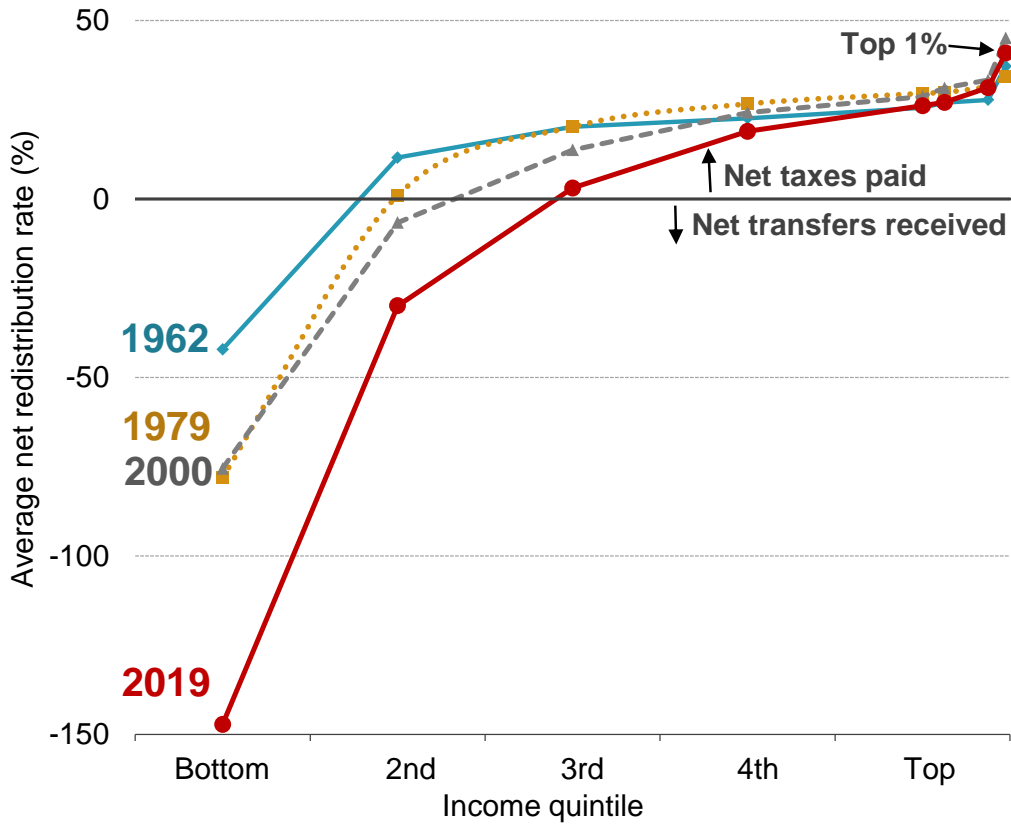*Sources:* Authors' calculations.

Figure 8: Redistribution increased over time

Notes: Average net redistribution rates are all taxes (federal, state, and local taxes, including payroll taxes) less cash and non-cash transfers (excluding government consumption) divided by pre-tax income of each income group. The top quintile is divided into four groups: P80–90, P90–95, P95–99, and the top 1%.
Sources: Authors' calculations.

Appendix
Table A1: Top 1% Income Shares, 1960–2019

Year	Pre-tax income	Pre-tax income plus transfers	After-tax income
1960	10.6	10.2	8.0
1961	10.8	10.4	8.3
1962	11.0	10.5	8.5
1963	11.2	10.8	8.7
1 964	11.4	11.0	8.8
1965	11.4	10.9	8.9
1966	11.4	10.9	9.0
1967	11.2	10.7	8.4
1968	11.0	10.5	8.1
1969	10.0	9.5	7.5
1970	9.2	8.6	6.7
1971	9.4	8.9	7.0
1972	9.6	9.0	7.1
1973	9.4	8.9	7.4
1974	9.1	8.5	7.0
1975	9.2	8.4	6.9
1976	9.2	8.5	7.0
1977	9.2	8.5	7.2
1978	9.1	8.5	7.3
1979	9.2	8.6	7.3
1980	9.0	8.3	6.9
1981	8.6	7.9	6.8
1982	8.8	8.0	6.7
1983	9.1	8.3	6.9
1984	9.2	8.5	7.2
1985	9.3	8.6	7.2
1986	9.2	8.5	6.8
1987	9.2	8.5	6.9
1988	11.2	10.3	8.7
1989	10.7	9.8	8.3
1990	10.8	9.8	8.3
1991	10.5	9.5	7.7
1992	11.3	10.1	8.2
1993	10.6	9.5	7.5
1994	10.6	9.5	7.5
1995	11.1	10.0	7.9
1996	11.6	10.4	8.2
1997	12.1	10.9	8.6
1998	12.3	11.1	8.7
1999	12.7	11.5	9.0
2000	13.3	12.0	9.4
2001	12.3	11.1	8.6
2002	11.6	10.4	8.2
2003	12.1	10.7	8.6
2004	13.0	11.6	9.2
2005	14.1	12.6	9.9
2006	14.5	13.0	10.1
2007	14.5	12.9	9.8
2008	13.7	12.0	8.9
2009	12.7	11.0	8.2
2010	13.9	11.9	8.9
2011	13.5	11.6	8.6
2012	14.9	13.0	9.8
2013	13.5	11.7	8.5
2014	13.8	12.0	8.8
2015	13.6	11.8	8.7
2016	13.3	11.5	8.3
2017	14.0	12.2	8.9
2018	14.1	12.2	9.1
2019	13.7	11.9	8.7

Notes: Adjustments used to estimate various income definitions are listed in Tables 1, 2, and B1 and described in detail in the online appendix. *Source:* Authors' calculations.
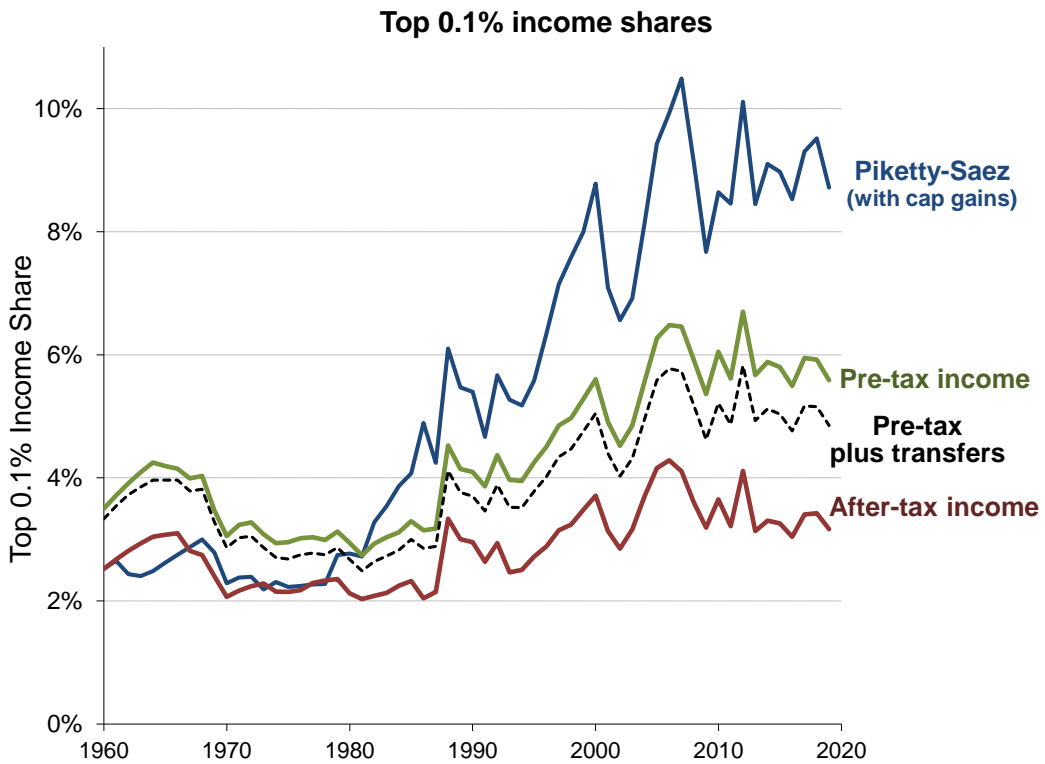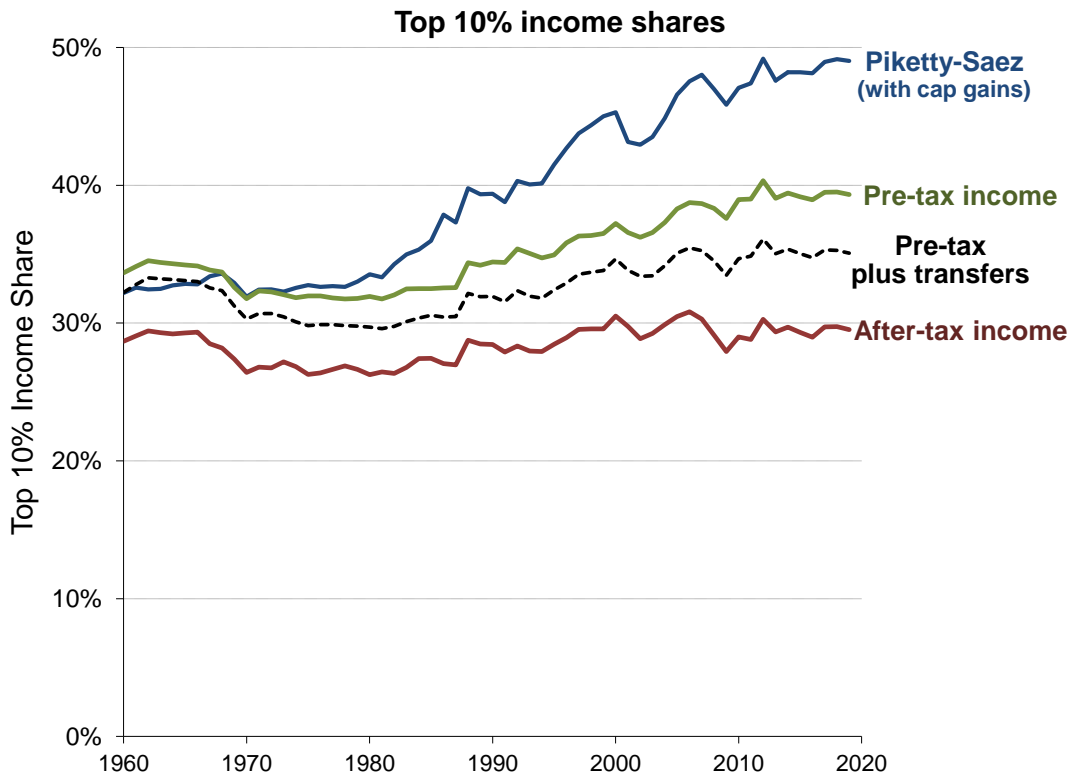
Top 10% income shares

Top 0.1% income shares

Figure A1: Top income shares: Top 10% (top figure) and top 0.1% (bottom figure)

Notes: Piketty and Saez series includes capital gains (thresholds set without capital gains).
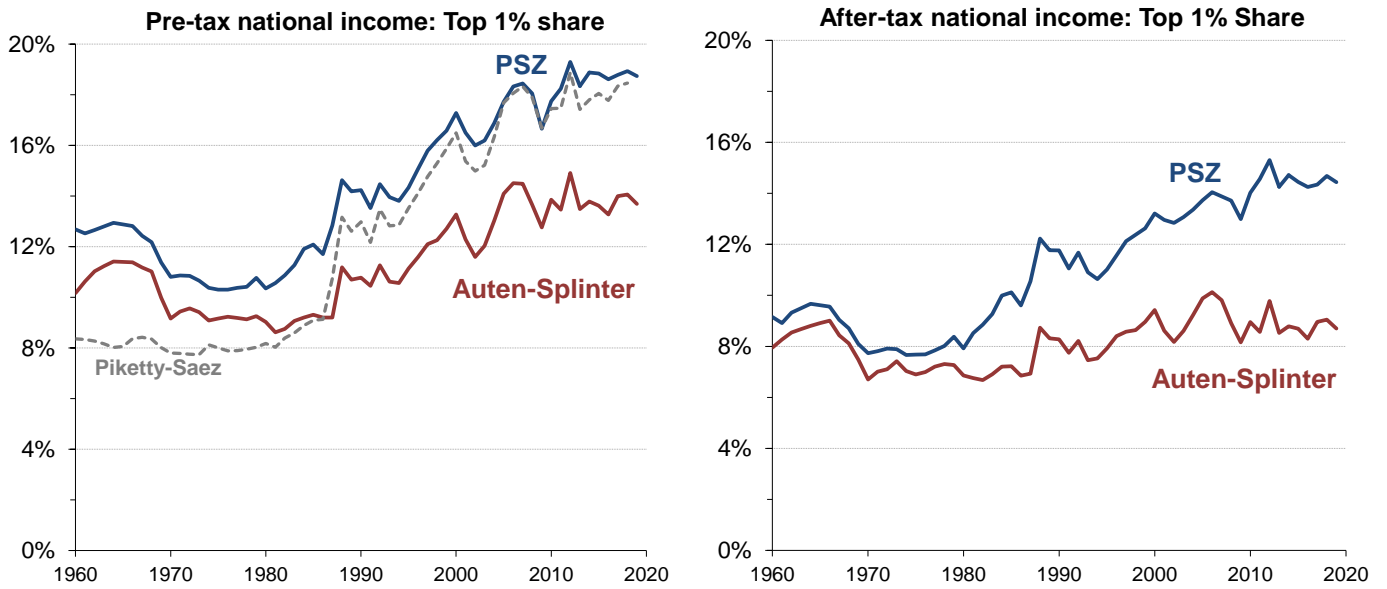*Sources:* Authors' calculations and Piketty and Saez (2003 and updates).

Figure A2: Top 1% shares of national income: Comparison with PSZ

Notes: Adjustments used to estimate Auten-Splinter pre-tax and after-tax income are listed in Tables 1 and 2 and described in detail in the online appendix. Piketty-Saez series excludes capital gains to make more comparable to national income.

Sources: Authors' calculations, Piketty and Saez (2003 with updates), and Piketty, Saez, and Zucman (2018, updated series as of Oct. 2021, PSZ in figure).