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

Gerald Auten
Office of Tax Analysis, U.S. Treasury Department

David Splinter
Joint Committee on Taxation, U.S. Congress

Abstract

Concerns about income inequality emphasize the importance of accurate income measures. Estimates of top income shares based only on individual tax returns are biased by tax-base changes, social changes, and missing income sources. This paper addresses these shortcomings and presents new estimates of the distribution of national income since 1960. Our analysis of pre-tax income shows that top income shares are lower and have increased less since 1980 than other studies using tax data. In addition, increasing government transfers and tax progressivity have resulted in rising real incomes for all income groups and little change in after-tax top income shares.

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

The idea that U.S. top income shares have increased dramatically since the 1960s has become widely accepted, fueled by the conclusions of studies using income tax data (Piketty and Saez, 2003; Piketty, Saez, and Zucman, 2018). 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). Such concerns have led to speculation that increasing inequality could lead to decreasing institutional accountability, reduced economic efficiency, and stagnating middle-class wages. These concerns emphasize the importance of accurately measuring the distribution of income.

Estimating the distribution of income 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 have 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 can lead to biased results when tax units are the unit of observation.[1] 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. Failing to adequately address these issues can lead to biased conclusions.

This paper presents new estimates of the levels and trends of U.S. income shares that address these challenges. We start with income as reported on tax returns and develop an improved measure of market income—referred to as fiscal income—that corrects for tax reforms and technical tax issues as well as social changes such as declining marriage rates. We add missing income to account for total national income with estimates of pre-tax and after-tax income, showing the step-by-step effects of each adjustment. Our approach extends earlier studies estimating national account distributions (Pechman and Okner, 1974; Reynolds and Smolensky, 1977). 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] Tax units include 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.

Results of our analysis based on distributing national income are similar to those of other recent studies. However, our results show lower top income shares and less upward trend than results based on fiscal income in Piketty and Saez (2003, hereafter PS) and modified national income in Piketty, Saez, and Zucman (2018, hereafter PSZ). We discuss reasons why our results differ from and improve upon both PS and PSZ. Due to the uncertainty of all such estimates, we provide a sensitivity analysis of our assumptions in allocating income not on tax returns.

Analysis only based on market income reported on individual tax returns, such as PS, implies that the top one percent share of fiscal income more than doubled from 9 to 19 percent between 1962 and 2019. One-third of this increase, however, occurred in the years just before and after the Tax Reform Act 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 inequality measures 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 (i.e., profits after corporate tax not distributed as dividends), as well as base-broadening reforms that reduced tax-shelter losses. Without these adjustments, top income shares are understated in the 1960s and 1970s, when high individual income tax rates created strong incentives to shelter income inside corporations.

Our analysis also accounts for the differential decline in marriage rates, which decreased substantially in lower- and middle-income groups but only slightly at the top of the distribution. Holding all else equal, as the overall marriage rate decreased, more adults filed separate tax returns. This increased the total number of tax units, thereby increasing the number of high-income tax units in the top one percent. This differential decline in marriage rates overstates top income shares in recent years.

Accounting for these issues produces results that differ substantially from those using only fiscal income reported on tax returns and basing income groups on tax units (essentially PS). Our pre-tax top one percent share of national income increased 4.4 percentage points between 1979 and 2019, about half the increase in fiscal income (see Figure 1).[3] For after-tax income, which includes transfers, our analysis shows that the top one percent share increased only 1.4 percentage points. Over the longer period since the early 1960s, our analysis shows that the top one percent pre-tax share increased 2.6 percentage points. For after-tax income, our top income shares are about the same as in the early 1960s.

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[2] For discussions of TRA86, see the online appendix and Auten, Splinter, and Nelson (2016). Geloso et al. (2022) examined earlier reforms, showing that pre-WWII top income shares are overestimated when not correctly accounting for tax policy changes.

[3] We also find significant increases in pre-tax income shares for the highest groups between 1979 and 2019: from 3.2 to 5.4 percent for the top 0.1 percent and 1.1 to 2.3 percent for the top 0.01 percent. See appendix Figure A1 and online data.
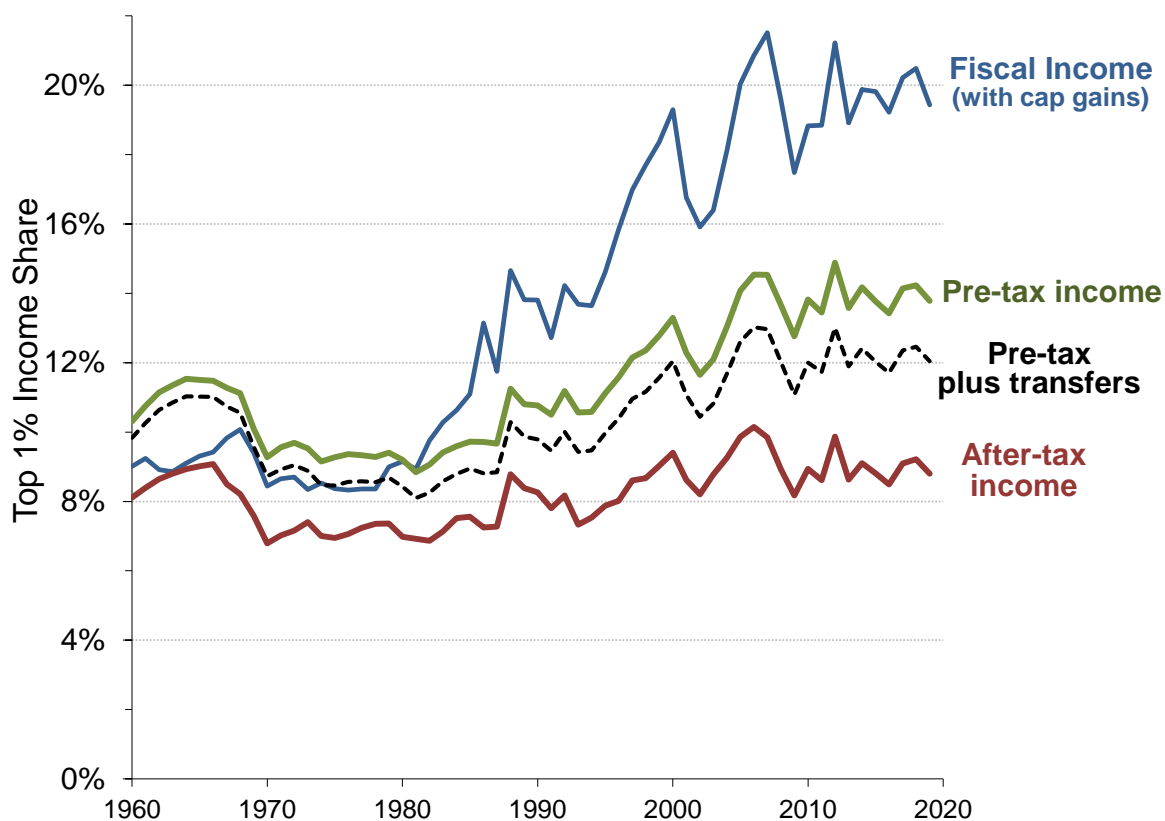
Figure 1: Top 1% income shares

Notes: Fiscal income includes capital gains with thresholds set without capital gains. Adjustments used to estimate pre-tax national income, pre-tax plus transfers, and after-tax income are listed in Tables 1 and 2 and described in detail in the online appendix. Annual values are shown in appendix Table A1.

Sources: Authors' calculations and in Piketty and Saez (2003 and updates) for fiscal income.

Our results are more optimistic about the bottom half of the distribution. PSZ estimated that average real pre-tax incomes of the bottom 50 percent remained virtually unchanged between 1979 and 2019. In contrast, our analysis shows that real pre-tax incomes increased by more than one-third and real after-tax income increased by two-thirds for the bottom half of the distribution. While the bottom 50 percent pre-tax income share decreased by 5.1 percentage points, after-tax income shares decreased only 3.1 percentage points over this period. Thus, taxes and transfers offset 40 percent of the decline in the bottom 50 percent share of pre-tax income. These results highlight how lower-income groups benefitted from increasing transfers and tax cuts, such as expanded refundable credits and other relief that contributed to a more progressive tax system.[4]

Why do our results differ from PS and PSZ? The main reason is methodological differences in allocating income not on tax returns. Our top one percent pre-tax income share is 6 percentage points (pp) lower than the PSZ estimate for 2014, the last year in the original published paper. The largest differences are from allocating underreported business income (2.0 pp), accrued

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[4] Congressional Budget Office (2022) data show that between 1986 and 2019 top-quintile average federal tax rates increased 1 percentage points while tax rates of the middle-quintile and bottom-quintile decreased 5 and 11 percentage points, respectively.

retirement income (1.0 pp), and corporate taxes (0.7 pp), as well as correcting for how income is reported on tax returns (0.4 pp).

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 business income (Auten and Langetieg, 2020). In contrast, PSZ ignored business losses and allocated underreported income only by positive reported income, thereby overstating top income shares. Our retirement income allocation methodologies also produce quite different results. This is largely because PSZ treated non-taxable pension and retirement account amounts as income, although almost all reflect assets being rolled over from one account to another.[5]

These differences are not merely differences in opinion. Each of our allocations result in a more consistent income definition over time (due to better accounting for tax policy changes and demographic changes) or use data ignored by PSZ (such as IRS audit studies used in national income aggregates). Our analysis corrects the tax sample to remove both non-resident filers and dependent filers who receive over half of their support from others as well as other filers under age 20. Our approach 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 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.

We are not alone in finding lower levels and smaller increases in U.S. top income shares. Other studies find similar levels and changes 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, identical to our estimate for pre-tax plus transfers income. 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 (2022) estimated that the top one percent share of before-tax income increased from 9 to 16 percent between 1979 and 2019, compared to our pre-tax income share increase from 9 to 14 percent over this period. Using internal Census data to overcome top-coding issues, Burkhauser et al. (2012)

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[5] Saez and Zucman (2020) revised the original PSZ estimates to partially address this issue slightly lowering their top income shares in recent years. See additional discussion in section IV.B.

estimated that the top one percent pre-tax income share increased only 4 percentage points from 10 to 14 percent between 1967 and 2006, similar to our estimates of 11 to 15 percent over this period.

Our paper makes several important contributions to the U.S. income inequality literature. We provide the only distributional estimates based on tax returns and other administrative microdata that follow the national income definitions, account for major tax reforms, and are informed by IRS detailed audit data. Our analysis addresses limitations of prior work by more carefully accounting for how income is reported on tax returns and allocating income not on these returns. Our analysis also addresses limitations of prior studies based on survey or earnings data which miss many income sources.[6] 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 providing 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. Finally, we compare our methodology with PS, PSZ, and the Congressional Budget Office so that readers will have a better understanding of why our estimates differ from other studies using tax data.

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 present the main results and sensitivity analysis. Section VI provides a summary and conclusion.

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 *improved 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 targets national income, *pre-tax income plus transfers* that includes government transfers, and *after-tax income* that includes government transfers and deducts federal, state, and local taxes.

Our pre-tax income measure follows the national income concept and therefore excludes transfer payments.[7] Pre-tax income plus transfers adds government transfers, which grew

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[6] In 2019, Census total money income is about 64 percent of national income (when cash transfers are added) due to missing income sources and underreporting. Survey of Consumer Finance before-tax family income is about 70 percent. Estimates of earnings inequality, even using administrative data (e.g., Guvenen and Kaplan, 2017), account for only about half of national income. Our estimates of wage inequality changes are broadly similar to prior estimates using administrative data. See the online data for incomes by source: wages, dividends, etc.

[7] 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

substantially from 5 to 16 percent of national income between 1960 and 2019 (see Figure 2). This measure provides a more complete estimate of the economic resources available for consumption, saving, and paying taxes—especially for families 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 measuring effective 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.[8] 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.
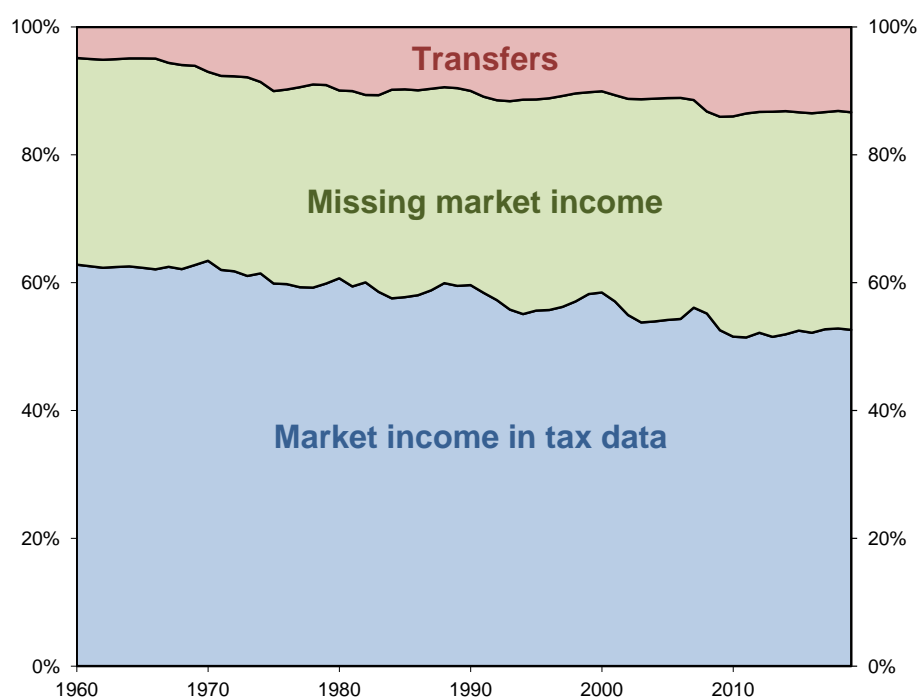
Figure 2: Income sources as a share of national income plus transfers

Notes: Specific adjustments to tax return income are listed in Tables 1 and 2. Sch. C and Other includes small amounts from unlisted sources, such as alimony, rents, etc. Corp. & Bus. Tax is federal and state corporate income tax and business property taxes. *Sources:* Authors' calculations.

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differs from the national income definition 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 excludes earnings retained inside businesses.

[8] 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 and Congressional Budget Office include social insurance benefits but not means-tested transfers, which are not reported in tax data.

The most significant tax reform in the period studied was TRA86, which lowered the top individual tax rate from 50 to 28 percent and broadened the tax base so as to be distributionally neutral. The base-broadening was targeted at high-income taxpayers, including repealing the 60 percent exclusion of long-term capital gains and limiting deductions for losses on passive investments. 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 had been even greater when the top individual rate was 91 percent before 1964 and then 70 percent until 1981. TRA86 lowered the top individual tax rate below the top corporate tax rate (28 percent vs. 34 percent), creating strong incentives for some corporations to switch from C to S corporations and to start new businesses as passthrough entities (S corporations, partnerships, or sole proprietorships).[9] This resulted in more business income being reported directly on individual tax returns because 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. Failing to make these corrections, would understate top income shares before 1987.[10]

TRA86 also dramatically increased the number of dependent filers, which would be 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.

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[9] This simple comparison ignores the double taxation of corporate income at the individual level and a 33 percent "bubble" rate that phased out the benefit of the 15 percent tax rate. Gordon and Slemrod (2000) and Auten, Splinter, and Nelson (2016) discussed the effects of TRA86 relative on business organization. Goolsbee (2004) examined other effects of tax rates on business organization.

[10] 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.

Social changes also bias comparisons of top income shares over time when measured using tax units. As marriage rates fell in the lower part of the distribution, this increased 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 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, our pre-tax income measure 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 (i.e., the missing market income in Figure 2). These excluded sources increased from an average of 34 percent of national income in the 1960s to 39 percent since 2000.[11] 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 now goes to those below the top of the distribution. Between 1962 and 2019, the top one percent share of capital income not included in fiscal income decreased from 4 to 2 percent of national income, due primarily to declining corporate retained earnings.[12] Meanwhile, the bottom 90 percent share of labor income not included in fiscal income increased from 4 to 12 percent of national income. Without these corrections, top income shares would be understated in the 1960s and overstated in recent decades.

II. Data

Our analysis uses annual samples of individual income tax returns from 1960 to 2019. These cross-section samples include between 80 and 360 thousand tax returns, with weights to make the sample representative of the filing population and oversampling of tax returns with high incomes. Most importantly for measuring top income shares, the samples include all tax returns with large total positive incomes (33,700 returns with over $8.5 million, about 0.2% of returns

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[11] Similarly, Foertsch (2016) discusses missing income sources and estimated that 2012 adjusted gross incomes on tax returns was 39 percent lower than NIPA personal income.

[12] Types of capital income excluded from fiscal income include 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.

filed in 2019). 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. For years they are available, we link tax returns to Form 5498 to account for individual retirement account wealth and to Form SSA-1099 information returns to account for unreported Social Security benefits, primarily among low-income filers. In addition, we make use of other IRS information returns for estimating employer contributions for health insurance, income of non-filers, and excluded combat pay. We also use the Survey of Consumer Finances and Census Bureau's March Current Population Survey to estimate 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 the adjustments that move from individual income tax data to national income definitions. Our analysis starts by replicating PS fiscal income including capital gains. We then sequentially remove capital gains, which are not in national income, correct the sample by removing returns of dependent filers and non-residents, estimate non-filer incomes using IRS information returns, adjust for the effects of major tax reforms, add tax-exempt interest, make additions and corrections to various income components, and base income groups on the number of individuals rather than tax units (Section III.A). These adjustments result in *improved fiscal income*, a measure of tax-return income that is broader and more consistent over time. *Pre-tax income* consistent with national income is then obtained by adding income sources not included in tax data (Section III.B). Government transfers are then added to obtain *pre-tax plus transfers income*, which is the broadest measure of pre-tax income and better reflects economic resources of retired taxpayers and others relying on transfers, as well as being preferable for estimating average tax rates (Section III.C). Finally, the rest of government policy is accounted for by subtracting taxes and adding non-transfer spending and government deficits. This yields *after-tax income* and matches national income totals (Section III.D). While some of our adjustments reduce

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top income shares, others increase top shares including ranking by size-adjusted incomes and adding tax-exempt interest, corporate retained earnings, and corporate taxes.

Section IV.A provides a summary of the results for our three income measures. Differences between our analysis and PSZ definitions and income allocations, as well as implications for top one percent income shares, are discussed in Section IV.B. Differences with Congressional Budget Office estimates are discussed in Section IV.C. The distributional effects of increases in tax progressivity and government transfers are shown in Section IV.D. Sensitivity of our results to alternative assumptions are presented in Section V.

A. *Improved Measure of Fiscal Income*

This section discusses five sets of changes to obtain an improved measure of fiscal income (i.e., reported market income in tax data) that is more consistent over time. The starting definition is PS fiscal income that includes capital gains. For filers, PS fiscal income equals total income (i.e., adjusted gross income plus statutory adjustments such as IRA contributions), but omits taxable Social Security and unemployment benefits. For non-filing tax units, fiscal income initially uses the PS assumption that non-filer income is 20 percent of the average income of filers. Since national income excludes capital gains, we remove capital gains and in a later step follow the national income definition by adding corporate retained earnings.

1. Correct the Sample: Limit Returns to Nondependent Adult Residents. It is important to start by ensuring 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 not included in the baseline Census numbers. 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 and their income is allocated among tax returns with dependent children.[13] These corrections significantly affect the sample since 1987 due to a TRA86 provision that reduced the amount of exempt income for dependent filers from $1,080 in 1986 to $500 in 1987. This resulted in over 5 million additional tax returns, which if not removed would

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[13] 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 in 20–24-year-old school enrollment from 13 percent in 1960 to 40 percent by 2012 (National Center for Education Statistics, 2018). Some elderly parents are also claimed as dependents.

be treated as independent tax units with very low incomes. 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 unit, but these married couples file two returns. As of 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., 2009; 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 except 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 to estimate income for groups of non-filers.[14] This approach avoids the common but incorrect assumption that all non-filers have low incomes. Instead, it is consistent with the Treasury Inspector General for Tax Administration (2020) finding that some non-filers have relatively high incomes

Correcting the sample and basing non-filer incomes on information returns data, rather than using a fixed share of filer income, has a negligible effect on top income shares before TRA86. Since 1987, however, these changes reduce top income shares due to increases in non-filer incomes and the removal of millions of dependent filers.

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. Data from tax returns just after TRA86 indicate that about 85 percent of high-income business losses would have been non-deductible under the new law. The largest effects occur in 1984 to 1986, just before the reform when this adjustment increases top income shares by 0.5 percentage points.[15]

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[14] There are 56 non-filer groups: two marriage, four age, and seven income groups. "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 intervening years. For earlier years we adjust for changing demographic groups and inflation. As discussed in the online appendix, this approach of separate demographic and income groups approximates other estimates of non-filer incomes reasonably well.

[15] 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. Other TRA86 base-broadening effects are accounted for in later

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 Finances and the 1962 Survey of Financial Characteristics of Consumers. Including 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 economic income. Excluded dividends before 1987 and tax-exempt combat pay are added to filer incomes. Net operating losses of a pass-through business reduce fiscal income in the year incurred and any unused loss can be carried forward to reduce taxable income in future years. To avoid double counting these losses and make our estimates consistent with national income, net operating losses carried forward from prior years are removed. State and local income tax refunds in fiscal income are removed because they are an adjustment for excess prior-year deductions, rather than income. Gambling losses claimed as an itemized deduction are deducted up to the amount of gambling income. Capital gains distributions reported directly on Form 1040 and ordinary gains from the sale of business property are also subtracted. Income from retirement accounts is generally included in fiscal income when it is distributed rather than when contributions are made. Contributions to certain accounts, such as 401(k) plans, are already excluded from fiscal income but others are included and therefore these contributions are subtracted. In addition, we remove taxable distributions of retirement accounts upon death and shift alimony payments from payors to recipients. These corrections are based on amounts reported on individual tax returns and in some cases on information returns. These adjustments can result in large income changes on some tax returns, substantially changing their rank in the income distribution and potentially affecting top income shares.

5. Base Income Groups on Numbers of Individuals and Rank by Size-Adjusted Income. To obtain a measure more relevant to economic welfare, we follow Congressional Budget Office (2022) by defining income groups based on all individuals (including primary and secondary taxpayers and dependents) and ranking tax units using size-adjusted incomes. Compared to groups based on tax units, this approach helps control for the bias introduced from the 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.[16]

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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.

[16] 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).

Marriage rates on tax returns declined from 67 to 37 percent between 1960 and 2019. However, marriage rates have remained high among the top one percent, decreasing only from 90 to 85 percent. Declining marriage rates outside the top of the income distribution increases income shares at the top of the distribution. Larrimore (2014) estimated that the differential decline of marriage rates explains 23 percent of the increase in household income Gini coefficients between 1979 and 2007.

For 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 (2022) and is similar to that used by the Census Bureau to set poverty thresholds and estimate income inequality (Cronin, DeFilippes, and Yin, 2012).[17] Size-adjusted incomes are only used to rank tax units and determine their income group. Income group shares are based on total tax-unit incomes so that they sum to national income.

Basing income groups on individuals and ranking by size-adjusted income have offsetting effects on top income shares. Basing income groups on individuals, rather than tax units, reduces top one percent income shares 1.5 percentage points in 1960 and 2.9 percentage points in 2019 (see Table 1).[18] Ranking by size-adjusted income moves some tax units with more individuals out of the top one percent and replaces them with more tax units with higher per-person income. This *increases* top one percent income shares by about one percentage point in earlier decades and 1.3 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 effects on top one percent income shares from moving away from tax units as the unit of observation (Bricker et al., 2016b; Larrimore, Mortenson, and Splinter, 2021).

These changes provide an improved measure of fiscal income and its distribution. Table 1 shows that relative to fiscal income excluding capital gains, most of the decrease in the top one percent share in 2019 results from changing from ranking by tax units to grouping by individuals and ranking by size-adjusted income. As discussed in Section IV.B., this approach has similar effects as the PSZ approach of basing income groups on the number of adults and dividing the income of married tax units in half.

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

[18] Growth in cohabitation explains some of this change. While there was relatively little cohabitation before 1970, more than 27 percent of couples 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).

B. *Pre-Tax Income: Expansions*

The next step in computing pre-tax income is to add income sources included in national income but not reported on individual income tax returns: (1) corporate retained earnings and business taxes, (2) employer-paid benefits and payroll taxes, (3) income in retirement accounts, (4) correcting for high inflation, (5) underreported income, and (6) other components of national income. Table 1 and Figure 3 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 activity shifts from C corporations to passthrough businesses. Meanwhile, the effects of employer-paid benefits and payroll taxes increase over time.

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
Fiscal income (with capital gains)	9.0	9.0	11.1	13.8	19.4	—	—	—	—	—
Fiscal income (no capital gains)	8.3	8.1	9.2	12.8	18.0	–0.7	–0.9	–1.9	–1.0	–1.4
Adjustments to 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
Base groups on number of individuals	7.2	6.9	8.5	11.0	14.2	–1.5	–1.7	–1.4	–1.8	–2.9
Rank tax units by size-adjusted inc.	8.1	7.8	9.3	11.6	15.4	0.9	0.9	0.8	0.7	1.3
Improved fiscal income & total changes	**8.1**	**7.8**	**9.3**	**11.6**	**15.4**	**–0.9**	**–1.2**	**–1.8**	**–2.2**	**–4.0**
Expansions to 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	9.9	10.7	12.3	16.3	2.3	1.8	1.0	0.4	0.7
C-corporation taxes	11.4	10.2	10.8	12.3	16.4	0.9	0.3	0.1	*	0.1
Business property tax	11.6	10.4	10.9	12.4	16.6	0.2	0.2	0.2	0.1	0.2
Inflation correction for interest	11.7	10.9	11.2	12.8	16.7	0.1	0.5	0.3	0.4	0.1
Underreported income	11.4	10.7	11.1	12.6	16.3	–0.2	–0.2	–0.2	–0.2	–0.4
Imputed rent	11.2	10.6	11.0	12.5	16.0	–0.2	–0.1	–0.1	–0.1	–0.3
Employer payroll tax	11.0	10.2	10.5	11.9	15.5	–0.2	–0.4	–0.5	–0.5	–0.5
Employer-paid benefits	10.9	9.9	10.1	11.4	14.6	–0.1	–0.3	–0.4	–0.5	–0.9
Retirement account income	11.2	10.1	10.8	11.8	14.8	0.3	0.3	0.6	0.4	0.2
Indirect taxes, non-profits, etc.	10.3	9.4	9.7	10.8	13.8	–0.8	–0.7	–1.0	–1.0	–1.0
Pre-tax income & total changes	**10.3**	**9.4**	**9.7**	**10.8**	**13.8**	**1.3**	**0.4**	**–1.4**	**–3.0**	**–5.6**

Notes: Total changes are relative to fiscal income including capital gains (thresholds set without capital gains). Sample corrections remove non-adult, dependent, and non-resident filers and adjust the number of non-filers accordingly. Imposing post-TRA86 loss limits makes many business losses non-deductible in earlier years. Among other changes, correcting the income definition adds back net operating losses that reflect economic activity in prior years. Basing income groups on the number of individuals means each percentile has the same number of individuals (rather than tax units). Ranking tax units by size-adjusted income controls for differences in the size of tax units. Expansions to fiscal income include income sources no on tax returns: fiduciary income retained in trusts and estates, corporate retained earnings (undistributed profits), corporate taxes that are part of pre-tax income, business property taxes, an inflation adjustment that increases business income due to lower real interest payments, underreported income based on IRS detailed audit studies, imputed rent on owner-occupied housing, employer-paid payroll taxes and benefits that are part of pre-tax income, retirement account income missing from tax returns, as well as various taxes and income sources (non-profits) included in national income but not in fiscal income. See the online appendix for detailed description of adjustments. Changes less than 0.05 percentage points are denoted by *. *Sources:* Authors' calculations and Piketty and Saez (2003 and updates) for fiscal income with capital gains.

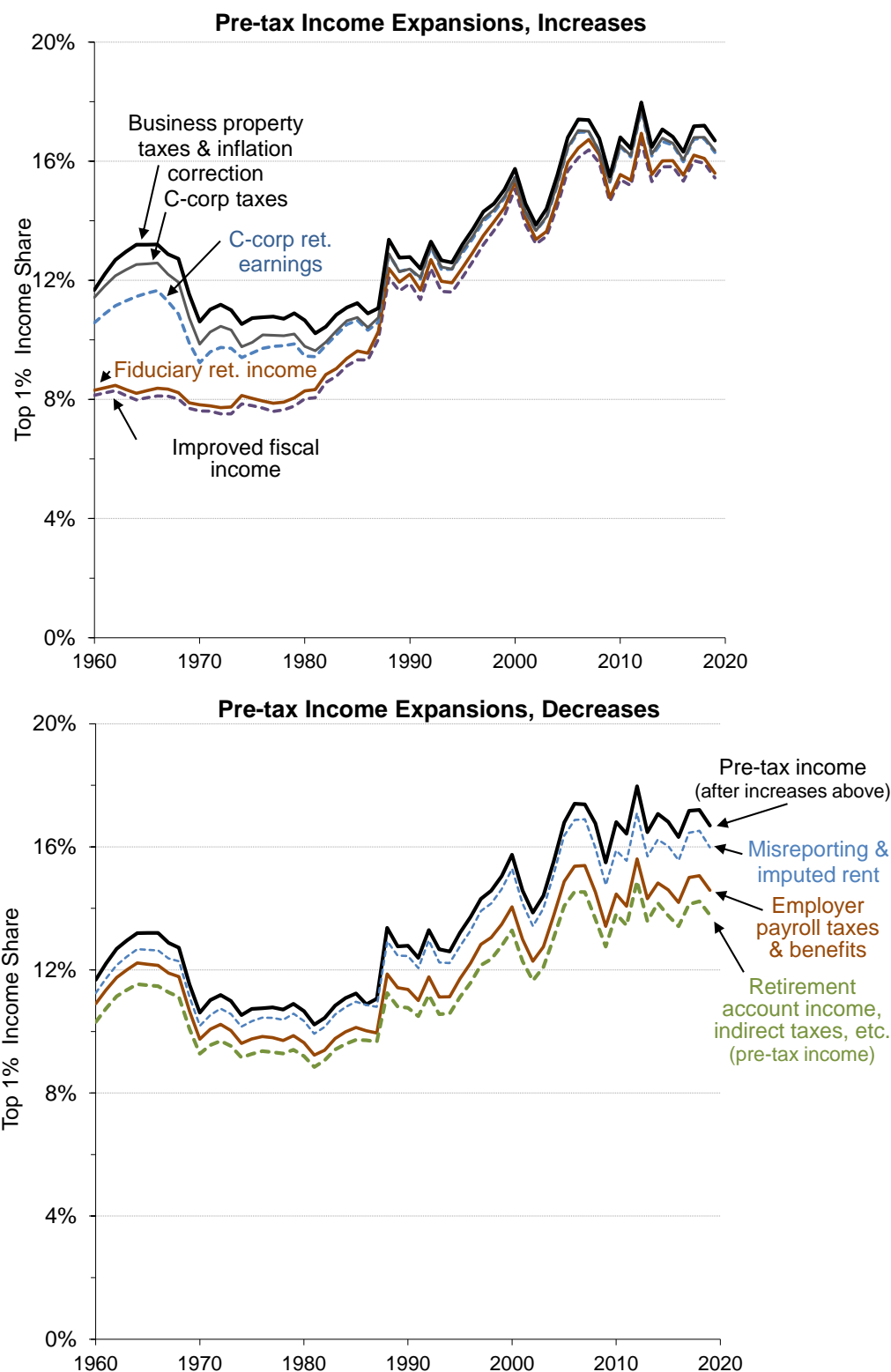**Figure 3: Top 1% income shares: Pre-tax income expansions**

Notes: Income expansions start with improved 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.

1. Retained Earnings of Corporations and Business Taxes. Pre-tax corporate profits in national income include all income of capital owners regardless of whether profits are distributed, retained, or paid out in taxes. Corporate profits 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.[19] We allocate corporate retained earnings from national accounts data, which excludes capital gains and includes estimated corporate income underreporting (see definition in Section II). This increases top one percent income shares about 2 percentage points in the 1960s, when C corporations accounted for a large share of business activity, but only about half a percentage point in recent decades due to the shift to passthrough businesses and the growth of more evenly distributed retirement assets.

Retirement account ownership of corporate stock increased dramatically from 4 percent in 1960 to around 50 percent since 1985. These estimates are based on Federal Reserve Financial Accounts and include private and public pensions, IRAs, and life insurance funds. 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. DC wealth is based on individual-level IRA asset values reported on Form 5498 information returns when available and otherwise allocated using income and age groups in the Survey of Consumer Finances (SCF).[20] Our retirement account ownership shares are similar to those in the Federal Reserve's Distributional Financial Accounts—for example, both have top one percent (ranked by income) shares of 7 percent in 1989 and 6 percent in 2018 (see online appendix Table B2).[21] The portion of retained earnings reflecting ownership by non-profit organizations and government, which ranges between 5 and 9 percent, is allocated half per capita 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 these retained earnings are allocated based on

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[19] Corporate passthrough entities (S corporations and REITs) are removed before estimating ownership shares because they have little or no undistributed profits. Our approach to allocating ownership of C corporations closely follows Rosenthal and Austin (2016).

[20] For the DB allocation, *earned income* includes wages, self-employment income, and up to $40,000 of taxable retirement distributions. These amounts are generally set to zero for the bottom 40 percent of tax units (ranked by wages) to account for low-wage employees usually not being covered by DB plans and top-coded at $300,000 to account for DB limitations. DC wealth shares since 1993 and for 1989 are based on Form 5498 IRA asset values linked to individual tax returns. For other years and to account for non-IRA amounts, total DC wealth is based on the percent having a DC account, mean DC wealth, and the standard deviation of DC wealth for each of 8 income and 4 age groups in the SCF. See the appendix for details.

[21] See www.federalreserve.gov/releases/z1/dataviz/dfa/distribute/chart (accessed Oct. 3, 2021), where 1989 is the earliest year available. Note that top wealth shares ranked by wealth are higher than when ranked by income.

a tax unit's share of dividends and one-quarter based on its share of realized capital gains. As shown in the sensitivity analysis, the results are robust to alternative assumptions. We favor using dividends received as the primary indicator of corporate ownership (Smith et al., 2023). The portion allocated to capital gains accounts for ownership of corporations not paying dividends and the large portion of capital gains from the sale of corporate stock (including gains from private equity investments). While the timing of realized capital gains can differ substantially from retained earnings, they tend to equalize over the long run (Pechman, 1985; Clarke and Kopczuk, 2017).[22]

Pre-tax national income includes taxes paid by businesses and is allocated based on assumptions about economic burden. Following Joint Committee on Taxation (2013) and Congressional Budget Office (2012), we allocate 25 percent of corporate taxes to wages.[23] The rest is allocated to individual tax returns based on the ownership of corporate capital (allocated as for retained earnings) and interest-bearing assets (allocated by taxable interest).[24] Including corporate taxes increases the top one percent income share 0.9 percentage point in 1960, when corporate tax rates were higher and corporate ownership was more concentrated, but has little effect in recent decades. Business property taxes are first divided among non-housing capital ownership shares (e.g., corporate equity, retirement accounts, and passthrough equity) and then allocated to tax filers as for corporate and retirement account ownership and by the absolute value of passthrough business income.

2. Employer-Provided Benefits and Payroll Taxes. Employer-provided insurance is non-taxable and an important addition to tax-based incomes. These benefits include health and life insurance and workers' compensation and increased from 1 to 5 percent of national income between 1960 and 2019. The distribution of employer-provided health insurance, which makes up most of these benefits, is based on health insurance amounts reported on Form W-2 in 2013 and 2015. While the magnitude of these benefits has increased substantially, its distribution has been found to be similar in 1992 (see online appendix and Warshawsky, 2016). Contributions to Flexible Spending Accounts (FSAs) are excluded from taxable income and therefore added back. Employer-provided insurance and FSA contributions reduce the top one percent income share only marginally in the 1960s but by nearly one percentage point by the mid-2000s.

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[22] 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 average top one percent share being several percentage points higher than our estimates.

[23] 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, compensation of executives is often based on corporate profits and their wages are affected by stock option values. Some empirical studies support this view. 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.

[24] 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.

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 reported on tax returns for filers and on Form W-2 for non-filers up to the taxable maximum thresholds (e.g., $132,900 in 2019). Including payroll taxes paid by employers reduces top one percent income shares half a percentage point in recent decades.

3. *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. The accrual approach, however, results in many retired people having little income. Counting retirement income when distributed provides a better measure of current incomes of retired people and matches the timing of tax burdens. The distribution approach is therefore used in most studies measuring comprehensive income. Following a distribution approach, we retain taxable income from pensions, retirement accounts, and annuities already in fiscal income but exclude retirement account contributions to prevent double counting. Since income accruing in retirement accounts has exceeded distributions and accrued amounts are included in national income, the excess accruals are added to conform to national income retirement totals. These amounts are allocated the same way as the retirement account portion of retained earnings.

4. Correcting for High Inflation. High inflation rates, most importantly in the 1970s and early 1980s, distort the measurement of income. Real interest income of individuals is overstated but business profits are understated due to overstated real interest deductions (Steuerle, 1985). To account for inflation, 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 effect of inflation on government interest payments as the difference between household interest decreases and business income increases so that total income is unchanged. Since lower real government interest payments likely decrease current or future taxes, we allocate this difference by federal and state income taxes. These adjustments increase top one percent income shares by an average of 0.4 percentage points in the 1970s and 1980s when inflation was high, but only 0.2 percentage points in other years.

5. Underreported Income. Amounts reported in tax data can differ from amounts in national income due to underreporting of income on tax returns as well as definitional differences. Our allocation of underreported income is based on the IRS National Research Program (NRP) and Taxpayer Compliance Measurement Program (TCMP) detailed audits studies, which are the basis for underreported income included in national income. We use tabulations by Auten and Langetieg (2020) from these studies covering six periods from 1988 through 2013. 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 misreporting ratios are applied, including a large no change group. To account for undetected underreporting, we apply the distributionally consistent gradient multipliers proposed in Auten and Splinter (2021). This method produces results similar to NRP-based estimates of the distribution of underreporting in Johns and Slemrod (2010) and DeBacker et al. (2020), as seen in online appendix Figure B5. Total underreporting amounts are calculated separately for wages and salaries, rental income, farm income, and S corporation net income. For nonfarm proprietor income, we use the misreported amounts as reported in the national accounts. Since the IRS audit studies only include filers, five percent is allocated to non-filers. We also account for other differences, such as faster depreciation in tax data than in national accounts due primarily to expensing on tax returns. See the online appendix for details.

Adding underreported income reduces top one percent shares of pre-tax income an average of only one-quarter of one percentage point between 1960 and 2019. For after-tax income, adding underreported income increases the top one percent share one-tenth of a percentage point before 2000 and one-third of a percentage point since (see online appendix Figure B6).

6. Other Income Expansions. While fiduciaries, including estates and trusts, distribute much of their income each year, some fiduciary income is retained and therefore missing from individual returns. Retained fiduciary income and taxes are allocated to individual tax returns by taxable fiduciary income, increasing top one percent income shares by 0.2 to 0.3 percentage points. Imputed rental income from owner-occupied housing is primarily allocated in proportion to deductions for real estate taxes. Since NIPA imputed rent is pre-tax, it includes property taxes. Imputed rent disproportionately increases middle incomes, lowering top one percent income shares an average of 0.2 percentage point. Sales taxes and indirect taxes are allocated by disposable income (defined below) less savings. 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 net of premiums $820 billion, and Medicaid benefits $670 billion.

Social Security benefits have been partially taxable and reported on tax returns since 1984. For cases where taxpayers significantly underreported or failed to report this income, generally because their incomes were below the thresholds for Social Security being taxed, we use Form SSA-1099 information return data. This adds benefit amounts for more than 5 million returns in the 1990s and over 1 million returns in recent years. The 1985 distribution is used for allocating benefits in prior years because it is the first year SSA-1099 forms are available. For filers, unemployment insurance benefits are the amounts reported since 1981 and imputed in earlier years. As discussed above, non-filer benefits are based on Forms SSA-1099 and 1099-G. The NIPA value of other cash transfers—federal supplemental security income and cash transfers from state and local governments—is allocated using the 1989 to 2016 distributions 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 dependent children, and marital status. Each demographic group is then divided into one hundred income percentiles by improved market income plus Social Security benefits. 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 increasing effects 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 reduced the 2010 top one percent share by more than 2 percentage points.

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	10.3	9.4	9.7	10.8	13.8	—	—	—	—	—
Pre-tax Income Plus Transfers, Add transfers										
Social Security benefits	10.1	9.1	9.4	10.4	13.1	–0.2	–0.3	–0.3	–0.4	–0.7
Unemployment benefits	10.0	9.1	9.4	10.4	13.1	–0.1	*	*	*	*
Other cash transfers	9.9	8.9	9.2	10.2	12.9	–0.2	–0.1	–0.1	–0.1	–0.2
Medicare	----	8.8	9.1	10.1	12.5	—	–0.1	–0.1	–0.2	–0.4
Other non-cash transfers	9.8	8.7	8.9	9.9	12.0	*	–0.2	–0.2	–0.2	–0.5
Pre-tax income plus transfers & total changes	**9.8**	**8.7**	**8.9**	**9.9**	**12.0**	**–0.5**	**–0.7**	**–0.8**	**–0.9**	**–1.7**
After-tax Income, Remove taxes										
Federal indiv. income & estate tax	8.9	7.8	7.9	8.6	10.0	–1.0	–0.9	–1.1	–1.2	–2.1
State/Local individual income tax	8.8	7.7	7.7	8.4	9.5	–0.1	–0.1	–0.2	–0.2	–0.5
Corporate income tax	8.0	7.3	7.6	8.3	9.4	–0.7	–0.3	–0.1	–0.1	–0.1
Property tax	7.8	7.2	7.5	8.3	9.2	–0.2	–0.1	–0.1	–0.1	–0.2
Payroll tax	8.1	7.6	8.0	8.8	9.5	0.3	0.4	0.5	0.5	0.4
Sales and other taxes	8.4	7.8	8.2	9.0	9.7	0.2	0.2	0.2	0.2	0.2
After-tax Income, Add rest of government sector										
Government deficit/surplus	8.7	7.9	8.1	9.0	9.4	0.4	0.1	*	*	–0.4
Government consumption	8.1	7.4	7.6	8.4	8.8	–0.6	–0.6	–0.6	–0.7	–0.5
After-tax income & total changes	**8.1**	**7.4**	**7.6**	**8.4**	**8.8**	**–1.7**	**–1.3**	**–1.4**	**–1.5**	**–3.2**
Total changes: pre-tax to after-tax	—	—	—	—	—	**–2.2**	**–2.0**	**–2.2**	**–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.

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. Overall, taxes are progressive and have become more progressive over time. Federal income taxes lower top one percent income shares about one percentage point in earlier decades but more than two percentage points in 2019. To match national income, two final adjustments account for the government sector by including government deficits/surpluses and government consumption (Table 2).

Federal individual income tax liabilities are the amounts reported on tax returns and amounts withheld for non-filers. The Additional Medicare Tax and the Net Investment Income Tax, which began in 2013, are included. Foreign tax credits are added back to federal income taxes because they reflect foreign income taxes paid on income included on tax returns. Refundable portions of tax credits, including earned income and additional child tax credits, result in negative average income tax rates in lower-income groups.

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 their 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 better 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).[25] Corporate income taxes and property taxes are those previously used in calculating 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

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[25] 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 based on shares of federal refundable credits on a state-by-state basis. Details of allocations to non-itemizers are provided in the online appendix.

and other taxes are allocated by disposable income (after-tax income prior to subtracting sales and other 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. 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." Riedel and Stichnoth (2022) present evidence supporting per capita allocation of public education spending, which is more than one-third of government consumption. To account for the mixture of types of government spending, we allocate government consumption half per capita and half by after-tax income.[26]

IV. Results

This section provides a summary our findings. First, we show how changing from a narrow to a broad measure of market income (fiscal income to national income) affects top income shares. Then we discuss differences between our national income estimates and PSZ national income estimates, as well as Congressional Budget Office expanded income. While the focus is on top one percent income shares, we also find that increases in income shares for the top 10 percent and top 0.1 percent are smaller than PS and PSZ for pre-tax income and that their shares of after-tax income are little changed (Figure A1). This section also discusses the effects of taxes and transfers on the distribution of after-tax income.

A. *From Fiscal Income to Broader 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 for improved fiscal income. Income expansions to match the definition of national income increase this share to 10.3 percent (Table 1 and Figure 3). The most important factor that increases the 1960 share is adding pre-tax C corporation income (including corporate retained earnings and taxes) in place of realized capital gains. This reflects the much larger C corporation share of

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[26] Allocating all government consumption per capita per Riedel and Stichnoth (2022) would have little effect on our estimated trends but would generally lower top one percent shares three-quarters of a percentage point.

business income prior to TRA86. For 2019, while the top one percent fiscal income share is 19.4 percent, our pre-tax income share is nearly one-third lower at 13.8 percent. The most important factors in this 5.6 percentage point (pp) difference are controlling for the declining marriage rate of lower-and middle-income tax units (2.9 pp), including employer-provided insurance (0.9 pp), replacing realized capital gains with C corporation retained earnings (0.7 pp), including the employer share of payroll taxes (0.5 pp), and including underreported income (0.4 pp).

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 9.8 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 13.8 to 12.0 percent (see Table 2). This difference suggests that about half of the increase in top market income shares was offset by increasing amounts of transfers.

After-tax income accounts for taxes and government spending. Progressive taxes, discussed more below, further decreased top one percent income shares: by 1.5 percentage points in 1960 and 2.3 percentage points in 2019. After-tax top one percent income shares fluctuate with the business cycle but 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.
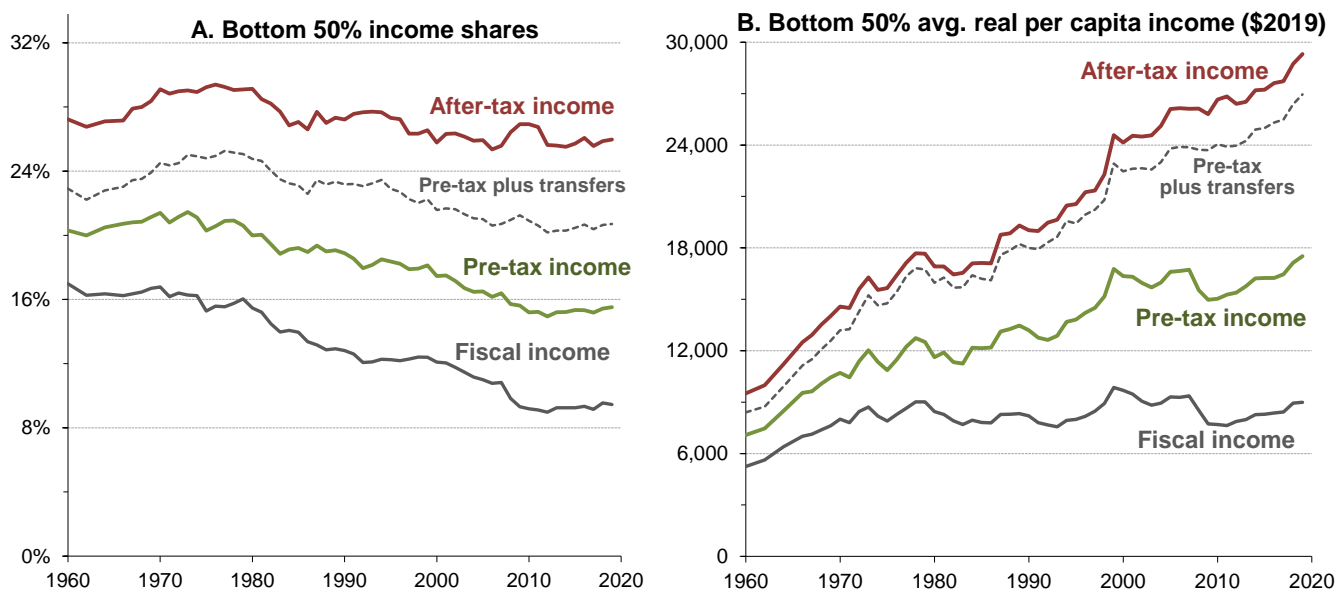

Figure 4: Bottom 50% income shares and average per capita real incomes
Notes: Fiscal income excludes capital gains. Real incomes are indexed by the PCE. *Sources:* Authors' calculations.

It is also important to consider the bottom half of the income distribution. Figure 4.A shows that the pre-tax income shares of the bottom 50 percent decreased 5 percentage points since 1962. The decrease was 4 percentage points after accounting for transfers and only 3 percentage points after taxes and transfers. Figure 4.B shows that real per capita pre-tax incomes of the bottom half of the distribution increased 135 percent since 1962. Real after-tax incomes nearly tripled (increased 193 percent). Since 1979, real per capita pre-tax incomes increased 40 percent and after-tax incomes increased 66 percent. Similarly, Congressional Budget Office (2022) found that real per capita incomes after taxes and including transfers of the bottom two quintiles increased 61 percent from 1979 to 2019.

A more comprehensive view shows that taxes and transfers have kept most income shares relatively unchanged. Figure 5A 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 5 percentage points since 1962, it was virtually unchanged after taxes and including transfers it: decreases in the late 1960s offset by increases since 1979. The middle-quintile share declined slightly since 1962, but after taxes and transfers it increased slightly. The bottom-quintile share declined 1.3 percentage point since 1962 but increased 0.4 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.
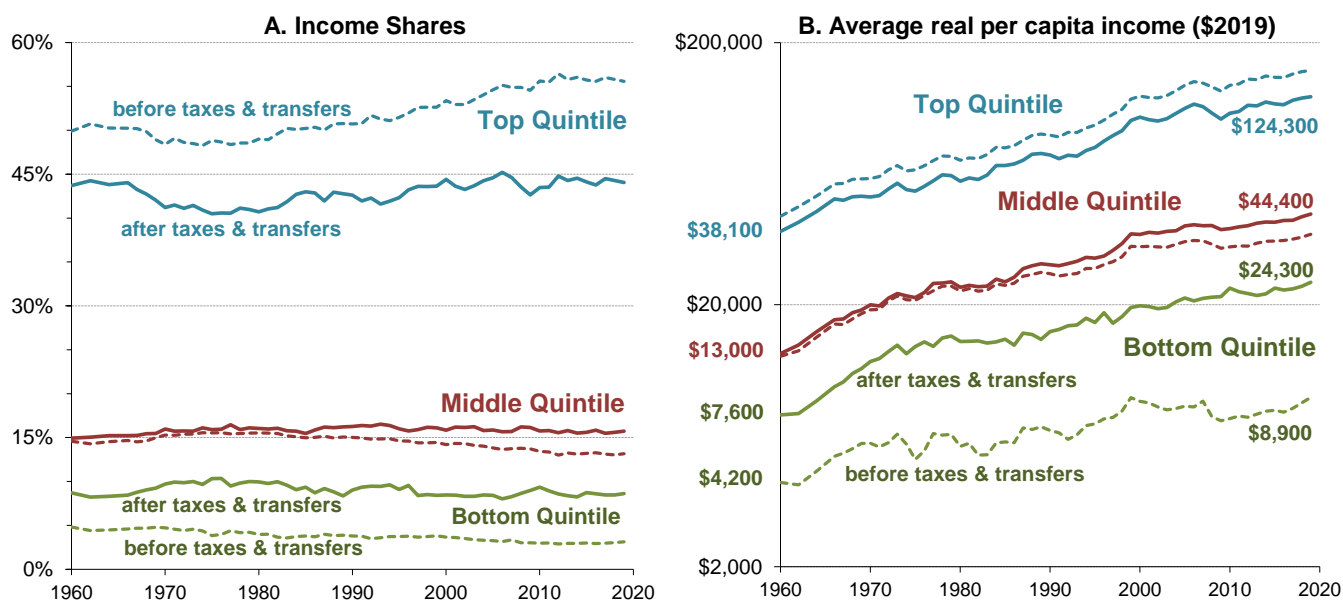
Figure 5: Income shares and per capita real incomes by quintile
Notes: Adjustments used to estimate pre-tax (before taxes and transfers), pre-tax plus transfers, and after-tax (after taxes and transfers) income are listed in Tables 1 and 2. Real incomes are indexed by the PCE and on a log scale. Amounts shown are for 1960 and 2019 rounded to nearest $100. For the bottom quintile, negative incomes are set to zero. *Sources:* Authors' calculations.

Also important is what happened to real incomes across the distribution. As shown in Figure 5B, real per capita income after taxes and transfers increased at similar rates for the bottom-, middle-, and top-income quintiles: tripling in all income groups. Real pre-tax incomes also increased substantially, more than doubling in all income groups. As discussed elsewhere, the larger growth of income after taxes and transfers reflects the growing importance of transfer payments and tax cuts for low- and middle-income taxpayers.

While our improved income measures provide a better understanding of the distribution of income in particular years, comparisons of cross-sections over time can be misleading. For example, a simple comparison of the 1979 and 2019 cross-sections would imply that the top one percent earned 22 percent of the increase in pre-tax income and 11 percent of the increase in after-tax income. A fundamental issue is that such comparisons convey the impression that it is the same people in the top of the distribution over time. Studies using panel data, however, show that the membership of income groups changes over time.[27] Among tax units in the top one percent each year, panel data show that only about 40 percent remained there for the subsequent three years and even fewer were there the prior three years (Auten, Gee, and Turner, 2013). In addition, mobility studies show that those starting with low incomes enjoy the largest percentage increases in average income while those starting with the highest incomes suffer the largest declines in income in following years (Auten and Gee, 2009; Splinter, 2021). Similarly, many in the lowest income groups or in poverty are only there temporarily (Larrimore, Mortenson, and Splinter, 2022).

Life-cycle effects can also bias cross-sectional comparisons, especially due to the large Baby Boom cohort. The Baby Boom generation (born 1946 to 1964) reached their peak share of the top one percent about 2009, which corresponds with the peak years of the top one percent share of pre-tax income (Auten, Gee and Turner, 2013). This large cohort drives the strong correlation of 0.87 between the share of peak-income-aged adults (age 48 to 57) and the top one percent share of pre-tax income (online appendix Figure B20). Thus, for various reasons, the beneficiaries of economic growth cannot be inferred by comparing cross sections.

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. 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

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[27] Cross-sectional comparisons obscure individual-level income mobility as well as compositional changes. More than one-third of 1979 adults filing tax returns died by 2014 and were replaced by a new cohort who earned more than half of adjusted gross income in 2014.

includes Social Security benefits and subtracts the associated payroll taxes. This section compares our results through 2014, the last year reported in the original PSZ series. Our results are compared with the updated PSZ estimates through 2019 in Figure 6.[28]

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 only 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 values (payroll taxes, and imputed rent and property taxes in recent decades).[29] Other allocations have similar effects on top shares because the top of the distribution receives only a small amount (transfers) or because the different data sources used suggest similar distributions (employer-sponsored insurance).

While PSZ top one percent shares are consistently more than one percentage point higher in earlier decades, our estimated changes in top one percent income shares are similar. As shown in Table 3, from 1962 to 1979, the original PSZ pre-tax share decreases 1.4 pp and ours decreases by 1.7 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.

[28] 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 reduced their top one percent income shares by about one percentage point in recent years. Figure 6 shows that revised PSZ national income top one percent shares remained at similar levels as PS fiscal income since 1988, despite many differences that imply lower national income top shares.

[29] Social Security benefits, however, are often unreported for lower-income returns. Unlike PSZ, our analysis uses information return data from the Social Security Administration to ensure the full correct amount is included.
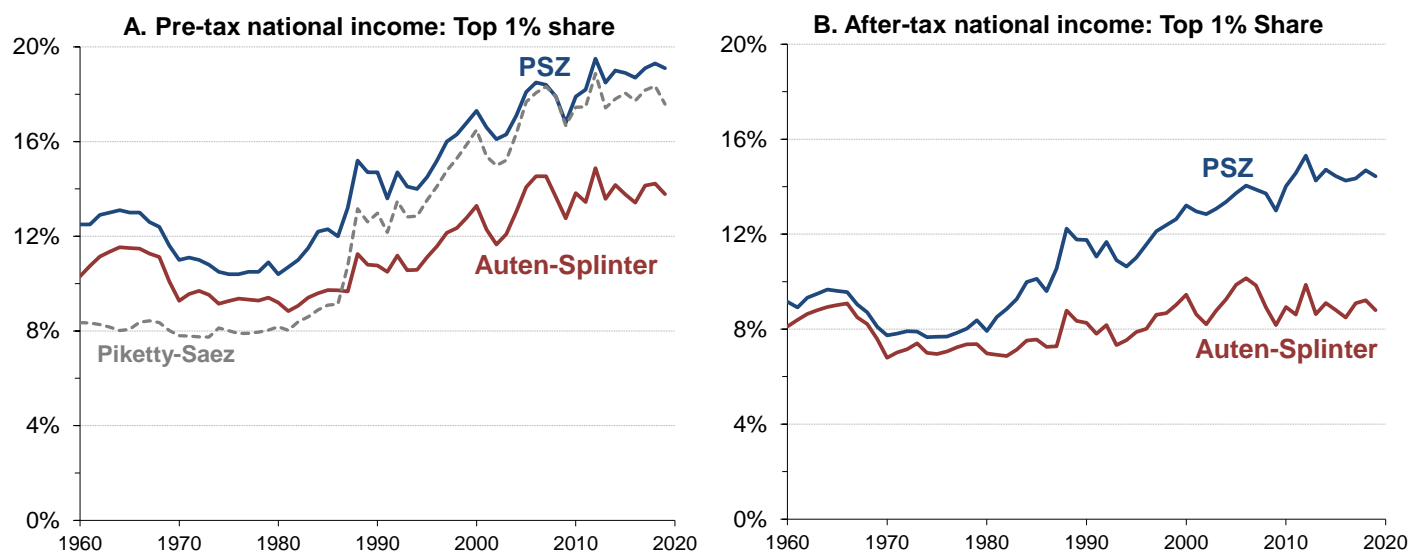
Figure 6: Top 1% shares of national income: Comparison with PSZ

*Note*s: 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)

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	11.1	9.4	14.2	−1.7	4.8	3.0
Pre-tax plus transfers	10.6	8.7	12.4	−2.0	3.7	1.8
After-tax	8.6	7.4	9.1	−1.3	1.7	0.5

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).

Since 1979, however, our conclusions about the levels and trends in top income shares are quite different, primarily due to differences in how to allocate national income components not on tax returns. PSZ estimated the top one percent share of pre-tax income increased by 9.0 pp (11.2 to 20.2 percent) from 1979 to 2014, while our analysis shows 4.8 pp (9.4 to 14.2 percent). Part of this difference is due to our adjustments for TRA86.[30] For after-tax income, the PSZ share increased 6.5 pp compared to our estimate of only 1.7 pp (7.4 to 9.1 percent). Over the full period from 1962 to 2014, the PSZ pre-tax top one percent share increases by 7.6 pp, while our estimate is a 3.0 pp increase. For after-tax income, the PSZ share increases 5.6 pp, while our share increases only 0.5 pp.

To understand the effects of specific methodological differences, 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 14.2 percent, 6.0 pp lower than the PSZ estimate. The largest differences are from our approaches in allocating underreported income (2.0 pp) and retirement income (1.0 pp). Other differences include our allocations of corporate income taxes (0.7 pp), other taxes (0.7 pp), and our corrections described in section III.A.4 for how income is reported on tax returns (0.4 pp).

One-third of the 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 average underreporting rates tend to decline at higher levels of reported income (Johnston, 2008; Auten and Langetieg, 2020). 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 allocates it to the top.[31]

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[30] While reduced in magnitude, readers will notice there is still a jump our top one percent share between 1986 and 1988. This remaining jump is partly 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. In addition, there was a dramatic increase in newly electing S corporations with income reported on individual tax returns and as discussed above, other base broadening was targeted at high-income taxpayers (see the on-line appendix and Auten, Splinter, and Nelson, 2016).

[31] A simplified computation explains the two percentage point gap in top one percent shares from differences in underreported income: 2% = [(50% − 15%) • $0.8 trillion in business income reporting gaps] / $15.2 trillion national income.

Table 4: Decomposition of differences in estimated top one percent income shares

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	2.0	0.7	1.6
Include distributed & other retirement income	Retirement alloc. includes some rollovers	−0.2	−0.2	1.0	1.2	1.2
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	0.5	0.3	0.7	0.4	0.1
Various corrections to tax income definition	Use unimproved 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
Limit returns to non-dependent U.S. residents	No adjustment	−0.3	−0.3	*	0.4	0.4
Groups by individuals/size-adjusted incomes	Groups by adults/equal-split married inc.	*	0.1	0.1	*	0.1
Non-profits/govt. income half per capita	Non-profits/govt. income all by income	*	*	0.1	*	*
Inflation correction	No correction	−0.1	−0.5	−0.1	0.4	*
Social insurance benefits/deficit excluded	Social insur. ben. incl., taxes deducted	*	*	−0.2	−0.1	−0.2
Subtotal: Pre-tax differences (PSZ less AS) & totals		**1.4**	**1.7**	**6.0**	**4.3**	**4.6**
After-tax income						
Govt. consumption allocated half per capita	Govt. consumption alloc. by after-tax inc.	0.8	0.6	1.3	0.7	0.6
Non-SS deficits by federal income taxes	Half by government transfers, half taxes	−0.2	*	0.4	0.4	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 distribution of government transfers	*	*	−0.1	−0.1	−0.1
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
Subtotal: After-tax differences (PSZ less AS) & totals		*	*	**0.5**	**0.5**	**0.5**
Total after-tax differences (PSZ less AS)		**1.4**	**1.7**	**6.6**	**4.8**	**5.1**

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).

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 inside buildup, which we allocate by retirement account assets (the top one percent receives about 7 percent). Overall, the top one percent receives about 6 percent of total retirement income. This is similar to the Federal Reserve's Distributional Financial Accounts estimate of the top one percent having about 6 to 7 percent of pension entitlements since 2008.[32] In comparison, PSZ online data indicate they allocated more than twice this share to the top one percent. The high PSZ share is largely due to their use of non-taxable as well as 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 distributions can be non-taxable, almost all of the largest non-taxable amounts on tax returns reflect rollovers (transfers of assets from one account to another).[33] Since these rollover amounts are asset values rather than income, they should not be mixed with income flows to allocate retirement income. Because the largest rollovers are concentrated among high-income individuals, the PSZ assumption significantly overstates top income shares. In recent updates, PSZ have partially addressed this issue but still assume too much (10 percent) of non-taxable amounts are income (see the online appendix for additional discussion).

The PSZ estimate of the top one percent share of after-tax income is much higher than ours (15.7 percent vs. 9.1 percent) in 2014, but most of this difference is explained by pre-tax differences. After accounting for pre-tax differences, the remaining net difference is only 0.5 percentage points. This small net difference is the result of several offsetting factors. The PSZ top one percent share is 1.3 percentage points higher due to allocating all government consumption by after-tax income, thereby ignoring the redistributive and public goods aspects of government consumption captured by our half per capita allocation. Another 0.4 percentage point is due to the PSZ allocation of government deficits half by transfer payments. Our allocation of deficits by current taxes is more consistent with the historical evidence than the PSZ assumption that current transfers would be significantly reduced.[34] These two effects, which raise PSZ top shares estimates, are largely offset by differences in distributing the burden of corporate and other taxes.

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[32] 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 Oct. 28, 2021, from www.federalreserve.gov/releases/z1/dataviz/dfa/distribute/chart

[33] In addition, when traditional IRAs are converted to Roth IRAs, previous non-deductible contributions to IRAs are treated as basis and thus reported as non-taxable amounts 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 are quite large, with the largest reflecting pension rollovers by executives. In 2014, for example, 79 percent of pension distributions reported by taxpayers with adjusted gross income of $1 million or more were tax-exempt. See the online appendix for more details.

[34] 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.

C. *Comparison with Congressional Budget Office Estimates*

The Congressional Budget Office (CBO, 2022) also produces widely cited estimates of top income shares using tax data. While our estimates are similar in 1979, CBO's top one percent before-tax income share was about 2 percentage points higher than ours in 2019. Most of the difference is from CBO ignoring retirement account ownership when allocating corporate taxes and CBO excluding the institutionalized population, imputed rents on owner-occupied housing, and the employee portion of employer-sponsored insurance (Auten and Splinter, 2019). Larger differences in some years are due to CBO's use of realized capital gains rather than retained earnings.[35] Both CBO's and our estimates suggest that including transfers and deducting taxes reduces top one percent shares by about 3 percentage points in recent years.

D. *Effects of Taxes and Transfers on Distribution Measures*

The top statutory federal individual income tax rate has fallen dramatically from 91 to 37 percent between 1960 and 2019. But top tax rates provide only a limited picture of the true tax burden of the top one percent. In the 1960s, only a tiny fraction of taxpayers actually paid the top tax rates (fewer than five hundred tax returns in 1962), in part due to tax avoidance behavior. TRA86 was designed to be distributionally neutral when it lowered the top tax rate to 28 percent but taxed capital gains at ordinary rates and closed many high-income tax shelters. Legislation in 1991 and 1993 increased progressivity by raising top income tax rates and adding base-broadening provisions targeted at high-income taxpayers (Auten, Splinter, and Nelson, 2016). Meanwhile, the bottom 90 percent has benefitted from lower tax rates and new or increased tax credits.

Figure 7 shows how total tax burdens by income class have changed over time. The upper panel apportions individuals evenly over the income distribution, highlighting the sharp increase in average tax rates for the top one percent, and the lower panel stretches out the top income groups. 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.[36] The progressive pattern in Figure 7 resembles that for federal income taxes burden estimates by the Congressional Budget Office, the Joint Committee on Taxation, Treasury's Office of Tax Analysis,

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[35] Typical holding periods for long-term gains are 5 to 8 years. Realization of gains accrued over many years can move these taxpayers into top income groups for that year thereby increasing top income shares. Total realizations also fluctuate across years due to changing capital gains tax rates and business cycle effects on realizations.

[36] This is a standard definition used by the Joint Committee on Taxation and Treasury's Office of Tax Analysis. While payroll taxes may appear regressive relative to annual income, the benefit side of Social Security, Medicare, and unemployment insurance programs are progressive (see online appendix Figure B16). Auerbach, Kotlikoff, and Koehler (forthcoming) addressed this limitation by moving from current-year to lifetime net tax estimates.

Piketty and Saez (2007), and the Tax Policy Center (Splinter, 2020a). Average tax rates of 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 were relatively constant between 1962 and 2000, but have decreased dramatically over the last two decades (especially for the bottom quintile), resulting in increased overall tax progressivity.[37] Congressional Budget Office and income tax data indicate that this was primarily due to the growth in low-income tax credits (Splinter, 2019). Thus, the increase in overall tax progressivity was driven primarily by individual income tax reductions for lower and middle-income taxpayers.[38]

Total tax burdens of the top one percent ranged from 32 to 46 percent between 1960 and 2019, averaging 38 percent with little trend (see online appendix Figure B14). Recently, top tax burdens were modestly higher: in 2019: 42 percent in 2019 compared to 38 percent in 1960. While the higher tax burden with falling statutory tax rates may seem surprising, it is consistent with earlier analyses of tax burdens in the 1960s.[39] 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. This change in revenue sources reflects the shift in business organization from C corporations to pass-through businesses with income reported on individual tax returns. While property taxes decreased as a percent of income, state and local income taxes increased substantially for the top one percent.

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[37] The Kakwani index of tax progressivity summarizes average tax rates over the entire income distribution. While , changing little between 1962 and 1985, this index increased dramatically from 0.07 to 0.29 between 1985 and 2019 (see online appendix Figure B18).

[38] These results also highlight that the U.S. tax system is more progressive than in European countries, which rely more on regressive value-added and payroll taxes. As a result, while top one percent shares of pre-tax income are higher in the U.S. than in Europe, shares of after-tax income are both estimated to be 9 percent in 2017 (based on our U.S. estimates and European estimates from Blanchet, Chancel, and Gethin (2022)).

[39] 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 35 percent for 1966 falls in the middle of this range. The 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.
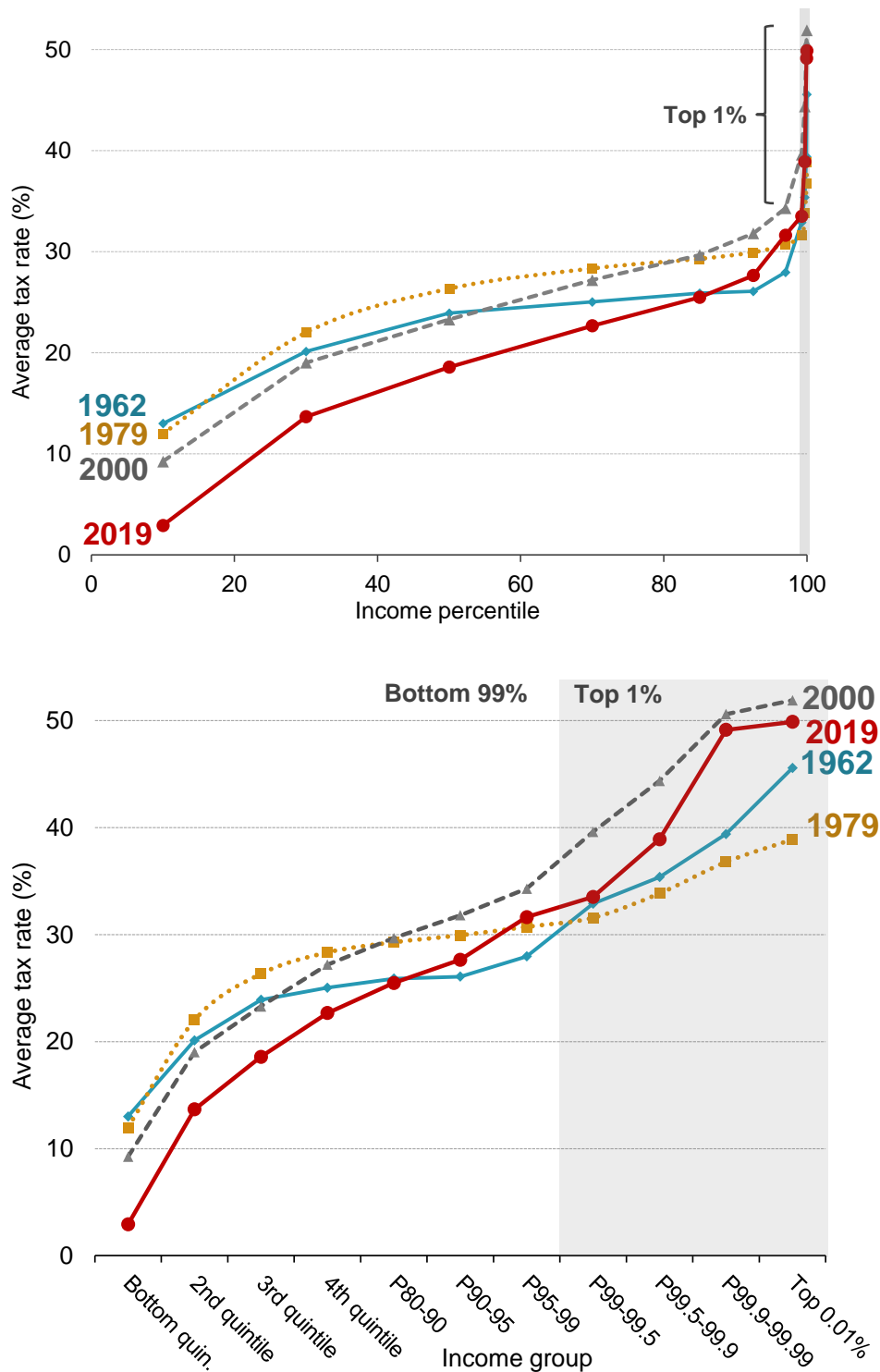
Figure 7: Tax progressivity increased over time

Notes: Average tax rates are taxes (federal, state, and local taxes, including payroll taxes) divided by the pre-tax income plus transfers measure. The upper panel shows income groups proportionally along the x-axis, with the top quintile split into four groups: P80–90, P90–95, P95–99, and the top 1%. The top 1% is shown in the narrow (proportional) range in gray. The lower panel disaggregates the top quintile such that it is not proportional along the x-axis. The top 1% is shown in the wide (non-proportional) range in gray. 1962 is the first non-recession year available and other years are business cycle peaks. *Sources:* Authors' calculations.

The net effect of changes in taxes and transfers since the 1960s was to increase redistribution toward low- and middle-income individuals. The combined effects of taxes and transfers on the income distribution are illustrated in Figure 8, which shows average net redistribution rates by income group for selected years. Net redistribution rates are transfers less taxes as a percent of pre-tax income. The negative net redistribution rates of high-income groups result from progressive taxes, as transfers to this group are small relative to income. The bottom quintile, however, receives substantial transfers and their redistribution rate increased from 47 to 104 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 142 percent in the following economic expansion.[40] 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.[41]

Figure 8: Redistribution increased over time

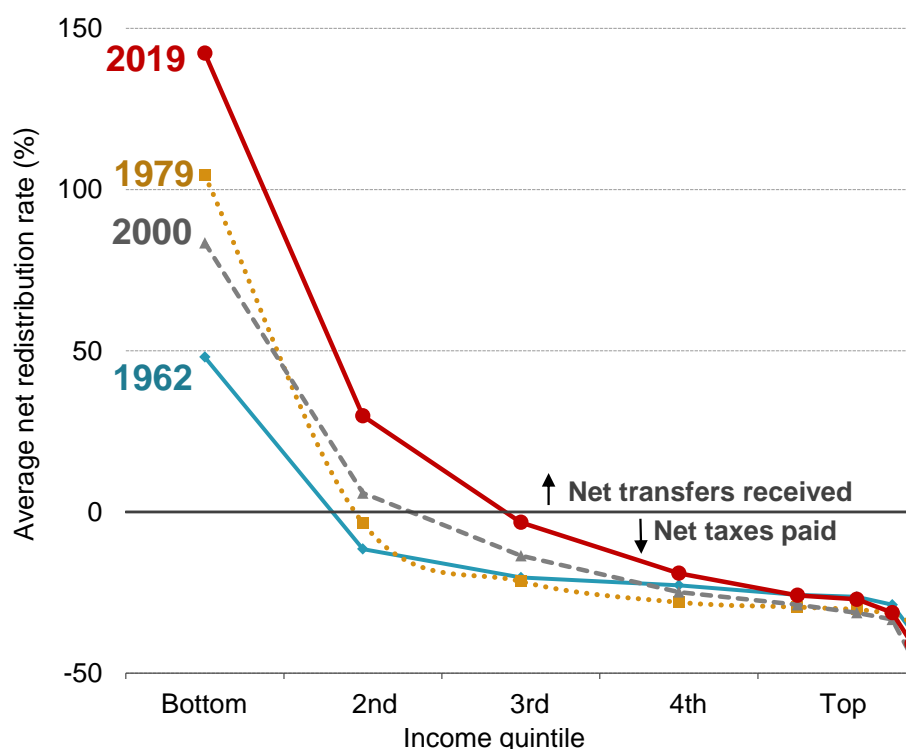*Note*s: Average net redistribution rates are cash and non-cash transfers (excluding government consumption) less all taxes (federal, state, and local taxes, including payroll taxes) divided by pre-tax income of each income group. The top quintile is divided into four groups: P80–90, P90–95, P95–99,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

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

[41] 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. Between 1985 and 2019, the Reynolds-Smolensky redistribution index increased by about half, from 0.09 to 0.13, indicating greater redistribution (see online appendix Figure B19).

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 generally 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 2.6 percentage points (11.1 to 13.8 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 (10.8 to 13.7). 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 (11.5 to 13.8).[42]

Corporate retained earnings can also be allocated in different ways. Rather than distributing the portion not in retirement accounts 75 percent by dividends and 25 percent by capital gains, distributing 50 percent by dividends and 50 percent by capital gains slightly decreases top one percent after-tax income shares. Allocating only by dividends increases the top share by about two-tenths of a percentage point.

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 0.5 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 0.9 percentage points in these years. Our baseline estimates are thus between these two extreme assumptions.

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[42] 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 most new businesses forming as S corporations or partnerships. See the online appendix and Auten, Splinter, and Nelson (2016).

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)	11.1	9.4	13.8	4.4	2.6
50% wages/50% corporate capital	10.8	9.3	13.7	4.5	2.9
0% wages/100% corporate capital	11.5	9.5	13.8	4.3	2.3
Corporate retained earnings (after-tax income)					
individuals: 75% dividends/25% capital gains (baseline)	8.6	7.4	8.8	1.4	0.2
individuals: 50% dividends/50% capital gains	8.6	7.3	8.7	1.4	0.1
individuals: 100% dividends/0% capital gains	8.9	7.6	9.0	1.4	0.1
Economies of scale for ranking (after-tax income)					
Partial: square-root, equivalence elast=0.5 (baseline)	8.6	7.4	8.8	1.4	0.2
No economies of scale: equivalence elast=1	9.1	7.7	8.9	1.2	–0.2
Full economies of scale: equivalence elast=0	7.4	6.5	7.9	1.4	0.5
Costs of earning income (after-tax income)					
Employee/investment expenses, no adjustment (baseline)	8.6	7.4	8.8	1.4	0.2
Deduct employee/investment expenses	8.5	7.3	8.8	1.5	0.2
Multiple Changes (after-tax income)					
Changes increasing 2019 top share	8.7	7.5	9.3	1.8	0.6
Baseline	8.6	7.4	8.8	1.4	0.2
Changes decreasing 2019 top share	7.8	6.6	7.5	0.9	–0.3

*Note*s: Baseline assumptions are described in text and in detail in the online appendix. Assumptions for sensitivity analysis are described in the text. *Sources:* Authors' calculations.

Wage and investment income as reported on individual tax returns generally reflects *gross* income rather than *net* income. Distributional analysis of national income would better measure economic income if the expenses of earning income were netted against income. Accounting for about $100 billion employee business expenses is important for some middle-income occupations, especially truck driving and construction. In contrast, investment interest expenses of about $30 billion are concentrated at the top. Accounting for both would have little impact on top one percent shares in 2019 but would increase the bottom half share of the distribution by 0.1 percentage point in earlier years.

A more robust sensitivity test is to combine several allocations that increase (or decrease) top income shares. Changes to our approach that would *increase* 2019 after-tax top shares are including no government deficits/surplus and allocating non-retirement retained earnings by 100 percent dividends and 0 percent capital gains. Changes that would *decrease* 2019 after-tax top shares are size adjusting income for ranking using households rather than tax units (see Auten and Splinter, 2019), allocating non-retirement retained earnings by 50 percent dividends and 50 percent capital gains, and allocating 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 7.5 and 9.3 percent, more than one percentage point below and half a percentage point above our main estimate of 8.8 percent.[43]

Tax compliance changes before 1988, the earliest audit data on which our early underreporting estimates are based, may also affect top income shares. Nearly all states began some income tax withholding in the 1950s or 1960s, along with third-party reporting and intergovernmental agreements for coordinating audits. Troiano (2017) found that these changes caused large increases in reported top income shares. This implies higher pre-1970 high-income underreporting rates than the 1988 audit data. Accounting for half of the Troiano (2017) effect 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 would including unreported income from offshore wealth affect top income shares? Saez and Zucman (2016) argued that unreported offshore wealth would increase top one percent wealth in 2013 by about $1.2 trillion. Assuming a 5-percent return and ownership by the same individuals in the top of the income distribution would increase top one percent pre-tax income shares by only one-third of a percentage point. In addition, reporting of foreign accounts and

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[43] 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 7.0 to 9.4 percent in 2019. Our main estimate of 8.8 percent is near the high end of this range.

income to U.S. tax authorities has increased significantly with new information-sharing and enforcement efforts. This has likely resulted in higher reported top income shares in recent years but understated top income shares in earlier years (Auten and Splinter, 2021; Johannesen et al., 2023). It is also important to note that unreported offshore wealth is not a new phenomenon. For example, a 1981 Internal Revenue Service and U.S. Treasury report discussed the growing use of tax havens in the 1970s.[44]

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

VI. Summary and Conclusions

Using administrative tax data in combination with the Survey of Consumer Finances and other data sources, this paper develops new estimates of the distribution of income in the U.S. since the 1960s. Our analysis examines levels and trends in all parts of the distribution in addition to top income shares. Our estimates for pre-tax income, based on distributing total national income, show that the top one percent share declined from 11.1 percent to 9.4 percent from 1962 to 1979 and then increased to 13.8 percent by 2019. Viewed over the full period, the top share increased by only 3 percentage points. While our pre-tax income measure includes labor and investment income, it provides an incomplete picture of economic resources available to individuals. A broader measure that includes Social Security benefits and other transfers lowers top one percent shares and results in a smaller increase. Our estimates for after-tax income indicate that the top one percent share increased only 1.4 percentage points since 1979 and only 0.2 percentage points since 1962. These improved income measures also have implications for lower-income groups. 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 two-thirds.

Using only market income on tax returns, Piketty and Saez (2003) argued that the top one percent share of income more than doubled since 1962. This analysis, however, did not include transfers and other income sources not reported on individual income tax returns, nor did it account for the effects of major tax reforms and changes in marriage rates. Thus, it gave a distorted view of income inequality levels and trends. Piketty, Saez, and Zucman (2018) reached less extreme

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[44] This report estimated about $30 billion of income in tax havens in 1978, about 1.5 percent of national income (Internal Revenue Service and U.S. Treasury Department, 1981, p. 38). A 5-percent rate of return would imply about $1.8 trillion in tax-haven-based offshore wealth (2013 dollars). An even earlier response to offshore assets was the enactment of subpart F rules for controlled foreign corporations in 1962 (Hellerstein, 1963).

conclusions after addressing some of these issues but relied on several problematic allocation assumptions for income not reported on tax returns. Our analysis shows that their conclusions are not robust to use of 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 mean that there is considerable uncertainty associated with estimating income distributions over time. Our analysis highlights the importance of attention to details in using tax data, accounting for tax reforms, and including income not reported on tax returns. By emphasizing the sensitivity of top income share estimates to the assumptions used to allocate income not reported on tax returns, our analysis contributes to a better understanding of the evolution of inequality since the 1960s.

Data Availability

Code, a detailed spreadsheet, and information about the confidential tax data used in this article can be found at Auten and Splinter (2023) in the Harvard Dataverse, https://doi.org/10.7910/DVN/NZ8YIT.

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Appendix

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

Year	Fiscal income	Pre-tax Income	Pre-tax income plus transfers	After-tax Income
1960	9.0	10.3	9.8	8.1
1961	9.2	10.7	10.3	8.4
1962	8.9	11.1	10.6	8.6
1963	8.9	11.4	10.8	8.8
1964	9.1	11.5	11.0	8.9
1965	9.3	11.5	11.0	9.0
1966	9.4	11.5	11.0	9.1
1967	9.8	11.3	10.7	8.5
1968	10.1	11.1	10.6	8.2
1969	9.4	10.1	9.6	7.6
1970	8.4	9.3	8.7	6.8
1971	8.7	9.6	8.9	7.0
1972	8.7	9.7	9.0	7.2
1973	8.3	9.5	8.9	7.4
1974	8.5	9.2	8.5	7.0
1975	8.4	9.3	8.5	6.9
1976	8.3	9.4	8.6	7.1
1977	8.4	9.3	8.6	7.2
1978	8.4	9.3	8.6	7.4
1979	9.0	9.4	8.7	7.4
1980	9.2	9.2	8.4	7.0
1981	8.9	8.8	8.1	6.9
1982	9.8	9.1	8.3	6.9
1983	10.3	9.4	8.6	7.1
1984	10.6	9.6	8.8	7.5
1985	11.1	9.7	8.9	7.6
1986	13.1	9.7	8.8	7.3
1987	11.8	9.7	8.8	7.3
1988	14.7	11.2	10.3	8.8
1989	13.8	10.8	9.9	8.4
1990	13.8	10.8	9.8	8.3
1991	12.7	10.5	9.5	7.8
1992	14.2	11.2	10.0	8.2
1993	13.7	10.6	9.4	7.3
1994	13.6	10.6	9.5	7.5
1995	14.6	11.1	10.0	7.9
1996	15.8	11.6	10.4	8.0
1997	17.0	12.2	11.0	8.6
1998	17.7	12.4	11.2	8.7
1999	18.4	12.8	11.6	9.0
2000	19.3	13.3	12.0	9.4
2001	16.8	12.3	11.1	8.6
2002	15.9	11.7	10.4	8.2
2003	16.4	12.1	10.8	8.8
2004	18.1	13.0	11.7	9.3
2005	20.0	14.1	12.6	9.9
2006	20.9	14.5	13.0	10.1
2007	21.5	14.5	13.0	9.8
2008	19.6	13.7	12.0	8.9
2009	17.5	12.8	11.1	8.2
2010	18.8	13.8	12.0	8.9
2011	18.8	13.4	11.7	8.6
2012	21.2	14.9	13.0	9.9
2013	18.9	13.6	11.9	8.6
2014	19.9	14.2	12.4	9.1
2015	19.8	13.8	12.0	8.8
2016	19.2	13.4	11.7	8.5
2017	20.2	14.1	12.4	9.1
2018	20.5	14.2	12.5	9.2
2019	19.4	13.8	12.0	8.8

*Note*s: Annual values shown in Figure 1. Fiscal income includes capital gains (thresholds set without capital gains).
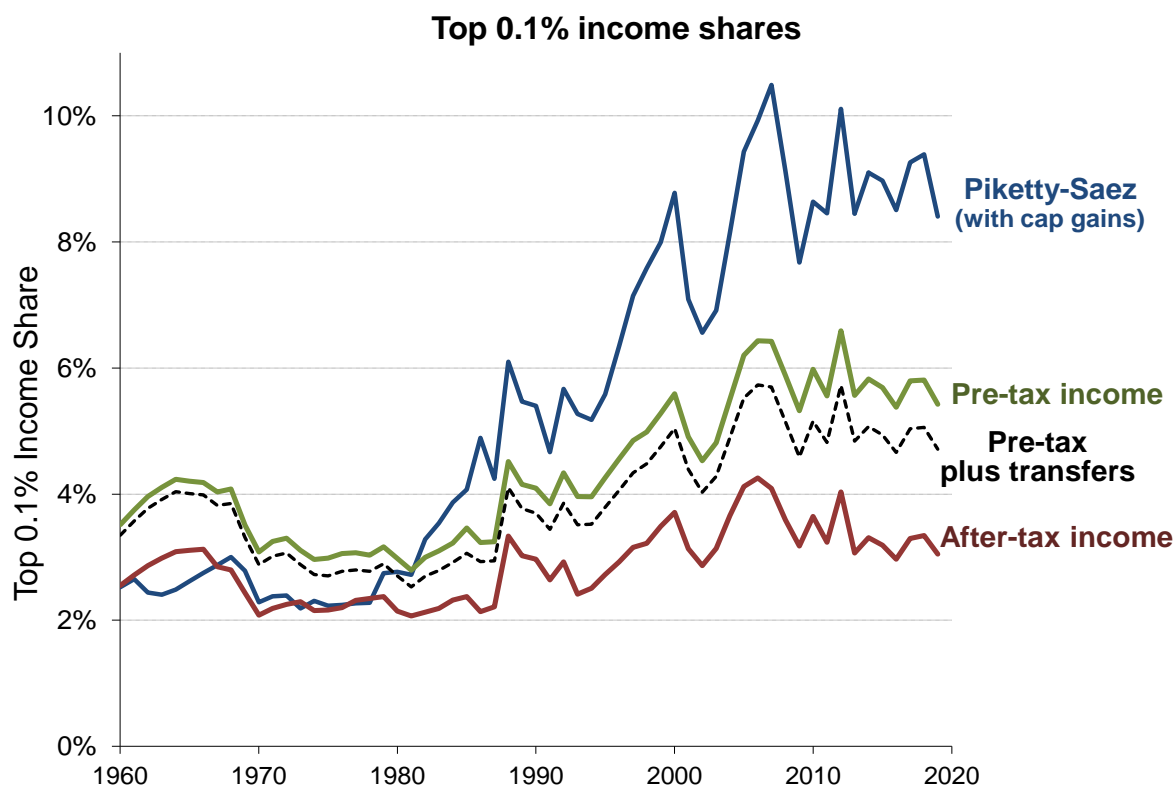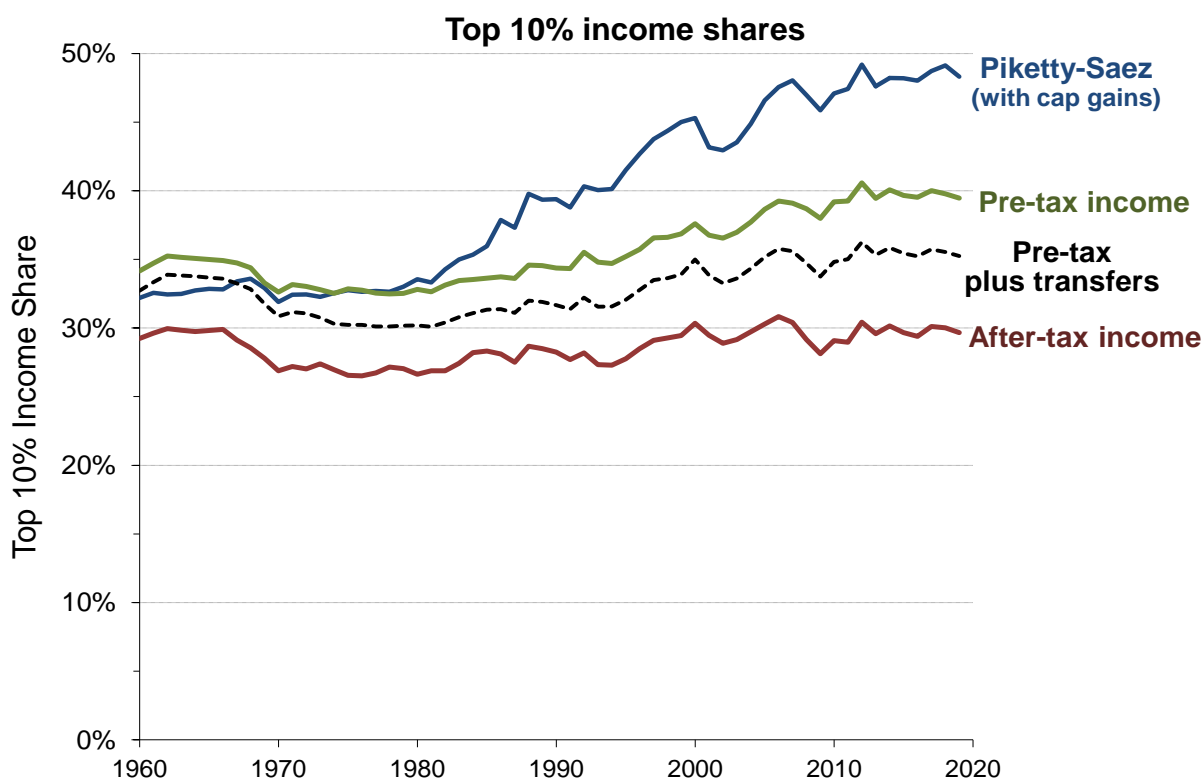*Sources:* Authors' calculations and Piketty and Saez (2003 and updates).

Figure A1: Top income shares: Top 10% (upper panel) and top 0.1% (lower panel)

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

ONLINE APPENDIX[1]

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

by Gerald Auten and David Splinter

September 29, 2023

This online appendix provides details about each of the adjustments made to create pre-tax income, pre-tax income plus transfers, and after-tax income. Table B1 summarizes each adjustment and the relevant data sources. Figure B1 shows the effect on top one percent income shares of adjustments moving from fiscal to improved fiscal income (our initial set of changes before income expansions). Figure 3 in the main paper shows the effect of income expansions. Figures B2 and B3 show the effects of adding government transfers and consumption and removing taxes. Figure B7 shows income shares and average incomes for the bottom half of the income distribution. Figure B8 shows income shares for the top half of the income distribution (excluding the top 10%). Figure B9 shows income shares by quintile and Figure B10 shows Gini coefficients. Figure B11 shows how the shares of each income source have changed over time over time. Figures B12 and B13 show average tax rates over the income distribution, with and without payroll taxes. Figures B14 and B15 show taxes by source for the top one percent and bottom 90%, with and without payroll taxes. Figure B16 shows how shares of income sources excluded from fiscal income changed since 1960—missing capital income for the top declined and missing labor income for the bottom 90% increased (thus pre-tax national income is more equal than fiscal income). Figure B17 shows that payroll tax rates jumped in 1994 with the uncapping of the 2.9 percent Medicare tax, which increased the overall progressivity of the combined taxes and benefits of social insurance policies. Using the Kakwani and Reynolds–Smolensky indexes, Figures B18 and B19 show the increase in tax progressivity and redistribution.

1. NIPA Data Sources

Our income measures include sources not reported on individual income tax returns. National totals for these sources of income, as well as control totals for income items only partially reported on tax returns, are taken from the Bureau of Economic Analysis (BEA) National Income and Product Accounts (NIPA). C corporation retained earnings are defined as undistributed profits, that is, profits with inventory value and capital consumption adjustments less taxes and net corporate dividends from NIPA table 1.12. Corporate profits are the pre-tax difference between receipts and expenses. Two adjustments are made to these profits to provide consistent economic-accounting measures. The inventory value adjustment converts the value of inventory to a current-cost basis, removing the capital-gain-like effect in profits from applying historical costs to inventory. The capital consumption adjustment replaces tax depreciation with economic depreciation, as well as converting depreciation to a current-cost basis (see the NIPA handbook on corporate profits for details at www.bea.gov/resources/methodologies/nipa-handbook). C corporation taxes include federal and state C corporation taxes from NIPA table 1.12 but remove payments to the U.S. Treasury by Federal Reserve banks from NIPA table 3.2 (these are government income from the interest on Federal Reserve assets, mostly mortgage and Treasury securities, added in a

later step). Total tax-exempt interest is based on interest paid by state and local governments from NIPA table 7.11. The following come from various NIPA tables: employer-provided insurance from table 7.8, government transfers from table 3.12, federal income tax from table 3.2, state and local income and property taxes from table 3.3, net imputed rent from table 7.9, property taxes on housing from table 7.4.5, indirect taxes from table 1.12, payroll taxes from table 2.1, fuel and utility taxes from table 3.5, total taxes from table 3.1, and government consumption from table 3.9.5.

2. Replicating Piketty and Saez (2003) Fiscal Income Shares

Our analysis starts by replicating the Piketty and Saez (2003, hereafter PS) definitions of tax return-based market income (i.e., fiscal income).[2] We make two corrections to the tax return data for these estimates. In 1964, about $20 billion in income is added to the bottom 90 percent (proportional to positive adjusted gross income) to match published IRS total income and replicate PS 1964 top income shares. In addition, replication of PS numbers requires treating capital gains distributions from mutual funds reported directly on Form 1040 as ordinary income rather than as capital gains to match PS totals. Our later computations correctly treat these as capital gains and so remove them.

1. **Improved Fiscal Income**

1. Correct Sample: Limit Returns to Adult U.S. Residents

Using Census data for the U.S. resident population, PS and Piketty, Saez, and Zucman (2018) estimated the total number of tax units as the sum of married men, divorced and widowed men and women, and single men and women aged 20 and over. The number of non-filer tax units equals the estimated total number of tax units less the number of tax returns filed. An implicit assumption is that all primary tax filers are age 20 and over, independent economic units, and resident in the U.S.[3] However, substantial numbers of tax returns are filed by taxpayers who are under age 20, dependent filers claimed on other tax returns, or non-residents. To make the tax return sample consistent with the Census population, these returns are dropped from our sample. As explained below, the income of dependent filers is added to tax returns claiming dependents.

We also remove a small number of duplicate observations from the confidential files between 1987 and 2015, about two dozen each year except since 2013, when the number was much larger because of major changes in top tax rates that caused taxpayers to file a second return in the same or later year with corrections. Most of the duplicate observations since 2013 are high-income returns. Their presence would therefore tend to overstate top income shares in recent years. Since they have small weights (often of one), their removal has little impact on the number of tax units but reflects over $10 billion of income for 2014 and 2015. Unfortunately, these duplicate returns are included in published IRS totals. We have discussed this issue with the IRS Statistics of Income and some duplicates have been removed from recent files, but we remove remaining duplicates.

1.a. Remove filers under age 20 and dependent filers

Removing individuals who are under age 20 and other dependent filers increases the number of non-filer tax units. In 2015, for example, about 11 million returns, accounting for about 8 percent of all returns filed that year were under age 20, dependents claimed on another tax return, or both. Because

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[2] There are no public use files in 1961, 1963, and 1965. Interpolated values are shown for those years.

[3] Note that the 2007 sample omits returns identified by the IRS as only filing to claim a tax rebate. The actual number of 2007 tax filers was more than the PS number of total tax units because over 10 million filers were younger than 20 years old or non-residents.

filers under age 20 are not included in the definition of the sample and the number of such returns jumped due to the Tax Reform Act of 1986, it is important to remove these returns from the sample.[4]

Starting in 1979, filers under age 20 are identified using dates of birth reported in Social Security data. Before 1979 we cannot link this information to public use observations and so target this number based on the Census Bureau's Current Population Survey civilian labor force aged 16 to 19.[5] We select unmarried tax returns without age exemptions and with low adjusted gross incomes (AGIs) to hit these targeted number of young filers.[6] For example, in 1978 their AGIs range between $1,400 and $4,200. We allocate the wage share of under age 20 and dependent filer income, regardless of age, to adult tax returns proportional to the number of dependents claimed. To account for high-income tax units that shifted income and assets to dependents we allocate the non-wage share by capital income (dividends, interest, and realized capital gains) on returns with dependents.[7] This accounts for a practice (before 529 plans and other education savings tax benefits) for parents and grandparents to set aside college funds under the Uniform Gifts for Minors Act. In addition, before the Tax Reform Act of 1986 (TRA86), a tax planning device for high-income taxpayers involved shifting family income to children. For example, a tax guide by Lourie and Cutler (1971) explained how to reduce taxes by shifting some income to children or spouses to benefit from multiple uses of the personal exemption and lower tax brackets.

Dependent filers are claimed as a dependent by another taxpayer but file their own tax return. To be claimed as a dependent means the individual provided less than half of his or her own support for the year, implying that they were not economically independent.[8] Prior to 1972, dependent taxpayers could claim both the minimum standard deduction and a personal exemption. Due to concerns about shifting of investment income by wealthy parents and double benefits from two exemptions and two standard deductions, Congress took away the benefit of the minimum standard deduction in excess of any wages for dependent filers in the Revenue Act of 1971. This reduced the potential amount of exempt investment income from $2,050 to $750 under 1972 law and increased the number of dependent filers. Further changes in TRA86 substantially increased the numbers of dependent filers. Prior to 1987, dependents who filed their own return could claim a personal exemption ($1,080 in 1986) but could not claim a standard deduction. Under TRA86, a dependent could no longer claim the personal exemption if claimed on another return but could claim a standard deduction of the larger of $500 or earned income up to the amount of the regular standard deduction. The drop from $1,080 to $500 in exempt investment income resulted in millions of additional tax returns being filed by young dependents. In addition to meeting several other tests, a child aged 19 or over could not be claimed as a dependent unless they were a full-

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[4] Auten, Gee, and Turner (2013) estimated that the number of dependent filers and filers younger than 20 years old increased from about 8 million in 1986 to 13 million by 1988. TRA86 reduced the amount of exempt investment income from $1,080 to $500 and eliminated the personal exemption for dependent filers, only allowing a single exemption on parent returns rather than on both dependent and parent returns.

[5] The number of filers under age 20 before 1979 is estimated by scaling by the average ratio of the number of filers younger than 20 years old to the civilian labor force age 16 to 19 between 1979 and 1986 (see online data).

[6] We also exclude returns checking a box identifying them as dependent filers with unearned income. While some of these are full-time students over age 20, they are included with those under age 20 in the online data because age is not available before 1979.

[7] Weber (1998) showed that incomes of dependent filers increase with the incomes of parents.

[8] Those 19 years or older who file as dependent filers receive more than half of their support from taxpayers claiming an exemption for them and be full-time students. Thus, they are not comparable to fully independent tax units and typically have very low incomes. The potential to influence measured inequality trends 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.

time student receiving over half of their support from the taxpayer claiming them and, beginning in 1989, had to be under the age of 24. A child 18 or under can be claimed as a dependent if other tests, such as the support test, are met. At a higher income level, dependent filers could be subject to a complicated "kiddie tax" that required summing the incomes of all family members and allocating the incremental tax on dependent income among all the dependents.

Since the requirements to be claimed as a dependent mean that dependent returns are not independent economic units, we remove remaining dependent filers regardless of their age. Since the unit of observation of our analysis is non-dependent tax units age 20 and over, the most appropriate approach is to treat dependent filers age 20 or older as part of another tax unit. Failing to remove them seems less appropriate because it would treat them as if they were low-income independent households. In 2013, for example, the average fiscal income of dependent filers age 20 to 23 was about $8,000 compared to $18,000 for non-dependent filers. Therefore, our approach is to drop all filers under age 20 and dependent filers over age 20 and allocate their income among returns with dependents, as discussed above. Since this effectively joins tax units, the total number of tax units is reduced by the number of dependent filers age 20 and over that are dropped.

1.b. Remove non-resident filers and correct for married filing separately returns

Since the number of total tax units is based on the U.S. resident population, non-resident filers are dropped thereby increasing the number of non-filer tax units. Since 1979, non-resident filers are identified as any filer with excluded foreign earned income or with an address outside the fifty states or the District of Columbia. For example, in 2011 this includes 800 thousand tax returns with average incomes of $77,000. In 1979, this correction decreases top one percent income shares by only 0.02 percentage points, suggesting that any effect in earlier years would be small. Before 1979, the public use files do not have state codes and so non-resident filers are identified by likely foreign earned income exclusions identified by other income losses that almost exactly offset wages. Specifically, they are returns with wages of at least $100, other income losses of at least $100, and other income equals negative wages within a range of plus or minus $50.[9]

The PS estimate of the total number of tax units count all married couples as one tax unit. But some married couples file separate tax returns and so the PS approach counts them as two filing tax units. This means the number of adult tax returns is greater than the number of adult filing tax units, which leads to an undercount of the number of non-filers. To correct for this effect, we increase the number of non-filing tax units by half the number of married filing separately returns.

1.c. Non-filer Incomes by Demographic Groups

Some previous studies have assumed a uniform non-filer income for each year, such as the Piketty and Saez (2001, 2003) assumptions that non-filer tax-unit incomes were 30 and 20 percent of filer fiscal incomes. Other studies introduce heterogeneity of non-filer incomes using Census Bureau's Current Population Survey (CPS) survey data. For example, Piketty, Saez, and Zucman (2018) rely on CPS-derived non-filer estimates from the Tax Policy Center, and the Congressional Budget Office statistically matches individuals on tax returns to the CPS and treats unmatched individuals as non-filers. In surveys, however, incomes at the bottom of the distribution tend to be underestimated, especially in recent decades relative to administrative data (Bollinger et al., 2019; Meyer et al., 2019). In addition, the use of surveys to derive non-filer incomes often rely on the incorrect assumption that non-filers always have less income than their applicable filing

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[9] Between 1976 and 1979, we also identify non-resident filers as any filer with excluded foreign earned income, but this variable only captures a fraction of likely non-resident filers.

thresholds. In fact, many non-filers have significantly more income than their filing threshold—the Treasury Inspector General for Tax Administration (2020) identified non-filers with incomes of over $100,000. To account for non-filer income heterogeneity and avoid survey-related underreporting, we use population-level information return data (submitted by third parties such as employers) for resident individuals not observed on tax returns to estimate non-filer incomes for 56 groups (2 marriage, 4 age, and 7 income groups). Information returns have been used to estimate non-filer incomes in other studies, including Heim, Lurie, and Pearce (2014, 2017), Chetty and Hendren (2018), and Larrimore, Mortenson, and Splinter (2016, 2021, 2022).

To estimate non-filer incomes, we first create a population list of non-filer taxpayer identification numbers (TINs). This includes any individual with a domestic (excluding Puerto Rico and territories) information return who is not included on a tax return as a taxpayer or dependent that tax year. In addition, each non-filing individual must be between 20 and 99 years old and not deceased based on the Social Security Administration's DM-1 file. Moreover, their TIN must be included in the DM-1 file, which removes many invalid TINs seen on information returns. We consider the following information returns and associated income sources: 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 (all sources, top-coded at $99,999), and K-1s (partnerships and S corporation distributions). Some TINs appear on many forms each year, likely due to multiple individuals (perhaps unauthorized workers) providing the same TIN to employers or service recipients. To limit this effect, we set a maximum number of five W-2 forms and three 1099-MISC forms for each TIN. These maximums are used because for higher numbers the average amount on each form increases—rather than decreases as one would expect. In 2010, this maximum number of forms per individual results in dropping about 40 thousand W-2 forms with $3 billion in wages and 260 thousand 1099-MISC forms with $120 billion in non-employment compensation.

To create non-filing tax units, we identify married non-filing units by matching non-filing males to non-filing females by address (specifically, the zip code and first seven characters of standardized addresses from information returns, with a maximum of one couple at each zip code/address combination). This results in 2.9 million matches in 2010. How reasonable is this estimate? Tax returns in 2007 provide a unique opportunity to answer this question because many individuals who would otherwise have been non-filers, filed a 2007 tax return to claim recovery rebate credits. These additional filers provide an indication of the number of married non-filing tax units. On 2007 returns, there were about 2.4 million more marriages than in 2006 (58.2 vs. 55.8 million jointly filed returns). This number of additional joint returns should provide a lower bound of the number of non-filer marriages because the number of married filing tax units was nearly flat over this period—only increasing 0.3 million between 2006 and 2010. Our estimate of 2.9 million married non-filing tax units is above this 2.4 million lower bound and appears reasonable.

After combining non-filing individuals who are likely married and summing their incomes, in 2010 we observe 23.6 million non-filing tax units. This compares to an estimated 22.2 million based on the difference between the Census-based number of tax units at least 20-years-old and the corrected number of filing tax units (after removing dependent and non-resident filers and correcting for double counting of married filing separately returns). This suggests that information returns appropriately capture domestic non-filers.

There are a few limitations of this information-return-only approach. Some non-filers and their income are likely missing. This would result from "under-the-table" income that is not reported by employers or service-recipients on Forms W-2 or 1099-MISC or self-employment income that is not captured by information returns. To the extent this under-the-table income results from legal activities, it is included in national income and should be included in our national income measures. We account for this income to some degree in a later step by allocating a portion of underreported income to non-filers.

We then estimate non-filer incomes for 56 demographic/income groups. These are by marriage status, age, and reported income groups. Age groups are: 20–34, 35–54, 55–64, and 65 or older. Income groups include those with information return incomes of zero or less, positive amounts to $5K, $5–10K, $10–20K, $20–50K, $50–100K, and more than $100K. In 2010, about half of the identified non-filing tax units have no market income, but only about a tenth have no income when including Social Security and unemployment insurance benefits (note that we include non-filers who only have a Form 1099-T indicating student status or other information returns with no income). In 2010, about 40 percent of non-filing tax units are aged 65 or older.

1.d. Estimates of Non-filer Incomes
Information returns for the population of resident individuals not observed on tax returns suggest an average tax-unit fiscal income (pre-tax/pre-transfer) of about $8,000 in 2010. Including Social Security and unemployment insurance benefits increases this to about $16,000. These correspond to about 17 and 33 percent of average tax return incomes (without and with Social Security and unemployment insurance benefits, respectively) and are comparable to prior assumptions by Piketty and Saez (2003, 2001) of 20 and 30 percent, respectively. In 2010, these include $86 billion in wages, $11 billion in dividends, $49 billion in 1099-MISC income (top-coded at $99,999) and Sch. K distributions, $37 billion in non-rollover retirement distributions, $5 billion in interest, $167 billion in Social Security benefits, and $16 billion in unemployment insurance.

The information return data used is only available since 1999 and therefore we must rely on demographic-group imputations to allocate non-filer income in earlier years. First, non-filer incomes are estimated using information returns as described above for 2000, 2010, and 2018. Second, the share of non-filing tax units is estimated for each demographic group (8 groups based on marriage and age status) based on the difference between all individuals in Census and those filing on tax returns. Third, for each year, the total estimated number of non-filing tax units is multiplied by the estimated demographic shares to yield the number of non-filing tax units in each group. Group incomes are estimated as follows: for years before 2008, the 2000 data is used with income amounts indexed by the CPI-U and wages indexed by the average wage index, for 2008 to 2017 we interpolate the 2010 and 2018 estimated group-level incomes, and since 2018 we use 2018 estimates indexed as described above.

This demographic group approach appears to provide reasonable estimates of non-filer incomes, even in earlier decades. In 1960, there was no standard deduction and therefore the threshold of income at which a tax unit must file a tax return was determined by the $600 per person exemption. Given the existence of multi-person tax units, our estimated non-filing tax unit fiscal income of $1,100 seems reasonable. Our estimated aggregate non-filer fiscal income also seems reasonable. Census estimated that 2.3 million families had incomes under $1K, 3.6 million with $1-2K of income, and 4.0 million with $2–3K of income.[10] If all families under $2K did not file and half of

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[10] www2.census.gov/library/publications/1962/demographics/p60-37.pdf

those with \$2–3K (i.e., at least 4 people in a tax unit to legally not file), the implied total non-filer income is \$15 billion (assuming a within-group average income of two-thirds the maximum)—similar to our estimate of \$14 billion of non-filer fiscal income (without underreporting). In the mid-1970s through mid-1980s, the real filing threshold was lower due to the non-indexation of personal exemptions and standard deductions (and legislative increases that did not keep up with inflation). Our demographic group approach tends to capture this effect of policy because in these years our non-filer incomes are lower relative to average filer incomes, falling to 16 percent of average filer income in 1970. For the 1990s through mid-2000s, our non-filer fiscal incomes average 21 percent of average filer income—just above the Piketty and Saez (2003) assumption. After a brief decline during the Great Recession, non-filer estimated incomes have increased to 35 percent of average filer income. This was largely due to an increase in wages not reported on tax returns, likely due to an increase in filing thresholds.

2. Impose Post-TRA86 Loss Limits
Before TRA86, taxpayers could offset taxable income with passive passthrough and rental losses (Joint Committee on Taxation, 1985). One of the goals of the reform was to limit the effect of these tax shelters with passive loss limitations (Nelson and Petska, 1990). The resulting non-deductible losses increased AGI. To make non-deductible losses consistent before and after TRA86, post-TRA86 loss limitations are imposed in pre-TRA86 years.[11] The fraction of losses that are non-deductible declines gradually after TRA86, which may be due to portfolio adjustments, the gradual phasing in of slower depreciation for real estate, or other behavioral changes as these losses became less valuable. It is less difficult to model imposing limits on pre-TRA86 losses than to try and simulate continuation of the prior regime of tax shelters and other tax avoidance. Therefore, we estimate non-deductible losses before TRA86 rather than make non-deductible losses deductible after TRA86. The imputation of non-deductible losses is based on the fractions of partnership/S corporation losses and rental losses that match those of non-deductible losses in years immediately following TRA86.[12]

3. Include Tax-Exempt Interest
State and local government tax-exempt interest payments are excluded from federal taxable income, although they have been reported on tax returns since TRA86. We include reported tax-exempt interest since 1987 and impute tax-exempt interest in earlier years. Tax units with high marginal tax rates tend to invest in tax-exempt bonds more than those with lower marginal rates. Since top marginal rates were much higher before 1987, the fraction of tax-exempt interest going to the top of the distribution was also higher. As seen in Figure B4, high-income tax units were still shifting out of tax-exempt bonds in 1988. Between 1982 and 1986, the fraction of tax-exempt interest going to each income group is based on shares from the 1983 Survey of Consumer Finances, which are similar to the 1987 shares seen in the tax data. The shares for 1960 and 1962 are based on the 1962 Survey of Financial Characteristic of Consumers. The shares are assumed to decrease linearly for years between 1962 and 1982 to account for changes in portfolios as the top income tax rate decreased from 91 percent to 70 percent by 1965 and 50 percent in 1982. Before 1987, tax-exempt interest is allocated after tax units have already been divided into relative income groups.[13]

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[11] This adjustment for business losses also indirectly accounts for the liberalized depreciation rules enacted in 1981 and the tightening of depreciation in later reforms.

[12] Non-deductible losses affect the top of the distribution more and allowed rental losses phase out for AGIs over \$100,000. For tax units with positive market incomes over \$100,000 in 1987 (indexed in earlier years), about 85% of partnership/S corporation losses and 30% of rental losses are estimated to be non-deductible. For tax returns below the threshold, 20% of partnership/S corporation losses are assumed to be non-deductible.

[13] Note that Piketty, Saez, and Zucman (2018) allocate constant shares over this period based on the 1983 Survey of Consumer Finances, which would underestimate tax-exempt incomes of the highest income groups in earlier decades.

4. Correct Income Definition

Some income sources are missing from or do not reflect current-year income. Our corrections and adjustments are to: (1) add excluded dividends, (2) add excluded combat pay, (3) deduct gambling losses up to the amount of gambling income, (4) add back net operating losses that have been deducted from income, (5) remove capital gains distributions and ordinary gains, (6) deduct Individual Retirement Account (IRA) contributions, (7) remove taxable distributions of retirement accounts upon death, (8) add missing alimony receipts and deduct alimony paid, and (9) subtract taxable state and local income tax refunds.

Excluded dividends are added to income for years before 1987. These values are taken directly from tax returns. Since TRA86, there are no excluded dividends. A small amount of excluded combat pay—between $5 to $14 billion—is added to income on an equal-tax-unit basis since 1995, when the exclusion began. These total amounts are based on aggregate amounts reported on Form W-2 since 1999 and indexed for earlier years (1995 to 1998).

Gambling winnings are generally included in other income on tax returns, but gambling losses may only be deducted up to the level of reported winnings by taxpayers itemizing their deductions. Since only net income from gambling should be counted as income, the asymmetric treatment of gambling gains and losses is corrected by subtracting deducted gambling losses. This correction is important because some taxpayers report large amounts of gambling winnings in other income, but equal or nearly equal amounts of gambling losses in miscellaneous itemized deductions. Failing to make this correction makes some taxpayers appear to have much more income than their true economic situation.

Net operating business losses (NOLs) that cannot be used to offset other income that year can be carried forward to future years. Large NOLs in one year can result in negative AGI for several years so that a one-time loss can be counted in income multiple times in future years. Since NOL carryovers are not current-year income, these need to be added back in computing current-year income.[14] This adjustment for losses moves many of these taxpayers up from bottom income percentiles, some as far as the top one percent.

Beginning in 1970, a new simplification measure allowed taxpayers with capital gains distributions from mutual funds and no other capital gains to report them directly on Form 1040 without filling out a Schedule D (except in 1997 and 1998). A separate line was added in 1971. It appears that this change was not accounted for in PS computations of market income.[15] Therefore the capital gains reported only on Form 1040 (adjusted for the capital gains exclusion) are subtracted as a correction of our replication of PS. Previously, taxpayers did not have this option and so capital gains distributions were already removed in those years. Beginning in 1971, gains and losses from Form 4797 (sales of business property) have been reported on a separate line of Form 1040 and

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[14] The original business losses are reported on Schedules C (sole proprietorships), E (partnerships and S corporations), or F (farms). Large losses can offset positive income over several years. Thus, parts of the original loss can show up in multiple future years as negative amounts in "other income" on tax returns, resulting in negative adjusted gross income in those years. For tax years beginning after 2017, the deduction for loss carryovers is limited to 80 percent of taxable income computed without regard to the loss carryover. Prior to 2017, limited carrybacks were allowed against prior-year returns. These rules changed several times and liberalization of loss carryback rules was sometimes used as an economic stimulus in recession periods.

[15] Our replication of PS suggests that their computations of market income net of capital gains only excluded Schedule D gains (line 13 on Form 1040 in recent years) but did not account for capital gains distributions or net gain or loss from Form 4797 from the sale of business property (line 14 on Form 1040).

are also removed in this step. Part of this gain reflects the recapture of depreciation expense in computing capital gains on assets. In the 1960s and 1970s, this amount was treated as a capital gain eligible for preferential rates. Another part reflects a provision providing preferential capital gains rates for gains on certain assets but ordinary treatment of losses so that the usual capital loss limits did not apply. These treatments were gradually cut back over time, especially in the 1980s, turning the net gain amount from a negative to a positive number. To adjust for these tax reforms, these gains and losses are subtracted out. Failing to make this adjustment would overstate income of the top one percent in recent years as compared to before TRA86 and earlier reforms.

Economists generally consider economic income to be net of the expenses of earning that income. Failing to net expenses treats some income as gross income, rather than net income. As discussed above, our analysis corrects one important situation by netting reported gambling losses up to the amount of reported gambling income. However, other netting corrections could also be considered, the most important of which are employee business expenses and expenses associated with investment income, including investment interest expense. We explore the effects of these deductions in sensitivity checks in section V.

Individual Retirement Account (IRA) contributions, as well as Keogh, SEP, SIMPLE and other qualified plan contributions, are removed for two reasons: they are parallel to employee contributions to defined contribution accounts such as 401(k) plans, which are also excluded, and retirement distributions are included in the definition of income, so contributions should be removed to prevent double counting. Note that we do not include non-taxable pension or non-taxable IRA distributions reported on Form 1040, because almost all of the large values are IRA and pension rollovers or Roth conversions and rollovers. While some of the smaller non-taxable pensions and distributions reflect typically small amounts of pension basis recovery or housing allowances for certain religious employees, these cases are rare and difficult to identify. See the additional discussion on this issue in section VII comparing our results to Piketty, Saez, and Zucman (2018). Death forces taxable distribution of retirement accounts. This is not income, but an asset value and should be removed. We remove these taxable distributions, identified using years of death for the primary taxpayer (since 1998) and large taxable retirement income amounts exceeding $250,000 ($2015), which reduces taxable retirement amounts by 0.2 percent or less.

Alimony received is included in our income measures since it has historically been part of AGI since the Revenue Act of 1942, but alimony paid is not deducted (as we add back adjustments to get to total income on Form 1040). Thus, alimony income is over-counted. We address this issue by deducting reported alimony paid. This amount, however, is larger than the amount of reported alimony income. To correct for both issues, we allocate additional alimony received to match deducted alimony payments and subtract alimony payments. These additional amounts are allocated 75 percent to non-filers and 25 percent proportionally to reported alimony if less than $5,000 ($2015). These adjustments address both the issues of over-counting and the difference between the amounts, attributing this income to the ultimate recipients. A related issue is that child support payments are not properly attributed because they are not reported in the tax data. As a result, child support amounts are only counted in the income of the payer, thereby understating the economic income of the recipient and overstating that of the payer. This could slightly overstate top income shares, although it appears that most of these transfers are between lower- and middle-income tax units.

Refunds of state and local income taxes are included in total income on tax returns to correct for itemized deductions in the previous year based on amounts withheld that exceeded the actual tax liability (resulting in a lower tax in the prior year). Most taxpayers seem to prefer over-withholding to receive a tax refund and avoid having to write a check to the IRS when filing their returns. These refunds are adjustments and should not be included in measures of income and are therefore subtracted.

Due to missing variables in early years, some corrections can only be imputed. State and local tax refunds are available in the data only since 1971, the first year this appears on IRS tax forms. This may reflect a new regulation as there is no mention of this in the instructions in prior years. Gambling losses are only deducted since 1972. The effect of ignoring gambling in the 1960s is small because this is well before the expansion of lotteries, casinos, and other legalized gambling activity. Since gambling losses were not reported separately before 1991, they are set equal to miscellaneous deductions if miscellaneous deductions are equal to or slightly less than other income based on observed patterns when this variable is reported. In later years, this method accounts for over half of gambling loss deductions. Before 1989, net operating losses are generally assumed to be 80 percent of other income losses, since a large fraction of losses in other income in later years reflect net operating losses. This percentage has sometimes been used as a rule of thumb in tax policy estimates. In recent decades, the foreign earned income exclusion is included in other income on Form 1040 as an offset to wages. Because the tax returns with excluded foreign earned income are dropped from the sample as non-residents, we do not address the effects of the foreign earned income exclusion. Alimony paid is missing as a variable in 1971 and even-numbered years in the 1970s and both alimony received and paid are missing before 1971. We impute the total amount of alimony paid in these years by indexing 1979 total alimony by inflation and scaling it by the share of divorced adults (which peaked in 1980) and assume half of alimony was reported before 1971. For years when these were not reported, we match the 1979 income effects over the distribution by allocating alimony received half per capita and half by wages and alimony deducted one-quarter by dividends and three-quarters by wages.

5. Base Income Groups on Number of Individuals and Rank by Size-Adjusted Income
A perennial concern for consistent inequality measures is to address the effects of social and economic changes on how individuals group themselves.[16] To address these issues, we base income groups on the total number of individuals (including primary and secondary taxpayers and dependents) and rank tax units using size-adjusted incomes. This approach generally follows that of Congressional Budget Office (2016). It provides a better measure of the relative economic resources and welfare of tax units by accounting for economies of scale and sharing, as well as the effects of supporting dependents, declining marriage rates outside the top one percent, and increasing numbers of single-parent households. Size-adjusted income is calculated by dividing tax unit income by the square-root of the number of individuals in the tax unit.[17]

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[16] Brady (1951, pp. 10–11) explained: "In long run comparisons changes in the composition of the population should probably be recognized by recourse to a scale of equivalents…Long run social and economic changes and also cyclical fluctuations may alter the manner of grouping the population into 'economic families', that is, consumer units. To the extent that the composition of the 'economic family' varies with the income situation, essential changes in the characteristics of the income distribution may be entirely obscured by comparing the incomes of consumer units in different periods. In depressions families and individuals with little or no income may disappear by merging with other families, while prosperity leads to undoubling, increasing the number of households."

[17] Since exemptions may be claimed for spouses and children living in Canada or Mexico, a correction is needed because the numbuer of individuals exceeds Census population estimates (Cilke, 2014). To correct the data for this issue, the number of individuals reported for exemptions on tax returns is reduced since 2005 by the number of secondary filers and children without Social Security Numbers (i.e., using Individual Taxpayer Identification Numbers).

The use of tax units over a period when marriage rates have been decreasing, except at the top of the income distribution, results in increasingly overstated top income shares in recent decades. To control for the declining marriage rate outside of the top of the distribution, as well as declining family size and increasing numbers of single-parent households, our analysis bases income groups on the number of individuals, rather than the number of tax units.[18] This means there is an equal number of individuals, rather than an equal number of tax units, in each percentile. An alternative approach of grouping by adults (i.e., counting both primary and secondary taxpayers on joint returns) partially corrects for declining marriage rates, but does not account for the increasing share of single-parent families.

For example, assume there are 100 million tax units each with two dependents per married tax unit, where all the top one percent are married and half of the bottom 99 percent are married, so there are just over 250 million individuals. In this example, when grouping by tax units, the top one percent has 4 million individuals and 1 million tax units. Grouping by individuals, the top one percent has about 2.5 million individuals and only about 0.63 million tax units (2.5 million divided by 4). Since there are fewer tax units in the top one percent of individuals, there is less income in the top one percent and its income share is lower. Setting groups by the number of adults has a similar but smaller effect. With just over 150 million adults, the top one percent of adults has about 1.5 million adults and about 0.75 million tax units (fewer than grouping by tax units but more than grouping by individuals).

If the marriage rate and number of dependents claimed were the same in all income groups, income shares by tax units and individuals would be the same. But because the marriage rate is much higher in the top one percent (and the average number of dependents a bit higher), using tax units always results in higher top one percent income shares.

The falling marriage rate outside the top one percent implies that the switch from grouping by tax units to individuals limits the increase in top income shares in more recent decades. Changes in the distribution of dependents partially offset the effect of falling marriage rates on top income shares. Between 1960 and 2015, the average number of dependents among top one percent tax units fell more (by 0.8 dependents, from 1.9 to 1.1) than for all tax units (by 0.6 dependents, from 1.2 to 0.6).

II. Pre-tax Income: Expansions

1. Include Fiduciary Retained Income
Fiduciaries, which include estates and trusts, distribute much of their income each year and this distributed income is already included in individual taxable income on tax returns. Some fiduciary income, however, is and therefore missing from tax-return-based measures of income. To account for undistributed fiduciary income, undistributed income excluding capital gains is added to individual pre-tax income. In addition, we add both distributed and undistributed interest, dividends, and capital gains to each of these sources, so that later imputations based on these income sources include this fiduciary income. Undistributed fiduciary income is allocated to tax returns by taxable fiduciary income (1966 shares by income groups are used in prior years). Fiduciary level income taxes (excluding estate tax) are added to state income taxes and federal fiduciary taxes are added to federal income taxes and allocated by taxable fiduciary income.

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[18] We estimate that a bit more than one-tenth of non-filing tax units (one-fifth of non-filing individuals) are married. These married non-filing tax units are counted as two individuals for the size adjustment.

2. Include Corporation Retained Earnings

C corporation retained earnings are part of national income and therefore need to be allocated to various corporate owners and beneficiaries of corporate income: individual owners, pension recipients and retirement account owners (including IRA, 401(k), and similar defined contribution plans), and non-profit organizations and domestic governments. C corporation retained earnings is defined as NIPA undistributed corporate profits and calculated as profits with inventory value and capital consumption adjustments less taxes and net corporate dividends. This definition includes reinvested earnings of incorporated foreign affiliates of U.S. corporations, that is, unrepatriated foreign earnings.[19] The U.S. resident ownership of foreign corporations is approximately equal to the non-resident ownership of U.S. corporations (Auerbach, 2006 and Burman, Clausing, and Austin, 2017). Therefore, our analysis essentially assumes that the retained earnings accruing to residents from the ownership of foreign corporations is equal to that accruing from a similar asset value of domestic corporations.

Current-year retained earnings of C corporations are commonly used as an alternative to capital gains income because they are a major source of the underlying income that produces capital gains.[20] The two primary alternative approaches with tax-return data are including realized capital gains as reported on tax returns and accrued capital gains and losses. Both approaches have limitations. Realized capital gains reported on tax returns have generally accrued over many years but are only reported on tax returns when realized. Accrued capital gains are difficult to measure and can be highly volatile because of business cycles and asset price bubbles and collapses (Larrimore et al., 2021).

For allocating the portion of corporate retained earnings on stock held by individuals, we favor using dividends received as the primary factor (Smith et al., 2019). Since some corporations do not pay dividends, we also allocate a portion by realized capital gains. Three-quarters of retained earnings are allocated based on a tax filer's share of dividends and one-quarter based on their share of capital gains, including Schedule D and Form 4797 gains from the sale of business property.

Another portion of corporate ownership is associated with retirement income, including private and public pensions, IRAs, and life insurance funds. Based on the Federal Reserve Financial Accounts, the fraction of corporate ownership associated with these retirement accounts was 4 percent in 1960, peaked at 57 percent in 2008, and decreased to 50 percent by 2012.[21] The non-profit organizations and domestic governments share of corporate ownership increased modestly from 5 percent in 1960 to 7 percent in 2013. Rosenthal and Austin (2016) present similar estimates.

The dramatic increase in the share of corporate ownership by pension funds has important implications for thinking about both the allocation of corporate income and the burden of the corporate income tax that has been overlooked in most prior distribution studies (for an exception, see Kallen and Mather, 2021).

As shown in Table B2, across the income distribution, our estimated pension ownership shares are close to those in the Federal Reserve's Distributional Financial Accounts (DFA). For example, the DFA showed top one percent (ranked by income) pension entitlement shares of 7.1% in 1989 (the

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[19] For more details, see www.bea.gov/resources/methodologies/nipa-handbook

[20] For example, see the discussion of Treasury's Family Economic Income concept in Nelson (1987). This approach is also used by Piketty, Saez, and Zucman (2018).

[21] We use the 2017 Investment Company Institute Fact Book data to estimate the corporate equity shares of IRA assets, including shares owned through mutual funds, which ranged from about 60 percent to 80 percent from 1997 through 2015.

earliest year of DFA) and 6.4% in 2018. Our allocation results in nearly identical shares of 7.4% and 6.3%, respectively. For the lower income groups, the DFA shares and our shares are also nearly identical. As described next, our use of individual-level IRA wealth reported on Forms 5498 captures significant top retirement wealth for specific individuals, including accounts with very large values.

The defined contribution (DC) retirement account share of corporate ownership is allocated by DC wealth. In 1989 and since 1993, IRA asset values are those reported on Form 5498 for each tax unit. Non-IRA DC wealth is then allocated using the Federal Reserve's Survey of Consumer Finances (SCF) scaled to reflect the share of missing DC wealth for each income and age group. Before 1989 and in 1990–1992, DC wealth is based on SCF estimates. Table B2b shows that these methods result in similar DC wealth shares over the income distribution. SCF-based DC wealth is estimated in three steps. First, DC wealth variables are calculated in the SCF by income group (P0-50, P50-90, P90-95, P95-99, P99-99.5, P99.5-99.9, P99.9-P99.99, top 0.01 percent) and age group of the family head (20–40, 41–64, 65–72, 73+). DC wealth includes assets in individually owned IRAs, Keoghs, and thrift-type retirement plans and excludes defined benefit plans. Since 1989, a minimum of $1,000 in DC wealth is required to be considered a DC owner. In the SCF, total income is similar to adjusted gross income, but there are few cases of large losses and so we define total positive income (TPI) in the tax data as the sum of non-negative incomes for each major income source, adding back excluded capital gains and dividends. TPI also provides a more consistent income measure across TRA86. Second, we randomly impute DC owners within each income/age group such that DC ownership rates are the same in both datasets. The 1983 SCF is used before 1988, the 1989 SCF through 1990, and then each subsequent triennial SCF for each three-year period. Third, we estimate DC wealth levels for these recipients using a normal distribution and the estimated mean and standard deviation that was separately estimated for each income/age group in the SCF (the standard deviation is adjusted to account for the one-sided non-normal distribution and DC wealth is set at a maximum of 20 times the group-level mean, which rarely binds in the SCF). Since exact ages are not available in the tax data before 1979, the estimates for either the 41–64 or 65–72 year-old age groups are used depending on whether the tax return claimed an elderly exemption (that is, one of the filers was 65 years or older). This estimated DC wealth is aggregated across all tax returns. Finally, the share of estimated DC wealth corresponding to each tax return is used to allocate the various income sources related to retirement accounts: corporate retained earnings, corporate taxes, and dividends and interest excluded from tax returns.

The defined benefit (DB) plans' share of corporate ownership is allocated by earned income. For this allocation, *earned income* is the sum of up to $200,000 of wages, self-employment income (i.e., self-employment payroll taxes (SECA) divided by SECA tax rates), and up to $40,000 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 non-linear effects for high wages.[22] Specifically, earned income is zero for those with no taxable retirement distributions and below the 40th percentile of tax-unit wages and top-coded at $300,000 for married returns (reduced by 30 percent for unmarried returns). To account for unusually generous DB plans, as well as very large DC accounts, earned income is increased by one-tenth the amount of non-taxable retirement account distributions exceeding $10 million. Large non-taxable pension and retirement account distributions are almost always account

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[22] Rosenthal and Burke (2020, pg. 4) write, "To qualify under the tax rules, a DB plan can pay a maximum $235,000 annually after retirement."

rollovers by top executives or other wealthy individuals. Therefore, including 10 percent of these amounts roughly convert wealth levels to earnings flows.

We account for only a subset of tax units with earned income having DB assets by setting some earned income above the 40th wage percentile to zero. Before 1988, we base DB ownership shares on the 1983 SCF share of families with DB from one's current job ranked by income: 3% of the bottom quintile, 9% of the second quintile, 21% of the third quintile, and about 33% for higher income groups.[23] Since 1988, these ownership shares are gradually reduced over time based on estimates in Devlin-Foltz, Henriques, and Sabelhaus (2016).

The retained earnings of non-profits and governments are allocated half per capita (equally across all individuals including dependents) and half by wages. This accounts for both the redistributive and consumption-like spending of non-profits (for example, United Way and symphonies).

3. Include Corporate Taxes
C corporation tax burdens are allocated following an approach similar to Congressional Budget Office (2012) and the Joint Committee on Taxation (2013). One-quarter of the tax is allocated to wages and three-quarters by corporate ownership and interest-bearing assets.

Various arguments have been used in support of the view that a portion of the burden of the corporate income tax falls on wages.[24] These include reducing the amount of capital per worker thereby reducing their marginal product, and the greater mobility of capital relative to labor. An additional hypothesis is that strong labor unions shared in the after-tax profits of oligopolistic industries in the 1960s. Felix and Hines (2009) found a direct link between state corporate income taxes and union wages, estimating that union wages captured about 54 percent of the benefits of lower state corporate tax rates. Executive compensation is also affected by corporate taxes because non-qualified stock options are included in wages as reported on Form W-2. Executive compensation has increasingly been based on stock option grants which reflect after-tax corporate profits and stock prices. Hall and Liebman (1998) documented that a shift in executive compensation from salary and bonuses to stock options began in the 1980s and concluded that there is a strong link between the fortunes of CEOs and the companies they manage when accounting for the effects of stock options and stock holdings. Effective in 1994, Congress imposed a one-million-dollar cap (unindexed for inflation) on deductions for compensation of the CEO and the four other highest compensated executives. However, "incentive pay" was exempt from this cap. Hall and Liebman (1998) found that the mean value of stock option grants jumped an additional 36 percent in 1994. Giertz and Mortenson (2013) examined executive compensation in the more recent period from 2000 through 2014 and found that stock options continued to expand as a share of executive compensation from 35 percent in 2000 to a peak of 67 percent in 2006 before dropping to 19 percent in 2009. This evidence suggests an increasing link between stock prices and the wages of executives. Allocating 25 percent of corporate tax burden to wages takes this into account. Since stock options are the most volatile component of executive compensation, this also contributes to the rising top income shares during recent expansions.

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[23] To match the 1983 SCF distribution of DB ownership, in these years earned income is allowed to increase to the amount of wages up to $400,000 and all earned income is retained for the top ten percent.

[24] Alternatively, estimates by Baker, Sun, and Yannelis (2020) suggest that *consumers* bear 31 percent of the burden of the corporate tax because of forward shifting to retail prices.

Corporate ownership is allocated to four groups based on their shares of assets in the financial accounts: non-retirement equity, interest-bearing assets, retirement or life insurance, and non-profit or government. The corporate tax share associated with non-retirement corporate equity ownership is allocated three-quarters by dividends and one-quarter by capital gains reported on tax returns. The share associated with interest-bearing assets (i.e., bonds) is allocated by taxable interest. The shares of the corporate tax associated with retirement and non-profit/government ownership are allocated in the same manner as the share of retained earnings associated with retirement and non-profit/government ownership. That is, DC plans are allocated by SCF-based ownership and DB plans by the earned income of filers. Non-profit/government ownership is allocated half per capita and half by wages (see above for additional details).

In 2019, these assumptions result in 18 percent of corporate tax being assigned to the top one percent. First, 25% is assigned to wages, of which the top one percent (after our adjustments) earns about 9%, including executive bonuses. Of the remaining 75%, half is attributed to retirement income and the top one percent receives about 7% of the retirement allocation (see Table B2a), and 7% to non-profits or government and the top one percent is allocated about 6% of this share. Finally, the remaining share is allocated by capital income with the top one percent earning about 40% of dividends, capital gains, and interest. In summary, the top one percent share of the corporate tax is 18% [0.25•9% + 0.75•(0.50•7% + 0.07•6% + 0.43•40%]. This is less than Congressional Budget Office (2016) estimates, which disregard the large fraction of ownership of corporations by retirement accounts (and the smaller share by non-profits and governments). Our estimate resembles those by researchers considering retirement accounts, such as Kallen and Mathur (2021, see their appendix Table A3), which estimated that the top one percent has only 15% of equity ownership.

4. Include Business Property Taxes
Business property taxes are included in pre-tax income. The aggregate amount is defined as all property taxes less owner-occupied housing property taxes and is distributed to tax returns in proportion to non-housing capital ownership shares. The portion associated with household corporate equities is allocated by three-quarters dividends and one-quarter capital gains. The portion associated with bonds is allocated by taxable interest. The portions associated with retirement plan and non-profit and government ownership are allocated as for corporate ownership. The portion associated with passthrough ownership is distributed by the absolute values of the net income of partnerships and S corporations, Sch. C businesses, rents, and Sch. F farms. The large effect of property taxes on top shares in 1960 is due to the substantial fraction of business property taxes distributed to corporate equity owners. This fraction declined as corporate ownership shifted to retirement accounts.

5. Inflation Correction
Inflation affects real incomes differently over the income distribution, and so correcting for inflation moves towards a more consistent measure of top income over time. Inflation causes an overstatement of interest receipts and an understatement of business profits, which are net of deductible interest payments. Steuerle (1985) explains that "[i]nflation raises the nominal interest rate on loans and decreases the probability that nominal financial or taxable income will be measured as positive even when real economic profits are present." (pg. 129) This reduction in measured profits relative to economic profits due to inflation may partially explain low nominal business income in the 1970s and early 1980s. Businesses may have exacerbated this understatement of income to the extent they sought to lower tax burdens by increasing borrowing and deductible interest payments. Between 1961 and 1981, interest payments that were potentially deductible increased from 5.5 to 13.1 percent of GNP (Steuerle, 1985).

To estimate incomes that are more consistent across years despite inflation rate fluctuations, we make three adjustments to interest flows. Our overall approach resembles the inflation corrections made in prior studies (Feldstein, 1988; Wallace, Wasylenko, and Weiner, 1991). First, we decrease household net interest receipts by the fraction accounted for by inflation, estimated as the inflation rate (using the PCE) as a fraction of the Aaa corporate bond yield. Second, we increase business income by the fraction of net interest payments accounted for by inflation as a fraction of the Baa corporate bond yield. In addition, we account for the effects of inflation on employer-sponsored pensions. Inflation likely reduces the real retirement income of households and causes businesses to increase real contributions to pension and other retirement funds. We divide the retirement account portion of the inflation adjustment equally between households and businesses. The main household inflation adjustment is distributed by taxable and non-taxable interest and the retirement effect by wages. The business adjustment is distributed by all business net income, both corporate and positive passthrough income. Third, governments also benefit from lower real interest payments. We estimate the aggregate value of inflation on government interest payments as the difference between household interest decreases and business income increases, such that total income is unchanged by the inflation adjustment. This residual approach results in amounts that are similar to the net interest paid by governments to domestic residents times the fraction of inflation. It is unclear who benefits from lower real government interest payments, but they likely decrease taxes and so we distribute the effect by federal and state income taxes.

This inflation adjustment increases top one percent income shares by an average of 0.4 percentage points in the 1970s and early 1980s when inflation was high. But the effect is much smaller in the 1960s and recent decades. This approach, however, may understate the impact of inflation on top income shares. Steuerle (1985) suggests that higher income business owners are better able to secure loans to take advantage of inflation tax arbitrages than lower income business owners. Allocating a larger fraction of the inflation-based business income increase according to this assumption would further increase top income shares in the inflationary 1970s.

6. Add Underreported Income and Reconcile Proprietor Income

Income is misreported on individual tax returns. Missing amounts need to be added to conform with national income totals, which account for net underreporting on tax returns.[25] This allocation is critical because misreported income roughly doubles the total amount of nonfarm proprietor income reported on individual tax returns (i.e., nonfarm sole proprietor and partnership income). National income amounts for wages and rental, farm, and S corporation income also differ from amounts reported in tax data—however, in recent decades, the misreported amounts of nonfarm proprietor income explicitly shown in national accounts make up most of the amounts added in this step.[26]

The misreported amounts included in national income are based on the IRS National Research Program (NRP) and previous Taxpayer Compliance Measurement Program (TCMP) studies. These are detailed audits of stratified random samples of tax returns used to estimate the overall

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[25] The term *evasion* "implies the criminal offense of intentionally failing to report income. But the NRP data…include all misreporting of income—including [late filing,] accidental errors, lack of adequate documentation, and issues where the application of rules are uncertain or in dispute…We generally use the broader and more accurate terms *underreporting* and *misreporting* (i.e., underreporting less overreporting)." (Auten and Splinter, 2021, pg. 2). A similar point is made by Hemel, Holtzblatt, and Rosenthal (2021).

[26] National accounts also include misreported corporate income. These amounts are included in total corporate profits and therefore captured with our allocation of C corporation retained earnings. See the BEA handbook chapter 13 for details: www.bea.gov/sites/default/files/methodologies/nipa-handbook-all-chapters.pdf

degree of underreporting. Since these studies are the best available information on misreported income and determine the amounts of misreporting added to national income, their distributions of misreporting are the primary basis for our allocation. In this section, we show that our method conforms with prior estimates using these audit studies, describe the steps of our allocation method, and discuss additional adjustments made to nonfarm proprietor income.

6.a. Including Misreporting Lowers Top Income Shares

When adjusting reported incomes for misreporting, researchers should account for the following empirical fact—the ratio of misreported income to reported income is generally smaller at higher levels of reported income.[27] For example, using the 2001 NRP audit study, Table B3 shows that the net misreporting percentage for total income decreases from 96 percent for returns with negative reported incomes to 10 percent for middle incomes ($40k to $50k) and only 1 percent for returns with AGIs of $2 million or more. The net misreporting percentage for sole proprietor income also falls as income increases: from 101 percent for returns with negative AGI to 61 percent at middle incomes and 19 percent for the top AGI class. Using earlier 1988 TCMP data, Auten and Gee (2009) also found that misreported income as a fraction of reported income was highest in the bottom quintile and lowest in the top one percent.[28]

Smaller misreporting rates for larger reported income suggests that adding misreported income should decrease inequality. However, misreporting in these audit studies is due to a subset of tax returns with substantial underreporting that are re-ranked up the distribution when underreported income is added to reported income. To some degree, this re-ranking effect offsets the inequality decreases implied from the pattern of misreporting rates by reported income. For example, using NRP data between 2006 and 2014, DeBacker et al. (2020) estimate that including detected misreporting (and re-ranking tax returns) decreases the top one percent income share by 0.3 percentage points. Using the same data between 2006 and 2013, Guyton et al. (2021) estimate that detected misreporting (and re-ranking tax returns) decreases top one percent income shares by 0.5 percentage points. As discussed below, to target the full amount of misreporting included in national income, we must include not only the detected misreporting just discussed, but also undetected misreporting. Due to re-ranking effects, this additional misreporting could result in different inequality changes than the estimates discussed above, but our approach (including both detected and undetected misreporting) shows similar changes to top income shares.

6.b. Allocations of Misreporting Conform to Prior Estimates

Our distribution of total misreporting resembles prior estimates. Figure B5 (top panel) shows estimated shares of 2001 misreporting by *reported* income groups. Our method results in nearly identical shares as Johns and Slemrod (2010) estimates using the 2001 NRP data. Figure B5 (middle panel) shows estimated shares of misreporting by *true* income groups (reported income plus detected misreporting, which excludes estimated underreported income not discovered in the audit studies). Our method also results in nearly identical shares as DeBacker et al. (2020).

The share of misreporting we allocate to the top 1% of tax returns increases with the effects of re-ranking. In 2010, when ranking by reported income the top 1% share of misreporting is 6 percent. When ranking by true income, the top 1% share increases to about 11 percent (when ranked by

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[27] The net misreporting percentage is defined as the misreported amount of each source divided by the sum of the reported and misreported (true) amounts of each source.

[28] For the United Kingdom, Advani (2022) finds that additional taxes found by special audits as a share of total taxes are highest for those with reported prior-year losses and decline as prior-year incomes increase.

AGI plus detected misreporting only) and 16 percent (when ranked by AGI plus detected and undetected misreporting). Hence, re-ranking offsets a substantial fraction of the inequality decreasing effects from adding misreporting. The impact of re-ranking can be seen in Figure B5 (bottom panel), which shows estimated shares of 2001 misreporting by reported and true income groups (AGI plus detected and undetected misreporting). A significant share of misreporting in the bottom 60% of the distribution moves to the top 20% of the distribution when changing from ranking by reported to true income groups. Note that the P95–99 share is larger in the middle panel due to the re-ranking effect of undetected misreporting. This re-ranking pattern resembles that estimated by Guyton et al. (2021) in recent NRP studies, as seen in their Figure A3.[29]

How does adding underreported income and the resulting re-ranking affect top income shares? Figure B6 shows the change in top 1% income shares from adding underreported income and other proprietor adjustments. Top 1% pre-tax income shares (top panel) decrease an average of 0.1 percentage point (pp) and after-tax income shares (bottom panel) increase an average of 0.2 pp. The changes over time are partly based on the 1988 TCMP and 2001 and 2006–2013 NRP studies (this range includes re-ranking effects and exclude 1986).[30] Note that the capital consumption and residual adjustments have negligible effects because expensing pushes one down the reported income distribution.

Changes in Gini coefficients from this allocation also appear consistent with prior estimates. For the 1980s, Bishop, Formby, and Lambert (2000) used the TCMP special audit studies to estimate that Gini coefficients decreased about 0.002 when adding detected misreporting to filer incomes. In 1980, our approach results in a 0.005 decrease. This is consistent with the smaller prior estimate because our approach accounts for about three times the amount of misreporting (i.e., detected and undetected misreporting) as well as non-filer misreporting.

6.c. Allocating Reporting Gaps and Proprietor Misreporting
Estimated reporting gaps, proprietor misreporting, and additional proprietor income differences are allocated in four steps. First, we estimate total reporting gaps that account for differences between tax-data and NIPA incomes. Second, a small share of this reporting gap and proprietor misreporting (the NIPA amount of nonfarm proprietor misreporting) is allocated to non-filers because they are excluded from the audit studies. Third, we allocate the filer portions based on misreporting estimates from special IRS audit studies. Fourth, we separately account for non-misreporting differences between tax-data and NIPA nonfarm proprietor income, such as faster depreciation (capital consumption) in tax data than in national accounts.

First, reporting gaps are estimated as the difference between the amounts already in pre-tax income and NIPA totals, separately estimated for wages and salaries, rental income, farm income, and S corporation net income.[31] These gaps are not just from misreported income, but also from

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[29] Guyton et al. (2021) estimate that the top 1% of tax returns had 25 percent of detected plus undetected misreporting when using simple detection controlled estimation (DCE) multipliers, as compared to our estimate of 16 percent when using gradient multipliers. Simple DCE multipliers tend to exaggerate re-ranking effects, and hence top misreporting shares, because DCE multipliers ignore auditor heterogeneity and can exaggerate estimated misreporting from uncorrected line switching (Auten and Splinter, 2021). Line switching occurs when income is reported on the wrong line of a tax return and therefore missing from another. These amounts should be cancelled out, as done in the Auten and Langetieg (2020) estimates used in this paper.

[30] Due to income corrections made in other steps, the pre-tax national income share decrease of 0.2 pp in 2010 is much smaller than the estimated AGI decrease of 0.9 pp in Auten and Splinter (2021).

[31] Specifically, it is the difference between tax-data and NIPA income values for each separate source: wages (including estimated amounts from non-filers, combat pay, and flexible spending accounts contributions less IRA

differences in data sources and income definitions. These gaps, however, are broadly consistent with the amount of misreporting estimated in various special audit studies. For wages, this approach usually leads to similar amounts as the explicit misreporting amounts added in NIPA, as discussed below. For S corporation income, assumed reporting gaps are similar to the S corporation audit studies used to adjust tax data for NIPA.[32] For rental and farm income, national accounts do not break out misreported amounts because they are partly based on surveys rather than only tax data (BEA, 2017), but the reporting gaps for these sources are consistent with their high misreporting percentages in the special audit studies (Auten and Langetieg, 2020). For nonfarm proprietor income, we divide the reporting gap into three groups: (1) the explicit amount of misreporting shown by NIPA (reduced to account for already included non-filer sole proprietor income), (2) differences in depreciation timing, (3) and other differences, as described at the end of this section.

For wages and salaries, NIPA misreporting captures "off-the-book" compensation, such as from cash payments, in-kind compensation, and unreported tips. Since 1982, these amounts are reported in NIPA Table 7.18. Before the 2000s and in the most recent decade, there are small differences between NIPA misreported wages and our wage reporting gaps. From 2000 to 2009, however, these differences temporarily increased to an average of about $90 billion, or about 1.5 percent of total NIPA wages and salaries. This is likely because the wage data sources are quite different. NIPA wage estimates are based on Bureau of Labor Statistics' Quarterly Census of Employment and Wages, which is derived from administrative data on wages subject to federal social insurance taxes (FICA) and business surveys.[33] BEA increases these amounts for both misreporting and wages not subject to FICA (primarily government employees, see NIPA Table 7.18). In comparison, our base wage data are the amounts reported on tax returns—which are not affected by FICA exclusions—and estimated non-filer wages based on Form W-2 amounts. The larger gap between NIPA and tax-data wages during the 2000s is likely the result of temporarily larger misreporting of wages on tax returns. That is, the BEA approach captures some wages subject to social insurance taxes that are *not* reported on tax returns. The gap in the 2000s of about $90 billion between our wage reporting gap and the NIPA adjustment for wage misreporting is consistent with estimates in recent audit studies, which provide an indication of the amount Form W-2 wages exceeding wage amounts reported on individual tax returns. DeBacker et al. (2020) estimated average wage misreporting of $79 per tax return in the 2006–2014 NRPs. Multiplying this average by 140 million tax returns suggests there was about $110 billion of filer wage misreporting, much of which should be from W-2 wages exceeding amounts reported on tax returns.

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contributions), rental income, Sch. F and other farm income, and S corporation income (see online Table T1). Two prior adjustments are made to tax-based income. First, residual differences in fiscal income resulting from other income (the line on tax returns) are allocated to nonfarm passthrough income in proportion to reported amounts (see online data Table T0). Second, estimated farm income from Sch. C sole proprietors, partnerships, and C and S corporations are deducted from tax-data amounts and moved to farm income before estimating the farm reporting gap (see online data Table T1).

[32] S corporation income underreporting in the national accounts is based on a separate audit, last done for 2003 and 2004. This audit study found an annual average of just over $40 billion in misreporting (GAO, 2009), nearly equal to the assumed S corporation reporting gap in those years. We are unaware of distributional estimates for S corporation misreporting by income, but the S corporation audit study showed that misreporting rates fall with asset levels. That is, higher asset S corporations had lower detected misreporting rates (Auten and Splinter, 2021). In addition, S corporation misreporting amounts are small relative to other passthrough business misreporting—therefore, we allocate S corporation reporting gaps as other passthrough income.

[33] For more detail, see the Bureau of Economic Analysis chapter discussing compensation of employees in the national accounts: www.bea.gov/resources/methodologies/nipa-handbook

Second, we allocate a portion of reporting gaps and proprietor misreporting to non-filers. BEA includes all non-filer nonfarm sole proprietor income in their estimate of "misreporting," and therefore we first deduct from the NIPA proprietor misreporting total the corresponding amount of non-filer income already allocated to non-filers with our information-return approach (as noted above). But there is still some off-the-books income not captured on information returns—such as unreported compensation and a large share of tips paid in cash—that should be allocated to non-filers. There is uncertainty about the extent of off-the-books income and how it should be allocated between filers and non-filers and over the non-filer distribution by reported income. To non-filers, we allocate 5 percent of reporting gaps and proprietor misreporting. Our allocation implies that off-the-books income attributed to non-filers represented an average of less than one tenth of non-filer pre-tax/pre-transfer income, and much less in earlier decades. This is likely a conservative allocation and non-filers may account for an even larger amount of off-the-books income.

Third, we allocate remaining reporting gaps and proprietor misreporting to filers using estimates from the special audit studies. This step is based on the distribution of *detected* misreporting as well as *undetected* misreporting. The allocation of detected misreporting starts with the detailed estimates from Auten and Langetieg (2020) for all the recent special audit studies for 1988, 2001, 2006–2007, 2008–2009, 2010–2011, 2012–2013. These estimates are across 11 reported income groups—including two negative income groups and the top one percent is divided into two groups (P99–P99.5 and the top 0.5%)—and ten ratio groups, which categorize tax returns by the ratio of detected misreporting to reported income (AGI). This captures the heterogeneity of the ratio of misreported to reported income across filers. It also controls for line switching—when an amount is added on the wrong line of a form and missing from another line—that can cause exaggerated estimates of underreporting (see Auten and Splinter, 2021). Ratio classes account for tax returns with *less* income after an audit (i.e., overreporting), returns with negligible income changes, and returns with substantial misreporting that more than doubles their income (ratios of 2–4, 4–8, and more than 8). For each income/ratio group cell, the share of returns, the mean ratio, and the ratio variance are available. To use these estimates, tax returns within each AGI group are randomly allocated to these ratio groups and then a random draw is made from that group's ratio distribution (bounded by max and min ratios, and the top group with a maximum of 125 percent of the cell mean).[34] Some groups have overreported income, which is also estimated and allowed to offset underreporting (misreporting refers to the net amount). Auten and Splinter (2021) provide details. Figure B6 (top and middle panels) shows that our application of the method replicates estimates of the distribution of misreporting in both Johns and Slemrod (2010) and DeBacker et al. (2020).

The amounts of misreporting included in national income include both detected and undetected misreporting. The IRS estimates that undetected misreporting is about twice as much as detected misreporting by the IRS (for tax gap studies) and BEA uses these augmented amounts for national account estimates. Undetected misreporting is based on detection controlled estimation (DCE), which accounts for differences between each auditor's detected misreporting and that of the most effective (aggressive) auditor.[35] The overall misreporting resulting from DCE is used for amounts included in national accounts, but at the micro level, applying these simple DCE multipliers to all detected underreporting will result in distributionally inconsistent results because they ignore

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[34] The 1988 TCMP estimates are used before 1992, the 2001 NRP estimates for 1992 to 2003, the 2006–2007, 2008–2009, and 2010–2011 estimates for the corresponding years, and the 2012–2013 NRP estimates starting in 2012. For years before 1987, to obtain a more consistent measure of AGI closer to the 1988 definition, employee business expense deductions and excluded Sch. D capital gains are added back to AGI.

[35] Prior to the 2006 NRP, estimates of undetected misreporting in the NRP and TCMP audits were based on simple multipliers of the amounts discovered for various types of income. Recent estimates use a more sophisticated approach.

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. To address this issue, Auten and Splinter (2021) propose distributionally consistent gradient multipliers that indirectly account for auditor effectiveness. We apply those multipliers to detected misreporting as described above, assume that total undetected misreporting is 2.3 as much as undetected underreporting from returns with positive income (consistent with the historical overall DCE multiplier of 3.3 less one to account for the detected portion),[36] include the non-filer portion, and then scale to match the total reporting gap and proprietor misreporting for that year. Recall that the reporting gap is the difference between NIPA income and amounts in tax data for adjusted wages, rental income, farm income, S corporation income. For nonfarm proprietor income, in addition to misreporting, there are other differences between NIPA and tax data that are discussed below.

6.d. Nonfarm Proprietor Capital Consumption and Residual Adjustments

For nonfarm proprietors' business income, we reconcile with NIPA adjustments to tax data by dividing the overall difference into three categories: (1) misreporting is the NIPA misreported income less the amount already included non-filer income, (2) NIPA capital consumption adjustments to account for expensing and accelerated depreciation in tax-based income, and (3) other differences. The largest adjustment is for misreported income. As described above, after deducting reported non-filer income, a small share of corrected NIPA misreported income is allocated to non-filers, but it mostly is allocated to filers according to special audit studies. Capital consumption adjustments are necessary to bring taxable depreciation deductions in line with economic depreciation. Tax depreciation is often on an accelerated basis relative to economic depreciation and therefore the national accounts add income to account for excess deductions in the tax data. This adjustment has become much larger since 2001 due to the significant expansion of expensing in the income tax system, which allows eligible investments to be immediately deducted.[37] In 1980 and earlier, the small amount of capital consumption adjustments is allocated proportionally by reported proprietor income (i.e., scaling reported income). To allocate these amounts after 1980, we first add back to income 85 percent of passthrough expensing reported on tax returns—including both the special New York City expensing and the later Section 179 bonus depreciation. The 85 percent adjustment (as opposed to 100 percent) is to account for some of the expensed amount representing true economic depreciation. The remaining part of capital consumption adjustments is allocated proportionally to depreciation deductions, which accounts for non-expensing accelerated tax depreciation. In 2017, capital consumption adjustments allocated to the top one percent are nearly half of a percent of national income.[38] The remaining residual between NIPA and tax proprietor income is allocated proportionally by reported

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[36] Net operating losses (NOL) carryovers are not part of national income but are part of audit-study misreporting (Auten and Splinter, 2021). To limit the effect of NOL carryovers, no multiplier is applied for returns with negative AGIs. NOL carryovers are removed from our income definition in an earlier step and therefore this mitigates potential double counting of NOL corrections.

[37] For more discussion of capital consumption adjustments, see Splinter (2020).

[38] Expensing can result in reported net incomes that are negative. Therefore, when allocating by expensing, capital consumption adjustments tend to go lower in the distribution than net business income (this is offset by upward re-ranking of those being allocated the adjustments). The Bureau of Economic Analysis recently released prototype estimates of S corporation profits, which are currently combined with C corporations. These prototype estimates are only for 2012 through 2017 and therefore cannot be used for our full analysis at this time. The estimates for 2016 suggest that the total corporate capital consumption adjustment is largely negative for C corporations but positive for S corporations. Based on these estimates, shifting a total of $149 billion from C corporation profits to S corporation capital consumption adjustments (also accounting for depreciation of intellectual property products and other related amendments), would increase our pre-tax top 1% income share by only about one-tenth of a percentage point.

proprietor income. The residual accounts for the many other differences between nonfarm proprietor income in NIPA and the total of our tax return, non-filer, misreporting, and capital consumption amounts. This accounts for some small additions, additional deductions for meals and entertainment (which are partially disallowed as expenses in tax-return incomes), the removal of foreign-source income, and other differences.[39]

7. Include Imputed Rent

Imputed rental income accruing to residents of owner-occupied houses is included and allocated by real estate taxes, which are well-identified for the top quintile by deductions on tax returns. These deductions capture about half of total real estate taxes in the 1960s and eight-tenths in recent decades (through 2017) and thus provide good measures for the top quintile. Next, five percent of real estate taxes is allocated to non-filers, consistent with Survey of Consumer Finances estimates for the bottom quintile. The remaining share of real estate taxes is allocated to non-itemizing filers by positive improved fiscal income plus reported non-taxable Social Security benefits and, if younger than 65 years old, by the amount this income definition exceeds $40,000 (2015 and indexed) to remove likely renters. In years where specific tax deductions are not available in the microdata, distributions are set to those in surrounding years.[40] Imputed rent includes property taxes paid, as this is a pre-tax measure.[41]

8. Include Employer Payroll Taxes

The employer portion of payroll taxes for filers is based on reported wages and for non-filers is based on average wages and applying tax rates and annual OASDI contribution limits. For individual filers in 2013, these taxes include a 6.2% OASDI tax on the first $113,700 of wages, a 1.45% Medicare tax on all wages, and a 6.0% unemployment insurance (UI) tax on the first $7,000 of wages. For married filing joint returns only combined wages for both spouses are reported, while payroll tax bases apply at the individual level. Since both spouses may work, their combined wages may be subject to a maximum of up to twice the individual-worker tax base for these taxes. Therefore, for married returns with sufficient wages we adjust the married OASDI tax base to range between an average of 105 and 125 percent of the individual-worker tax base (generally set using matched individual-level wage data in 1974, 2000, and 2010) and for UI taxes to range between 104 and 160 percent of the individual-worker tax base.[42] This estimation approach is necessary because individual-level wage data is only available in 1974 and recent years. Using matched individual-level data, we adjust the average OASDI rates to account for slightly larger taxable fractions among higher wage returns. The effect of adding employer payroll taxes to income is smaller in years before 1979, since the employer OASDI tax rate was below 4.0% for most of the 1960s and the Medicare tax was non-existent before 1966. The small difference between total NIPA payroll taxes and amounts estimated for filers and non-filers is allocated proportionally by estimated payroll taxes.

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[39] See Tables 11.3 and 11.4 of the NIPA Handbook (www.bea.gov/system/files/2019-05/Chapter-11.pdf) for a description of the numerous other adjustments. Many of these do not apply to our approach because our partnership income starts with amounts reported on individual tax returns, whereas NIPA amounts start with partnership-level income and must therefore apply additional corrections.

[40] Near-year shares of property taxes are applied to years with missing variables (1960, 1967–1971, 1974, 1976, 1978) and since 2018, when the deduction for these taxes was limited.

[41] BEA discusses imputed rents here: www.bea.gov/sites/default/files/methodologies/RIPfactsheet.pdf

[42] The UI adjustment generally grows over time as the UI tax base falls in real terms and the share of married returns with two earners rises.

9. Include Employer-provided Insurance and FSA Contributions

We use the distribution of non-taxable employer-provided health insurance reported on Form W-2 to allocate the total NIPA amount of employer-provided insurance to each income group. These data were only recently added to Form W-2 and have been shown to better capture the value of these health insurance benefits than the CPS (Larrimore and Splinter, 2019; Lurie and Miller 2023). We use distributions from years just before and after most components of the Affordable Care Act took effect. For 2013 and prior years, we use data from 2013. For subsequent years, we use data from 2015. Within each AGI group, insurance is allocated proportionally by wages. Note that the health insurance of the self-employed is usually included in passthrough business income and removed from AGI with an above-the-line deduction (i.e., adjustment). Fiscal income adds all adjustments back to AGI, and therefore these self-employed insurance amounts are already included in our base income definition.

The total NIPA amount includes health, life, and workers' compensation insurance paid for by employers (including employee pre-tax contributions), of which health insurance represents about 90 percent in recent years.[43] Bureau of Labor Statistics data presented in Warshawsky (2016) suggest that the distribution of this benefit in top earnings groups was very similar in 1992 and 2010 (see Table C11b of the online data). Moreover, the distribution seen from Form W-2 was almost completely unchanged between 2013 and 2015, just before and after most components of the Affordable Care Act took effect. We estimate that the top one and ten percent of tax units received 2.0 and 24.9 percent of employer-provided health insurance.[44] The effect of adding employer-provided insurance on top income shares increased monotonically over time and in 2019 decreased the top one percent share by 0.9 percentage points. Kaestner and Lubotsky (2016) review distributional studies of the effect of adding employer-provided health insurance. While adding insurance to income increases distribution-wide inequality, as the top half of the distribution earns most employer-provided insurance, our data show that it decreases top income shares, as insurance becomes a smaller share of income at the top of the distribution.

Contributions to Flexible Spending Accounts (FSAs) and similar "cafeteria plans" are employee compensation that is excluded from taxable wages and should be added. These amounts are included in the "other" line of NIPA Table 7.18.[45] Form W-2 data show that the subset of observed FSA contributions (health savings accounts and dependent care) have nearly the same distribution as employer-provided insurance and therefore we allocate FSA contributions in the same way. We estimate total health FSAs based on recent Medical Expenditure Panel Survey (MEPS) counts of participants (BEA also uses this data source) and the maximum allowed annual contribution. In 2015, MEPS shows that about 35 million residential units had health FSAs and assuming an average contribution of 85 percent of the $2,550 maximum employee contributions implies $76 billion of health FSA contributions.[46] In addition, Form W-2 shows $24 billion of dependent care

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[43] In recent decades, health insurance accounts for almost all employer-provided insurance. In the 1960s, however, life insurance accounted for a significant fraction.

[44] Using the 2015 Form W-2 data, employer-provided health insurance shares for the top 10, 5, 1, 0.5, 0.1 and 0.01 percent tax unit income groups (set by number of tax units and based on PS total number of tax units) are: 24.9, 12.2, 2.0, 0.94, 0.18, and 0.02 percent. These estimates are similar to U.S. Treasury distributions of the health insurance exclusion tax expenditure (www.treasury.gov/resource-center/tax-policy/tax-analysis/Documents/Selected-Credits-Deductions-and-Exclusions-2015-Revised.pdf).

[45] See discussion on page 10–17 of the NIPA Handbook: www.bea.gov/system/files/2019-12/All-Chapters.pdf For further discussion of FSAs in NIPAs, see https://apps.bea.gov/scb/pdf/2009/05%20May/0509_nipastats.pdf. Thanks to Gabriel Zucman and BEA's Brian Smith for helpful discussions regarding FSAs.

[46] See https://meps.ahrq.gov/mepsweb/data_stats/download_data_files_codebook.jsp?PUFId=H181&varName=FSAGT31

FSA and employer contributions (Archer MSA amounts are small) for a total of about $100 billion in 2015 FSA contributions. This total is consistent with the NIPA "other" adjustment line, which adds $235 billion to wages and salaries and, as described in the NIPA handbook, includes not only FSA contributions but also some farm-based wages, in-kind household work, and other compensation missing from the underlying wages and salaries and amounts from the Bureau of Labor Statistics. We assume a 5 percent annual nominal growth (decrease) rate relative to 2015 and a 10 percent rate for years before 2010 (see online data Table T1). We assume that FSA contributions before 1978 were negligible because this was before legislation clarified their use.

10. Include Retirement Account Income

Distributed retirement income is already included in fiscal income. Undistributed dividend and interest income of retirement accounts, also referred to as inside buildup, is added to income. Note that corporate retained earnings and taxes have already been allocated to retirement account owners. The excess of employer and employee retirement account contributions over current-year distributed income is also added to conform with national income retirement income totals.[47] These are both allocated the same way as the retirement account portion of retained earnings: by earned income for the share of corporate ownership by DB plans and otherwise by the share of DC wealth, which resembles the DB and DC wealth distributions estimated in the Federal Reserve's Distributional Financial Accounts, as discussed above. The income from DC plans makes up a relatively larger share of income for those in the top ten percent but below the top one percent (P90–99). For example, in 2015 adding this retirement income has little effect on top one percent income shares but increases top ten percent income shares by 2 percentage points.

11. Include Remaining Indirect Taxes and Other Income

Remaining indirect taxes, which are mostly sales tax, are allocated by disposable income (defined below) less savings.[48] Savings rates for the top ten percent groups come from the Surveys of Consumer Finance in Dynan, Skinner, and Zeldes (2004): 24 percent for P90-95, 37 percent for P95-99, and 51 percent for the top one percent. In addition, we assume a savings rate of 80 percent for the top 0.1 percent, a savings rate of 10 percent for P50–90, a savings rate of 5 percent for the bottom 50 percent (by AGI, excluding non-filers), and a savings rate of 0 percent for non-filers.[49] A small amount of business transfers and subsidies, surplus of government enterprises, and

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[47] The distribution approach to retirement income is used in most studies of income inequality, including Piketty and Saez (2003), but relative to an accrual approach this shifts income away from individuals' working years. Some studies count retirement income both when accrued and when distributed to better reflect economic welfare in each period, but this approach double counts retirement income. For aggregate defined benefit pension flows, the U.S. national accounts shifted in 2013 from a cash accounting to an accrual accounting basis (Bureau of Economic Analysis, 2013). For micro-level estimates, however, measuring the accrual of defined benefit plans can be problematic due to non-linear vesting rules, underfunding of promised pensions, and uncertainty about future wages and lifespans. Moreover, an accrual approach ignores that defined benefit plans act like annuities—if you live another year you essentially "earn" the income that year. This suggests that for inequality estimates a distribution basis may be more appropriate for this type of plan. For additional discussion of timing issues related to retirement income, see Rosenberg (2013).

[48] Since this is a pre-tax income measure, the inclusion of these taxes in income can be thought of as a shift from conventional tax-inclusive prices to tax-exclusive prices, essentially increasing real purchasing power. Fuel taxes and public utility payments are excluded from both these taxes and government consumption because they are considered closer to user fees than taxes.

[49] Using the Consumer Expenditure Survey, Fleck et al. (2021) estimate that expenditure shares (subject to sales tax) as a percent of pre-tax/pre-transfer income was relatively flat over most of the income distribution: about 25% for incomes of $10–15K and 19% for incomes of $100–120K, although the extremes diverge with a 37% share for the lowest $5-10K group and 7% for incomes over $150K. Note that the expenditure share gradient over the income distribution is flatter when using disposable income—adding transfers decreases low-income expenditure shares and removing taxes increases high-income expenditure shares.

dividends and interest income of non-profits/governments are allocated as above (half per capita and half by wages). Business transfers largely consist of donations, insurance payments, losses due to fraud and theft, deposit insurance premiums, fines and fees, lawsuit settlements, and excise taxes paid by non-profits. These subsidies are mostly federal payments for housing and agriculture. Finally, Federal Reserve payments to the U.S. Treasury, which are mostly interest on Treasury securities and, since the fiscal crisis, mortgages, are allocated by the absolute value of improved fiscal income. This allocates the largest shares to the middle and upper part of the income distribution.

III. Pre-tax Income Plus Transfers

1. Include Social Security Benefits

Social Security and disability insurance (SS) benefits are reported on Form SSA-1099 information returns prepared by the Social Security Administration. However, SS benefits are often not fully reported on income tax returns, especially by lower-income taxpayers with benefits below the level at which these become partially taxable. Our analysis uses SSA-1099s information returns to fully account for filer SS benefits in years for which information returns are available (1985 and all years since 1987). In other years, SS first became taxable for taxpayers to the extent their modified AGI exceeds $25,000 ($32,000 for joint returns) in 1984. Since the 1984 data are incomplete, we impute filer Social Security benefits for earlier years using the 1985 distribution that includes amounts reported only on SSA-1099 forms. Since exact age is not available on returns before 1979, the allocation procedure is based on the percentage of primary taxpayers at least 65 years old in each income group. As discussed above, non-filer SS benefits are based on amounts from SSA-1099 data by non-filer demographic groups.

2. Include Unemployment Insurance Benefits

Unemployment insurance (UI) benefits were at least partially excluded from federal taxable income before 1987. Since 1979, UI benefits of filers have been reported on their tax return. Reported benefits since 1981 are added to tax filers' incomes and imputed benefits in earlier years. To create an imputation, we match the 1981 distribution and levels of reported benefits. In 1981, the top ten percent of adults received only 2.2 percent of unemployment benefits. Since 1981, the total UI benefits received by tax filers have averaged 84 percent of NIPA unemployment insurance. Unattributed benefits are added to non-filer incomes in proportion to imputed UI benefits based on Form 1099-G information returns.

3. Include Other Cash Transfers

We add the NIPA value of other cash transfers. Other cash transfers include federal supplemental security income (SSI), veterans' benefits, and one-time payments made through the tax system (e.g., 2008 stimulus checks), but exclude refundable tax credits (which are accounted for with income taxes). Also included are transfers from state and local governments: social insurance funds (generally, temporary disability insurance and workers' compensation), family assistance (generally, aid to families with dependent children and temporary assistance for needy families), and SSI.

We allocate stimulus payments using amounts reported on tax returns scaled to totals in the national accounts. However, other cash transfers are generally not reported in federal tax data. We therefore use estimates of the distribution of remaining cash transfers from the Census Bureau's March Current Population Survey (CPS) estimated by Larrimore et al. (2021). Tax units are divided into 10 demographic groups based on the age of the oldest person in the CPS-constructed tax unit (younger than 40, 40–64, and 65 years or older), the presence of any dependent children (omitted for 65 or older age group), and marital status. Each demographic group is divided into 100 income percentiles by corrected market income plus Social Security benefits and the mean

CPS-based transfer is allocated to each corresponding tax unit. Cash transfers are truncated above the 90th percentile to account for error in dividing household-level transfers among multiple tax units. Data for 1989 is used for prior years and data for 2016 is used for subsequent years. We then proportionally scale these amounts to equal the NIPA totals.

4. Include Medicare

The NIPA value of Medicare benefits less premiums are added using national income benefit totals and Medicare Trustees Reports premium totals. We allocate benefits to filers and non-filers age 65 and older. The filer share is allocated proportional to the number of adult individual tax filers aged 65 or older and with wages below $150,000 (2015 dollars and indexed). If the primary filer is aged 65 or older then the secondary is also treated as such. The wage limitation is intended to account for high wage-earners likely receiving health insurance through their employers and thus receiving little or no benefit. We subtract Medicare premium payments, where Part D premiums and Part B premiums before 2007 are allocated proportionally to Medicare benefits. Congressional Budget Office (2016) makes a similar adjustment. Some Part D premiums shifted away from non-filers to account for low-income Part D subsides. Since 2007, we take the additional step of allocating Part B premium payments according to AGI-based progressive rates.

5. Include Other Non-Cash Transfers

We add the NIPA value of remaining non-cash transfers from Medicaid, food stamps/SNAP, school lunches, housing assistance, and other in-kind transfers. We allocate these like other cash transfers, using the CPS-based estimates of Larrimore et al. (2021). Kaestner and Lubotsky (2016) estimate that among top decile families less than one percent has a family member participating in Medicaid.[50]

IV. After-tax Income

After-tax income is estimated by sequentially removing taxes from pre-tax income plus transfers. Since almost all tax returns at the top of the distribution itemize deductions (including state income taxes and housing property taxes), this approach provides good measures of state and local taxes for top income groups. To match national income, two final adjustments fully account for the government sector by including government deficits/surpluses and non-transfer government spending.

1. Federal Individual Income and Estate Taxes

Federal individual income taxes are measured as federal tax liability after refundable and non-refundable tax credits and scaled to match national income totals. Federal individual income tax liabilities are the amounts reported on tax returns and amounts withheld for non-filers. The Additional Medicare Tax and the Net Investment Income Tax, which began in 2013, are included. Foreign tax credits are added back to federal income taxes because they reflect foreign income taxes paid on income included on tax returns. Refundable portions of tax credits, including earned income and additional child tax credits, result in negative average income tax rates in lower-income groups. Refundable tax credits mostly consist of earned income and additional child tax credits but exclude stimulus payments that were included in cash transfers. Non-filer income taxes withheld on Form W-2 are also deducted in this step. Passthrough business income taxes are

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[50] For annual income measures, insurance should be valued ex-ante, or independent of the amount of health care consumed that year. For many people, much of the current-year value of health insurance is from the insurance component that allows for decreased precautionary savings, hence increasing and smoothing non-health consumption. Survey-reported valuations of health insurance likely undervalue not only these ex-ante insurance benefits, but also the value of subsidized health care received. For example, Finkelstein (2021, pg. 5) explains that "the uninsured already receive a substantial amount of health care, but pay for only a very small portion of it" due to uncompensated care.

included in our measure of individual income taxes. Following Joint Committee on Taxation (2013), we allocate to wages 5 percent of these passthrough business income taxes (defined as federal and state income taxes times the share of AGI from positive passthrough income).[51]

The estate tax encourages planning over many years prior to the actual payment of the tax. This suggests that the estate tax affects behavior over many years. Therefore, we assume that the estate tax is borne by decedents with an equal annual proportion over the decade before the actual year of observed bequest (excluding the year before estate tax returns were filed). Using population tax data, we estimate the fraction of estate tax paid in 2006, 20015, and 2019 by decedents in various income groups in each of the ten years prior to the year of death.[52] This accounts for the significant income variability among high-wealth individuals. In comparison, Cronin (1999) and Burman, Gale, and Rohaly (2004) used survey data to link wealth and income distributions and estimated that about two-thirds of the 2000 and 2001 estate tax burden fell on the top one percent. Our approach based on the more complex relationships among annual incomes, income variability, wealth, and estate tax policy suggests that 37 percent of the estate tax was borne by the top one percent of the income distribution in 2000 increasing to 65 percent by 2015.

Since tax return population data is available starting in 1996, we estimate these fractions for bequests subject to estate taxes ten year later, in 2006, as well as in 2015. The taxable threshold of estates increased over this period from $2 million to over $5 million. Since 1982, the share of the estate tax borne by each income group is interpolated based on the real taxable threshold. The 1982 shares are used in prior years. The share of the estate tax allocated to the top one percent by income is 33 percent in 1982 (and prior years), increases to 44 percent by 2006, and to 65 percent by 2015. To check that this estimated increase in the progressivity of the estate tax corresponds to published IRS data from early years, we compare the distribution of the estate tax paid by real sizes of estates (as opposed to incomes of the decedents). In 1960, about half of the estate tax was paid from estates of under $5 million (2015 dollars), while by 2006 only about one-third was paid by these smaller estates, and by 2015 the higher threshold essentially exempted these estates. In contrast, in 1960 about a third of the estate tax was paid from estates of over $10 million, while in 2006 about 60 percent was paid by these larger estates, and by 2015 this increased to about 90 percent. This suggests that the estate tax is increasingly borne by larger estates, which likely corresponds to higher income decedents (see the online data).

2. State and Local Individual Income Taxes
State and local income taxes of filers are based on itemized deduction amounts.[53] The difference between amounts deducted on tax returns and NIPA totals (about one-tenth of the totals in recent years) is allocated by positive AGI less $3,000 per exemption (2015 dollars) to non-itemizers in states with income taxes. Before 1979, the difference is allocated to non-itemizers in the bottom 90

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[51] Risch (2020) presents short-term estimates for this effect for marginal tax rate changes. These should be interpreted as upper bounds for the long-run estimates needed for the allocation in this paper.

[52] This multi-year analysis resembles that of Joulfaian (2001) and Cronin and Eiler (2018, pg. 1), who estimated that relative to income in the year prior to death there is "a higher correlation between income 5 years prior to death and wealth at death". Tax data only allow us to track the income of the decedent. The estate tax would be borne by decedents if they target an after-tax bequest, causing them to reduce their consumption or increase their effort to earn income. Alternatively, the estate tax may be borne by the beneficiaries. The close relation of the parties further complicates any clear assignment of burden (Kopczuk, 2013). Allocating a portion of the estate tax to beneficiaries would shift the estate tax burden lower in the income distribution, lowering our 1960s top tax burdens.

[53] The fraction of the top one percent itemizing was generally at least 95 percent between 1960 and 2015. Most of these non-itemizers live in states with no income tax.

percent of the distribution by AGI less $3,000 per person because state of residence is not reported in the public use files. For recent years, state refundable tax credits are estimated as fixed shares of federal refundable credits on a state-by-state basis after that state introduces refundable credits.[54]

3. Corporate Taxes

Corporate income taxes deducted are the amounts previously included in pre-tax income.

4. Property Taxes

Both business and residential property taxes included in imputed rent are those previously calculated for pre-tax income.

5. Payroll Taxes

Payroll taxes removed include the employer and employee portions, as well as self-employment taxes as reported on tax returns (i.e., SECA taxes). Employee payroll taxes are set equal to previously calculated employer taxes except for 1984, 2011, and 2012 due to employee portion payroll tax holidays. Two surtaxes on high-income taxpayers began in 2013: the 0.9 percent Additional Medicare Tax and the 3.8 percent Net Investment Income Tax. We include these surtaxes in federal income taxes despite their association with Medicare. The tax base for the Net Investment Income Tax is not labor earnings, as is the case with other payroll taxes, and the revenues have gone into the general fund rather than the Medicare Trust Fund.

6. Sales and Other Taxes

Sales and other taxes (excluding fuel and utilities "taxes" as these are closer to user fees) are distributed by disposable income, which is after-tax income up to this point excluding non-cash imputations, less savings.

7. Include Government Deficits and Surpluses

Government deficit and surpluses are allocated by income and payroll taxes paid, but excluding state income taxes, because almost all deficits are at the federal level.

8. Include Government Consumption

Government consumption includes spending valued at cost of military expenditures, schooling costs, and other non-transfer government spending. This excludes all transfer spending and user-fee type government taxes/spending for fuel taxes and government utilities. We allocate government consumption half per capita and half by after-tax income. This accounts for quasi per capita-type spending (for example, the pure public good component of military spending) and that higher income individuals may derive more benefits from some government spending (public university spending). Reynolds and Smolensky (1977, p. 50) used the same half per capita and half by income allocation, arguing that "households benefit on some equalitarian basis as well as in proportion to income." This is broadly consistent with empirical evidence in Riedel and Stichnoth (2022) supporting a per capita allocation of public education spending, which represents more than one-third of government consumption (although they suggest a full per capita allocation). Other researchers, such as Gillespie (1965), divided government consumption into two categories: one for general outlays that cannot be clearly allocated (e.g., military, general government, etc.) and specific expenditures that can allocated on a case-by-case basis. The allocation of this government consumption to income groups includes a large amount of uncertainty and deserves further study.

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[54] These are based on data accessed on Oct. 28, 2021 from www.taxcreditsforworkersandfamilies.org/state-tax-credits

V. Net National Income: Deduct employee business and investment interest expenses

Economic income should deduct the expenses of earning that income. It appears that national income fails to deduct some expenses. This corresponds to treating wages and investment income as *gross* income rather than *net* income, i.e., after deducting appropriate expenses. This is likely due to how these are expenses are reported in tax data—rather than being deducted from total income amounts, these expenses are deducted at a later step on the tax form as adjustments or itemized deductions. Starting with pre-tax national income, our definition of *net national income* (estimated for select years in a sensitivity analysis) deducts unreimbursed employee business expenses (subject to a two percent floor since TRA86) and investment interest expenses, which makes net national income a bit smaller than national 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 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 top one percent shares. Accounting for both types of expenses, unreimbursed business and investment interest expenses, reduces the reduces the top one percent share by 0.1 percentage points in 1962 and 1979 but has no significant effect on top one percent shares in 2019. The bottom half share of the distribution, however, would have a 0.1 percentage point increase in 2019.[55]

This analysis ignores missing income from employee expense accounts. These accounts allowed for tax-sheltered personal consumption that was deducted by businesses and fairly unregulated until tax code changes since 1969 severely limited the tax benefits of expense accounts. In the late 1950s, however, about one percent of national income was spent through expense accounts (Rothschild and Sobernheim 1958). This suggests expense accounts could increase our early-1960s top one percent income shares up to one percentage point. But some of these expenses were true business expenses and some did not go to the top one percent. Nevertheless, expense accounts may imply the 1962 to 2019 top one percent after-tax income share increase of 0.2 percent should actually be a modest decrease.

Due to missing variables in certain years, some amounts must necessarily be imputed. Employee business expenses are imputed using near-year data for 1960 due to unavailable data and since 2018 due to repeal of these deductions through 2025. Investment interest expense amounts are available in the tax data in 1972 and since 1985. The 1972 amounts are adjusted to account for a limitation of half of amounts above $25,000. The investment interest expenses between 1972 and 1985 are generally based on total itemized deductions for interest other than mortgage interest and credit card interest. In the four years these are not available, estimates are based on total interest paid. Investment interest expenses, however, represent a larger share of non-mortgage interest deductions among returns with higher income, in part because interest on consumer debt was generally deductible before TRA86. Targeting the distributions observed in 1972 and 1985, a portion of non-mortgage interest deductions are generally retained based on AGI group.

VI. Effects of the Tax Reform of 1986 on Reported Income

Many provisions of TRA86 affected income reported on individual income tax returns and thus affected measured top income shares. Table B4 shows the revenue estimates of key base-broadening provisions that were expected to increase revenues by more than $20 billion in 1990 when the effects of most provisions were fully phased in. A large share of the base-broadening

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[55] Accounting for these expenses reduces incomes. In 2019, average after-tax incomes decrease $100 for the second quintile, $300 for the middle quintile, and $900 for the top quintile.

was targeted at the top of the income distribution and at their tax shelters. The Treasury model used for the 1986 tax reform estimated that 69 percent of the base-broadening effect for partnership and rental income was from the top one percent or the bottom income group that was dominated by taxpayers with negative AGIs due to tax shelter losses and the fact that only 40 percent of capital gains were included in AGI (Nunns, 1987). At the top tax rate of 28 percent that applied to almost all this base-broadening, the $20 billion of base-broadening revenue would result from about $70 billion of increased taxable income, or about one-third of the observed 1985–1990 increase in top one percent fiscal incomes.

The effects of TRA86 on top one percent income shares can be seen using cross-section tax return data to examine the base-broadening reforms and a 1985–1993 panel of tax returns to show the effect of business entity shifting. Table B5 shows that the top one percent fiscal income share increased over 50 percent between 1986 and 1988, from 7.8 to 12.8 percent. Half of this increase came from wages, some of which reflects shifting of wages forward to 1987 or 1988 so it would be taxed at a lower rate. S corporation net income accounted for 0.8 percentage points of the change and partnership net income for 0.5 percentage points. Since active S corporation owners report about half of their income as distributions and half as wages (Smith et al., 2019), a significant fraction of the increase in wages is likely due to increases in S corporation income that followed from TRA86.

Some of the base-broadening changes that affect total income can be observed directly from information on individual income tax returns. These include non-deductible rental losses, non-deductible passive losses, the extension of at-risk rules to the activity of holding property (these further limit deductible losses), and the elimination of the dividend exclusion. These partial base-broadening changes account for almost one-tenth of the increase in top one percent income shares between 1986 and 1988 (0.4 percentage points). Note that the effects of many base-broadening changes, such as changes in depreciation, are hidden in the net changes of partnership and sole proprietorship income.

Additional insight comes from following high-income taxpayers over time. Using a panel of a stratified sample of about 13,000 individual income tax returns from 1985 to 1990, Table B6 shows changes in top one percent incomes relative to 1985 and 1986 average incomes. In 1988, the changes in passthrough entity income as reported on individual tax returns account for 25.2 percent of the increase in top one percent income. Taxpayers whose first S corporation was after TRA86 may have converted C corporations into S corporations. Such new S corporations accounted for about an equal portion of the income increase as pre-existing S corporations. This suggests an important but limited role for the conversion of C corporations to S corporations in the increase of top one percent shares in 1987 and 1988. Partnership income from taxpayers with partnerships prior to TRA86 accounted for more of the increase in income than new partnerships (8.4 vs. 2.6 percent). Almost all the change in net income for taxpayers with pre-existing partnership income was accounted for by partnerships with net losses in 1985 and 1986. This suggests that much of this change in partnership income reflected the tax shelter limitation effects of TRA86.

This analysis focuses on the period immediately after TRA86, but the reform likely had a persistent impact on the concentration of income reported on individual tax returns. For example, Dyrda and Pugsley (2019) estimated large effects after TRA86: between 1988 and 2015, the "rise of pass through entities explains roughly 40 percent of the increase in the share of pre-tax income for top 1 percent households."

VII. PSZ Comparison

Several of our adjustments have similar effects as Piketty, Saez, and Zucman (2018, hereafter PSZ). The decrease in top one percent income shares from PSZ changing from tax units to adults is similar to the decrease from our changing from tax units to individuals ranked by size-adjusted income. We both remove filers younger than 20 years old (PSZ since 1979). We both allocate non-retirement corporate retained earnings by reported dividends and realized capital gains. There is little uncertainty about the distribution of some amounts because they are reported on tax returns (income taxes and tax-exempt interest in recent decades) or calculated from reported values (payroll taxes). Other allocations have similar effects on top shares because the top of the distribution receives only a small amount (transfers) or because different data sources suggest similar distributions (employer-sponsored insurance).

There are, however, numerous differences in the approach we and PSZ take to distribute national income across the U.S. population. For example, PSZ use several questionable assumptions to allocate the large share of national income not on tax returns and do not make our adjustments for technical aspects of tax return data. To understand the relative impact of these differences, Table B7 presents estimates of how top one percent income shares change when moving from our approach to the PSZ approach and vice-versa (the average of these two changes is shown). Note that we present changes in top one percent shares that result from changing each assumption independently, such that the order of changes does not affect our results.[56] In 2014, our top one percent pre-tax income share is 6.0 percentage points below the PSZ estimate. After accounting for the differences in our pre-tax income estimates compared to PSZ, there is half a percentage point of remaining difference between our after-tax income shares. In 1962 and 1979, the pre-tax differences are less than two percentage points, and the after-tax differences are negligible.

For pre-tax incomes, we consider eleven separate differences in our approaches. Moving from the AS the PSZ approach, these include:

(1) switching from allocating underreported income by IRS audit data as described in section II.6 to the PSZ allocation of underreported wages by reported wages and underreported business income by positive passthrough business and rental income;

(2a) from including distributed private retirement income, including taxable pension, annuity, and retirement account payments as reported on tax returns, to allocating private retirement distribution by the PSZ private retirement distribution (calculated as retirement income less Social Security income distribution, see online data table C19);

(2b) reallocating retirement account income (inside buildup), as described in section II.10, from the DC wealth/earned income distribution to the PSZ private retirement income distribution;[57]

(2c) reallocating the retirement portion of retained earnings from the DC wealth/earned income distribution to the PSZ private retirement distribution;

(2d) reallocating the retirement portion of business property taxes from the DC wealth/earned income distribution to the PSZ private retirement distribution;

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[56] In contrast, adding changes on top of previous changes in a cumulative fashion would make the estimates sensitive to the specific order chosen. For an example of that alternative approach, see comparisons between PSZ and our earlier estimates in Auten and Splinter (2020).

[57] In the main paper, we discuss a number of issues with applying this accrued income approach to undistributed retirement income. Another issue is that early withdrawals of accrued income in defined contribution accounts would face a 10 percent early withdrawal penalty, implying that a discount should be applied to this income under an accrual basis. We ignore this effect for national income targeting.

(3) allocating other taxes by disposable income less savings to the PSZ factor income less savings distribution, (since we did not find this distribution in the PSZ results we use AGI, which is less concentrated than factor income and so should approximate the effects of savings);

(4) switching from our non-retirement pre-tax corporate income by removing dividends reported on tax returns and retained earnings and corporate taxes as described in sections II.2 and II.3 and instead allocating these amounts based on the PSZ distributions for these income sources (see our online data table C19a);

(5) dropping corrections to tax income definition, such as removing non-deductible losses and other corrections described in sections I.1 and I.4, to the PSZ lack of corrections from tax return based incomes;

(6) allocating imputed rent by property tax deductions to the PSZ housing wealth distribution (see PSZ online table TE2);[58]

(7) switching from limiting returns to adult non-dependent residents (see the adjustments described above in section I.3) to the PSZ approach of no change from raw tax returns;

(8) switching from grouping by the number of individuals and ranking by size-adjusted incomes is described in section I.5 to the PSZ grouping by adults and ranking by equal-split married incomes, which doubles weights and divides income in half for married filing joint returns;[59]

(9) allocating half of non-profit and government pre-tax income per capita to allocating this amount by AGI;

(10) removing the inflation correction described in section II.5 because PSZ make no correction for inflation;

(11) switching from excluding social insurance benefits and deficits per the definition of national income to the PSZ pre-tax approach of deducting OASDI and unemployment taxes paid (HI taxes are not removed) and adding Social Security and unemployment benefits and deficits half by social insurance benefits received and half by payroll taxes. When applying all these changes, the resulting 1962, 1979, and 2014 PSZ replicated top one percent income shares are within a few tenths of a percentage point of the PSZ estimates.

For after-tax incomes, we consider six separate differences in our approaches:

(1) allocating half of government consumption per capita to allocating all by PSZ after-tax income (see PSZ table TC3e), with small adjustments made to target the after-tax AS/PSZ top one percent share gap (when applying all PSZ approaches);[60]

(2) allocating non-social insurance deficits/surpluses by federal income taxes to the PSZ allocation of half by government transfers and half by all taxes;

(3) allocating estate taxes by the decade-before-death income groups of the decedent, as described in section IV.1, to allocating all to the top one percent, which approximates the PSZ approach;

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[58] Imputed rent is allocated by reported property taxes in both studies. PSZ, however, fixed the share of property taxes allocated to non-itemizers at 25 percent in all years, despite non-itemizers having nearly 50 percent in the 1960s (see our online data Table C10, columns AV and AW).

[59] While grouping by adults partially corrects for declining marriage rates, it does not account for other changes in household structure over time, such as smaller families and a larger share of single-parent families.

[60] Stichnoth and Riedel (2021) find that "in Germany at least, education spending tends to go disproportionately to the bottom half of the post-tax cash income distribution, so the proportionality assumption adopted in the DINA literature does not work very well in the cross-section." To the extent that education spending patterns are similar in the US, this supports a strong weight on the per capita component of government consumption in our estimates. Stichnoth and Riedel (2021) present long-run estimates that are also progressive relative to income and inequality reducing.

(4) allocating government transfers (excluding Social Security and unemployment insurance) as described in sections III.3, III.4 and III.5 to allocating by the PSZ distribution (see PSZ online tables TC3b and TC3c);

(5) allocating corporate taxes one-quarter by wages and three-quarters by corporate ownership to allocating only by capital ownership (this offsets part of the corporate income differences for pre-tax income);

(6) allocating other taxes by disposable income less savings to allocating by PSZ factor income less savings (allocated as discussed above).

Table B7 shows that about one-third of the 2014 gap in pre-tax top one percent shares, or two percentage points, is due to PSZ attributing much more underreported income to top earners than suggested by the IRS audit data, as explained in the main paper.[61] PSZ have previously suggested that the detailed and rigorous IRS NRP and TCMP audits, which we use to allocate underreported income, may miss a portion of income in complicated partnerships. If half of the $100 billion of income in circular partnerships estimated by Cooper et al. (2016) was not identified by the IRS audits (and all other underreported income was correctly identified) and this income all belonged to the top one percent, then the 2014 top one percent share would only increase 0.3 pp [$50 billion / ($15,144 billion national income + $50 billion) = 0.3%]. More recent estimates, however, shows that most of the "circular partnerships" are owned by foreigners and non-profits and therefore should have little impact on top one percent income shares (Love, 2021). Indeed, some of the estimated offshore wealth appears to be investments by university endowment funds and other non-profits, rather than wealthy domestic individuals (Auten and Samarakoon, 2022). 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 in the underreporting step. This has little effect on top income shares because expensing decreases net incomes. For details, see Splinter (2020b) and the online appendix. Splinter (2020) and Auten and Splinter (2021) provide further discussion.

Differences in measuring retirement income account for about one-fifth of the gap in 2014, or one percentage point. While they do not report this information separately, our replication estimates suggest that the PSZ method allocates about 16 percent of private retirement income to the top one percent (see online data tab C19). This is much higher than suggested by the distributions of taxable retirement benefits and retirement wealth based on the Federal Reserve's Distributional Financial Accounts (DFA).[62] Taxable benefits are observed in tax data and the top one percent receives about 2 or 3 percent. Non-taxable income is not observed and should be allocated by retirement wealth. Devlin-Foltz, Henriques, and Sabelhaus (2016) estimated that the top one percent (ranked by wealth) owns about 8 percent of retirement wealth while the Federal Reserve's DFA shows the top one percent (ranked by income) having 6 percent of pension entitlements in 2018 (we also allocate them 6 percent of income from retirement wealth, as shown in Table B2).

Our understanding (based on PSZ computer code and later confirmed by Saez and Zucman, 2020) is that PSZ (2018) allocated retirement income using wages, and both taxable and non-taxable

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[61] 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. Therefore, a simplified computation explains the two percentage point gap: 2% = [(50%-15%) • $0.8 trillion in business income reporting gaps] / $15.2 trillion national income.

[62] Saez and Zucman (2020) updated the method in PSZ to partially account for the upward bias in their original top income shares. Their updated method, however, retains some of the bias from partially allocating based on rollovers.

pensions and distributions from IRAs and other DC retirement accounts as reported on Form 1040.[63] The use of non-taxable amounts creates an upward bias in the share allocated to the top one percent because most of these amounts reflect rollovers, which represent asset values, as opposed to an income flow.

Almost all of large-dollar non-taxable pension amounts reflect rollovers. For example, IRS line count data for 2015 show $1,169 billion in total pensions and annuities, of which $479 billion is non-taxable. Large dollar amounts generally reflect rollovers of pensions.[64] This is especially true of the top of the distribution, including executives who leave a position at a firm and transfer their retirement plan from that company to another. Among taxpayers with AGI of $1 million or above, 79 percent of pension distributions are non-taxable, almost all of which reflects rollover transactions (see Table B8). These non-taxable rollovers represent asset values, as funds are moved from one account to another, and thus are not income.

A possible concern is that some non-taxable amounts are not rollovers but Roth distributions, although we find these to be less than half a percent of non-taxable amounts. IRS data for 2014 (IRS Statistics of Income, *Individual Income Tax Returns Line Item Estimates*) show that taxpayers reported $279 billion in total IRA distributions, of which $44 billion was non-taxable. The IRS requires taxpayers to report taxable conversions of traditional IRAs to Roth IRAs as well as various non-taxable amounts: (1) rollovers from one account to another, (2) portions of distributions of traditional IRAs reflecting recovery of basis from non-deductible contributions, and (3) distributions from Roth IRAs. Our tabulations of Form 1099-R suggest that in 2014 only about $2 billion of the non-taxable distributions reflect non-taxable Roth distributions and that most of the rest reflects non-taxable rollovers.[65]

The reasons for the 2014 pre-tax gap can be summarized as follows: nearly two-fifths from differences in allocating underreported income, one-fifth from the treatment of retirement income, one-tenth from differences in non-retirement pre-tax corporate income including corporate tax differences, one-tenth from our allocation of other taxes by disposable income less savings (versus PSZ allocation by factor income less savings, which ignores transfers, retirement income, and taxes), and nearly one-tenth from the net effects of our corrections to tax return–based income.

The final column of Table B7 shows the reasons for differences in the top one percent income share increase between 1962 and 2014. Because our 1962 estimates are more similar to PSZ, the reasons for the 2014 differences in levels also explain the differences in changes.

1. Bottom 50 Percent

In addition to top income shares, we also estimate income shares for each quintile, the bottom 50 percent, the 50th to 90th percentile group, and the 90th to 99th percentile group. For the bottom 50 percent, our estimates suggest that pre-tax and after-tax income shares decreased by 5 and 3 percentage points between 1979 and 2019 (Figure B7). Thus, taxes and transfers offset about 60%

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[63] The original PSZ file "build small.do" defined non-taxable retirement income (penincnt=totpen-txpen) and file "build_usdina.do" (line 36: gen totpeninc=peninc+penincnt) included this rollover-inclusive income when allocating pension wealth (hwpen).

[64] Some reported pensions are non-taxable, most notably typically modest amounts of housing allowances for eligible retired ministers. In addition, some non-taxable amounts reflect recovery of basis for non-deductible employee contributions.

[65] An additional consideration in both studies is that the national income approach only counts retirement account income to the extent pension plans are funded, thereby understating the accrual of future pensions likely to be paid. Many private and state and local government plans are underfunded, and federal employee plans are not funded.

of the increase in bottom pre-tax income share. In contrast with the PSZ estimate that average real pre-tax incomes of the bottom 50 percent remained virtually unchanged, we estimate that they increased by more than one-third. We also estimate that real pre-tax income plus transfers (which includes Social Security benefits) increased by 61 percent and after-tax income increased by 66 percent for the bottom half of the distribution. Our estimates are similar to those of the Congressional Budget Office for the bottom two quintiles.[66] These findings highlight the impact of increasing transfers and a more progressive tax system due to multiple tax cuts and tax credit expansions benefitting lower- and middle-income individuals.

Several methodological issues suggest that PSZ underestimated the income of the bottom 50 percent in recent years. First, PSZ do not add back net operating loss carryovers from years, which do not reflect current year business activity and are thus not included in current national income. These are typically wealthy individuals that often have negative AGIs in the current year and are therefore in the bottom of the PSZ distribution. As a result, these net operating loss carryovers and negative reported incomes reduce PSZ estimate of income of the bottom 50 percent. Our analysis does not make this mistake and adds back net operating loss carryovers. This adjustment changes many incomes from negative to positive, moving such returns well up in the income distribution, even to the top one percent. Second, as discussed previously, the ratio of misreported income to reported income declines as reported income rises. The PSZ allocation of misreported income in proportion to positive reported income does not take this into account and therefore also understates income of the bottom 50 percent. Third, our analysis includes alimony income when received and subtracts alimony paid. PSZ do not make these adjustments, reducing the income of alimony recipients in the bottom 50 percent. Finally, PSZ explain that they assign incomes of zero or very low amounts to the institutionalized population (about 4 million in 2010). In addition to individuals in jail or prison (2.3 million in 2010), this includes growing numbers of middle- and upper-income individuals in retirement homes that likely file income tax returns. Their assumption likely understates incomes in the bottom 50 percent since some individuals will be counted twice (as filers and as part of this population with a zero income). While each of these issues may have small effects, they raise concerns about PSZ estimates for the bottom 50 percent.

Additional factors outside the current scope of this paper could further increase our estimated bottom 50 percent income shares (and reduce top income shares). First, all the studies considered here apply a constant 20-year-old threshold for independent tax units, but the trend of children starting school at later ages results in later completion of college and later entry into the labor force (Deming and Dynarski, 2008). Between 1960 and 2012, school enrollment by those age 20 to 24 from 13 to 40 percent (National Center for Education Statistics, 2018). While we partially address this change by removing dependent filers of any age, a more comprehensive exclusion of college students would further decrease our estimates of top income shares in recent years. Second, we allocate government consumption half per capita and half by taxes paid, which may understate the per capita allocation. Increasing the per capita share to three-quarters reduces our 2019 after-tax top one percent share by 0.4 percentage point. Third, while our estimates account for alimony received and paid, they do not account for child support. In 2013, over 4 million custodial parents received average child support of about $5,300 (U.S. Census Bureau, 2016). Among custodial mothers below the poverty level, child support payments averaged about half of their total income including child support. These and other private transfers generally reallocate income from higher to lower income adults and therefore tend to increase bottom 50 percent incomes and decrease top

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[66] Congressional Budget Office (2018) estimates that per capita after-tax and after-transfer real incomes of the bottom two quintiles increased 62 percent from 1979 to 2015.

income shares. For example, Schaller and Eck (2021) show how private transfers respond to wealth and income shocks and can take the form of both financial transfers as well as informal care. There may of course be other factors working in the opposite direction, but these considerations highlight some of the uncertainties estimating incomes for the bottom 50 percent.

2. Limitations of the PSZ Simplified Method

Piketty, Saez, and Zucman (2019) proposed a "simplified" method for allocating non-taxable income to tax returns using only two allocation factors: taxable labor/pension income and taxable capital income. In addition, it goes back to the Piketty and Saez (2003) approach of using tax units to set income groups rather than individuals or adults and so retains the upward bias to top income shares from ignoring the effects of declining marriage rates. Using this simplified method, Piketty, Saez, and Zucman (2019) claim that in 2015 we allocated only 10 percent of non-taxable/non-retirement capital income to the top one percent. In fact, our analysis showed the top one percent receiving about 40 percent of this income (excluding imputed rents). By failing to account for our numerous adjustments to estimate improved fiscal income and other differences, such as the treatment of underreported income, their paper mischaracterizes our allocations of capital income.[67]

The limitations of the PSZ simplified method and why it mischaracterizes our capital income allocations can be understood by comparing it to a simplified version of our step-by-step analysis in Table 1 of our main paper.[68] Start with our 2015 top one percent shares of pre-tax fiscal income (excluding capital gains) of 18.6 percent. Next, change from grouping by tax units to individuals ranked by size-adjusted incomes and apply our sample corrections. This reduces the top share by about 3 percentage points. Finally, allocate income sources missing from tax returns to the top one percent: 1.7% of employer-sponsored insurance (ESI), 3.6% of the employer portion of payroll taxes, 4% of other income sources, such as underreported income and re-ranking effects, about 7% of inside buildup within retirement accounts, about 8% of imputed rent, and about 40% of private non-retirement capital income. Our resulting 2015 top one percent pre-tax income share is $2.2 trillion / $15.7 trillion = 14%.

$$(18.6\% - 3\%) \cdot \$9.54 + 1.7\% \cdot \$0.9 + 3.6\% \cdot \$0.6 + 4\% \cdot \$2.1 + 7\% \cdot \$0.7 + 8\% \cdot \$0.7 + 40\% \cdot \$1.1 = \$2.2 \text{ trillion}$$
Fiscal indivs./sample   ESI   payroll   other   retirement imp. rent private capital

A few changes to the equation above approximates the PSZ simplified method: (1) remove the effect from grouping by individuals and applying our sample corrections, (2) increase the imputed rent and private capital allocations to 53%, and (3) increase all other allocations to 16%.[69] This shows three issues with the PSZ simplified method: (1) it uses tax units to set income groups rather than individuals and fails to correct the sample, both of which cause upward biases to top shares, (2) it allocates 16% of ESI and payroll taxes to the top one percent rather than the more correct shares of less than 2% and 4%, (3) it allocates 53% of owner-occupied imputed rent to the top one percent rather than the more correct share of about 8%. Due to these limitations to the PSZ simplified method, it is not appropriate to use the PSZ simplified approach to augment the income reported on tax returns or make comparisons with our estimates.

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[67] Piketty, Saez, and Zucman (2019) also mischaracterized our estimated top income amounts. As we explained in the online appendix of Auten and Splinter (2019): PSZ (2019) "claim that the AS (2018) top 1% estimate of pre-tax national income is less than the PS estimate of fiscal income in 2015. In fact, our top 1% receives $2.23 trillion of pre-tax national income which is considerably more than the $1.78 trillion of fiscal income excluding capital gains."

[68] The online appendix of Auten and Splinter (2019) shows a more complete version of this analysis based on earlier estimates.

[69] See Piketty, Saez, and Zucman (2019) online spreadsheet: https://eml.berkeley.edu/~saez/PSZ2019datafile.xlsx

VIII. Distribution of Economic Growth

Some studies have estimated the distribution of economic growth over time by comparing the distributions of cross-sections in different years. 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 (see online data table C16). Using this cross-sectional approach, our income measures thus suggest that economic growth has been shared more equally.

The 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 (2019a), tax return panel data still show a progressive distribution of growth.

IX. Tax Progressivity

Average tax rates by type of tax are shown in Figure B14 (Figure B15 excludes payroll taxes) for the top one percent (upper panel) and the bottom 90 percent of individuals (lower panel). Total tax burdens of the top one percent ranged from 32 to 46 percent over the 1960 to 2019 period, averaging 38 percent with little trend. The average tax burdens were modestly higher in 2019: 42 percent compared to 38 percent in 1960. While the higher tax burden with falling statutory tax rates may seem surprising, it is consistent with earlier analyses of tax burdens in the 1960s.[70] 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. The dramatic decline in corporate taxes primarily reflects the shift in business organization from C corporations to pass-through businesses with income reported on individual tax returns. While property taxes decreased as a percent of income, state and local income taxes increased substantially for the top one percent.

The variation in average effective tax rates of the top one percent is primarily due to federal individual income taxes. First, top incomes are procyclical, moving a larger fraction of their

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[70] 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 35 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."

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, income taxes on realized capital gains are included, even though pre-tax income replaces capital gains with corporate retained earnings. In the 1960s, this makes top tax rate estimates less sensitive to income sheltering by using C corporations to retain income and delay capital gains realizations (both subject to relatively higher rates in this period). In 2019, the top one percent average tax rate is unchanged when replacing retained earnings with capital gains. The 1986 increase in taxes paid by the top one percent was due to the unlocking of unrealized gains before capital gains tax rates increased with TRA86.

Figures B15 also illustrates how taxes have reduced inequality of after-tax income more in recent decades. Average tax rates for the bottom 90 percent of the distribution decreased from 26 to 20 percent since 1979, especially since 2000. Congressional Budget Office and income tax data indicate that this was primarily due to the growth in low-income tax credits (Splinter, 2019b). In contrast, average tax rates for the top one percent fluctuated around 38 percent. Thus, the increase in overall tax progressivity was driven primarily by individual income tax reductions for lower and middle-income taxpayers.[71]

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[71] These results also highlight that the tax system is more progressive in the U.S. than in European countries, which rely more on regressive value-added and payroll taxes and generally apply high income tax rates to larger shares of the population. As a result, while top one percent shares of pre-tax income are higher in the U.S. than in Europe, shares of after-tax income have been found to be the same: both 9 percent in 2017 (Blanchet, Chancel, and Gethin, 2022). The U.S. tax-and-transfer system lowers the top one-percent share of pre-tax income by 5 percentage points, but European systems reduce this share by only 2 percentage points.

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Table B1: Descriptions and data sources of adjustments to income and tax units

Changes	Initial Year	Final Year	Data source	Adjustment Method
Panel 1: Improved fiscal income, Adjustments and income groups				
Remove filers under age 20	All Years		Tax return and Social Security microdata	Remove tax filers less than 20 years old, as not in baseline Census age 20+ population
Remove dependent filers	All Years		Tax return microdata	Primarily college students age 20-23, fewer in early years per college enrollment trends
Remove non-resid. filers & MFS fix	All Years		Tax return microdata	Remove if excl. foreign earn. inc. or not in the U.S. (since 1979). Increase non-filers by half MFS returns.
Impose post-TRA86 loss limits	1960	1986	Tax return microdata	Limit pre-1986 business losses based on post-TRA86 rules
Add tax-exempt interest	All Years		NIPA Table 3.3, tax return & SCF data	Listed on returns since 1987, shares before 1988 based on SCF, see Figure B2
Include excluded dividends	1960	1986	Tax return microdata	$100/200 exclusion ended with Tax Reform Act of 1986
Add tax-exempt combat pay	1995	present	IRS Compliance Data Warehouse	Use information returns, for missing years use military pay (2000-01), interpolate (2002-04), 1999 values minus $500M a year (1995-98)
Net out gambling losses	1972	present	Tax return microdata	Before 1991, equals miscellaneous deductions (not subject to 2% AGI limit after 1986), but only up to other income (which includes gambling winnings)
Remove cap. gains distributions	1971	present	Tax return microdata	From 1040 amounts not on Schedule D. Not separate in 1997 and 1998 and before 1971
Remove other gains on 1040	1971	present	Tax return microdata	Remove gain or loss on 1040 beginning 1971
Remove IRA contributions	1975	present	Tax return microdata	Remove amount reported on return, new provision beginning 1975
Remove tax refunds	1971	present	Tax return microdata	State and local income tax refunds variable missing before 1971
Remove net operating losses	All Years		Tax return microdata	Before 1989, equals 80 percent of other income losses
Alimony: add received/remove paid	All Years		Tax return microdata	Add only missing portion received, where total is based on deductions. Imputed before 1971.
Set groups by #indivs/sz-adj. inc.	All Years		Tax return microdata	Set income groups by #individuals and rank by size-adjusted income
Panel 2: Pre-tax income, Expansions				
Add fiduciary retained income	All Years		IRS public data	Allocate by taxable fiduciary income (use 1966 shares in prior years)
Add C-corp retained earnings	All Years		NIPA Table 1.12, Tax return & Form 5498 microdata, SCF & U.S. Financial Accounts	Allocate household portion 3/4 by dividends and 1/4 by capital gains, retirement portion by earned income for DB ownership and otherwise by DC wealth, non-profit/govt. portion half per capita and half by wages.
Add corporate income tax	All Years		NIPA Table 1.12, Tax return & Form 5498 microdata, SCF & U.S. Financial Accounts	Allocate household portion of C-corp ownership 3/4 by capital (as above) and 1/4 by wages on tax returns, bond share by taxable interest, and retirement and non-profit/govt. portions as with retained earnings.
Add business property tax	All Years		NIPA Tables 3.3 and 7.4.5	Allocate as corporate tax (no wages) and includes passthrough ownership by positive passthrough income.
Inflation effect on interest	All Years		BEA inflation & Moody's BAA corp. yields	Increase business income, decrease household interest receipts and government payments
Add underreported income and reconcile proprietor income	All Years		NIPA data and residuals of taxable income allocated using special audits: TCMP & NRP	Allocate NIPA proprietor misreporting and reporting gaps by distributions in 1988 TCMP, 2001 and 2006-2013 NRPs, allocate NIPA proprietor capital consumption adjustments by expensing and deductions, and allocate proprietor residual by reported proprietor income
Add imputed rent	All Years		NIPA Tables 3.3, 7.9, and 7.4.5	Includes real estate taxes as pre-tax measure. Allocate based on real estate taxes deducted.
Add employer payroll tax	All Years		Tax return microdata	Calculated based on reported wages or non-filer income and legislated rates and benefit bases
Add employer-provided insurance	All Years		2014 Form W-2 & NIPA Table 7.8	Allocate NIPA health, life, and workers' comp. insurance using 2014 Form W-2 distribution
Add retirement account income	All Years		NIPA Table 1.12, Tax return & Form 5498 microdata, SCF & U.S. Financial Accounts	Allocate interest and dividend income to tax returns as with retained earnings.
Add indirect taxes, non-profits, etc.	All Years		NIPA Table 1.12 & Tax return microdata	Allocate indirect taxes (mostly sales tax) by disposable income less savings, transfers/subsidies/govt. income by half per capita and half wages, and Federal Reserve payments by improved fiscal income
Panel 3: Pre-tax income plus transfers				
Add SS benefits	All Years		Tax return and Form SSA-1099 microdata & NIPA Table 3.12	Include reported benefits, use 1985 distribution in prior years

Add UI benefits	All Years	Tax return microdata & NIPA Table 3.12	Include reported benefits, use 1981 distribution in prior years
Add other cash transfers	All Years	NIPA Table 3.12 & CPS data	Veterans benefits, fed. SSI, wkrs. comp., and state/local social insurance
Add Medicare (less premiums)	1965 present	NIPA Table 3.12	Allocate benefits proportional to number of 65+ filers (except Part B premiums in recent years)
Add other non-cash transfers	All Years	NIPA Table 3.12 & CPS data	Includes federal SNAP, state and local medical care, general assistance, energy assistance, etc.

Panel 4: After-tax income, Remove taxes

Remove fed. indiv. inc. & estate tax	All Years	Tax return data & NIPA Tables 3.12 & 5.11	Include foreign tax credits as taxes paid. Estate tax allocated by decedent prior-decade income groups.
Remove state/local indiv. inc. tax	All Years	Tax return microdata & NIPA Table 3.3	Allocated by state/local income tax deductions and for non-itemizers as described in appendix
Remove corporate income tax	All Years	see above	As calculated above
Remove property tax	All Years	Tax return data & NIPA Tables 3.3 & 7.4.5	Allocate business portion as above & housing portion by deductions
Remove payroll tax	All Years	Tax return microdata & NIPA Table 2.1	Employee tax equal employer FICA tax, except in 1981, 2011 and 2012
Remove sales and other taxes	All Years	Tax return data & NIPA Tables 3.1 & 3.5	Allocate to filers by after-tax income less savings, based on SCF results in Dynan et al (2004)

Panel 5: After-tax income, Add government sector

Add government deficit/surpluses	All Years	NIPA Table 1.12 & calcs. in Table T3	Allocate by federal income and payroll taxes
Add government consumption	All Years	Tax return data & NIPA Tables 3.9.5 & 3.5	Allocate half per capita and half by after-tax income

Table B2a: Pension shares over the income distribution: 1989 and 2018

	Top 1%	P80-99	P60-80	P40-60	P20-40	Bottom 20%	Total
Panel A: 1989							
DFA	7.1%	46.5%	22.7%	14.9%	6.2%	2.4%	100.0%
Auten-Splinter	7.4%	46.6%	23.5%	14.8%	5.8%	1.9%	100.0%
Panel B: 2018							
DFA	6.4%	52.0%	24.7%	11.3%	4.3%	1.3%	100.0%
Auten-Splinter	6.3%	52.5%	24.2%	11.3%	3.7%	2.0%	100.0%

Notes: In the Federal Reserve's Distributional Financial Accounts (DFA), pension entitlements account for DB pensions, DC accounts, and life insurance.
Source: Authors' calculations and DFA, see https://www.federalreserve.gov/releases/z1/dataviz/dfa/distribute/chart (accessed Oct. 3, 2021).

Table B2b: DC and IRA wealth shares over the income distribution by estimation method: 1989, 1999, and 2018

Income percentile (TPI)	1989			1999			2018		
	Form 5498 + SCF non-IRA (all DC)	Form 5498 IRAs only	SCF only all DC	Form 5498 + SCF non-IRA (all DC)	Form 5498 IRAs only	SCF only all DC	Form 5498 + SCF non-IRA (all DC)	Form 5498 IRAs only	SCF only all DC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
0-20	3.1%	4.4%	3.5%	3.0%	2.9%	3.2%	2.2%	3.1%	2.8%
20-40	3.6%	8.8%	3.7%	3.8%	5.6%	3.2%	3.5%	5.4%	2.8%
40-60	14.7%	13.3%	15.6%	14.5%	9.4%	16.6%	10.9%	9.2%	13.7%
60-80	18.3%	22.9%	18.6%	19.7%	16.3%	20.6%	20.9%	21.6%	20.6%
80-95	27.9%	25.9%	26.9%	26.5%	27.7%	26.3%	30.1%	30.4%	27.9%
95-99	21.4%	17.0%	20.5%	20.8%	23.1%	19.7%	22.4%	20.3%	22.6%
99-99.5	4.4%	3.4%	4.3%	4.2%	5.8%	3.9%	4.3%	4.1%	4.1%
top 0.5%	6.7%	4.4%	6.7%	7.4%	9.3%	6.5%	5.8%	5.8%	5.6%
All	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
Top 1%	11.1%	7.8%	11.0%	11.7%	15.0%	10.3%	10.1%	9.9%	9.7%

Notes: Income is total positive income (TPI). See text for description of methods. *Source*: Authors' calculations.

Table B3: Misreporting rates of income by reported AGI and type of income, 2001

Reported AGI ($)	Total Income (%)	Wages, Salaries and Tips (%)	Schedule C Business (%)	Capital Gains (%)
Negative	96	12	101	34
1–5K	53	13	90	35
5K–10K	38	9	78	18
10K–15K	29	6	76	59
15K–20K	22	4	75	26
20K–25K	20	3	74	22
25K–30K	17	2	70	41
30K–40K	11	1	69	25
40K–50K	10	1	61	53
50K–75K	7	1	57	23
75K–100K	5	1	45	28
100K–200K	6	*	32	17
200K–500K	8	*	21	11
500K–1M	4	*	23	4
1M–2M	2	*	21	*
>2M	1	*	19	*
Total	11	1	57	12

Notes: * denotes values rounding to zero. AGI classes are based on reported AGI. The table shows the IRS measure, net misreporting percentage, defined as the misreported/underreported amount of each source divided by the sum of the reported and unreported (true) amounts of each source.
Source: "Tax Year 2001 Individual Income Tax Underreporting Gap Estimates by Selected Levels of True and Reported AGI," as cited in David Cay Johnston, "Trust but Verify," *Tax Notes* (August 4, 2008).

Table B4: Revenue estimates of base-broadening provisions in the Tax Reform Act of 1986 that affect total fiscal income
(fiscal year effects in millions of dollars)

	1987	1988	1989	1990
Total income on tax return (total effects)	**4,454**	**11,427**	**14,562**	**18,683**
Cap employee contributions to 401k, 403b	310	628	691	809
Pension: repeal 3-year basis recovery	1,096	1,763	2,001	2,015
Pension: raise age limits, reduce DBs	315	869	960	1,097
Adjustments to sec. 404 limits	17	42	45	49
Non-discrimination benefit rules	0	72	128	140
Reduce foreign earned income exclusion	24	34	45	56
Unearned income of children under 14 (part)	60	195	226	249
Repeal unemployment compensation exclusion	230	764	749	723
Limit exclusion of scholarships/fellowships	8	64	130	160
Limit deduction for meals, travel, etc. (Sch. C)	513	937	1,112	1,291
Limit on passive losses	1,166	4,488	7,479	10,932
At-risk rules on real estate	46	192	343	483
Repeal dividend exclusion ($100/$200)	212	573	580	605
Recognition of gain/loss in liq. distributions	-1	-13	-32	-44
Purchase price allocation	-2	2	9	13
RIC end of year distributions timing/excise tax	484	866	163	180
Installment sales	12	42	31	32
Taxation of prizes and awards	-21	-59	-63	-66
SEP plans	-15	-32	-35	-41
Depreciation effects on tax returns (total effects)	**-115**	**352**	**1,486**	**2,954**
Depreciation, expensing (individual portion)	-502	-584	498	1,980
Amortization of trademarks and trade names	1	4	8	14
Agricultural expensing and prepayment	45	55	33	36
Oil, gas, and geological depletion	20	49	45	45
Simplify LIFO for small business	-11	-18	-28	-44
Capitalize inventory, construction, and dev.	146	479	583	639
Farmer pre-productive period expenses	56	161	144	121
Long-term contracts	98	109	103	62
Repeal reserve for bad debt	32	97	100	101
Total of all provisions (nominal)	**4,339**	**11,779**	**16,048**	**21,637**

Notes: The revenue changes to depreciation rules are for the individual portion (not corporate changes) and therefore affect total income on tax returns (fiscal income) by changing the net amounts of partnership, S corporation and sole proprietorship income. Negative amounts for depreciation for the first few years reflect increases in the limits for expensing under section 179, which is quickly more than offset by the reductions in depreciation deductions.
Sources: Authors' calculations and Joint Committee on Taxation.

Table B5: Changes in top 1% fiscal income shares after TRA86 (cross-section analysis)

	1986	1987	1988	1989	1990
Top 1% income share	7.8	10.4	12.8	12.4	12.8
Change from 1986: Total		2.6	5.1	4.6	5.0
Wages		1.6	2.5	2.1	2.4
S corporation, net		0.4	0.8	0.7	0.7
Partnership, net		0.3	0.5	0.5	0.5
Self-employment, net		0.2	0.4	0.3	0.4
Base changes, partial		0.3	0.4	0.5	0.4
Other		-0.2	0.5	0.5	0.5

Notes: Income excludes capital gains, but top one percent thresholds are based on tax return income including capital gains and the number of tax returns (non-filers are not considered). Self-employment income is Schedule C income. Base changes include rental loss limits, disallowed rental and passive losses and at-risk rules and elimination of the dividend exclusion.
Sources: IRS and authors' calculations.

Table B6: Increase in top 1% fiscal incomes due to TRA86 changes (panel analysis)

	1987	1988	1989	1990
Total income increase ($billions)	110.6	200.0	193.7	240.4
Percent of income increase due to listed TRA86 changes (%)				
New S corporations	0.2	7.6	4.9	7.5
Existing S corporations	8.0	6.6	5.4	5.5
New partnerships	6.4	2.6	1.6	0.9
Existing partnerships	7.4	8.4	10.4	8.3
Total	**22.0**	**25.2**	**22.3**	**22.2**

Notes: Income increase is the nominal change in fiscal income excluding capital gains from the 1985–86 average. New S corporation and partnership income is for taxpayers not reporting income from these sources in 1985 or 1986. Top one percent thresholds are based on tax return income including capital gains and the number of tax returns (non-filers are excluded).
Sources: Authors' calculations using the 1985 base year individual tax return panel.

Table B7: 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	Underreported income by reported income	0.4	1.3	2.0	0.7	1.6
Include distributed & other retirement income	Retirement alloc. partly includes rollovers	−0.2	−0.2	1.0	1.2	1.2
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	0.5	0.3	0.7	0.4	0.1
Various corrections to tax income definition	Use unimproved 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
Limit returns to non-dependent U.S. residents	No adjustment	−0.3	−0.3	*	0.4	0.4
Groups by individuals/size-adjusted incomes	Groups by adults/equal-split married inc	*	0.1	0.1	*	0.1
Non-profits/govt. income half per capita	Non-profits/govt. income all by income	*	*	0.1	*	*
Inflation correction	No correction	−0.1	−0.5	−0.1	0.4	*
Social insurance benefits/deficit excluded	Social insur. ben./def. incl., taxes deducted	*	*	−0.2	−0.1	−0.2
Subtotal: Pre-tax differences (PSZ less AS) & totals		**1.4**	**1.7**	**6.0**	**4.3**	**4.6**
After-tax income						
Govt. consumption allocated half per capita	Govt. consumption all by after-tax income	0.8	0.6	1.3	0.7	0.6
Non-SS deficits by federal income taxes	Half by government transfers, half taxes	−0.2	*	0.4	0.4	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	*	*	−0.1	−0.1	−0.1
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
Subtotal: After-tax differences (PSZ less AS) & totals		*****	*****	**0.5**	**0.5**	**0.5**
Total after-tax differences (PSZ less AS)		**1.4**	**1.7**	**6.6**	**4.8**	**5.1**

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. 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 B8: Taxable and Non-taxable Pension and IRA Distributions, 2014

AGI Class	Pensions				IRA Distributions			
	Total ($million)	Taxable ($million)	Non-taxable ($million)	Non-taxable (%)	Total ($million)	Taxable ($million)	Non-taxable ($million)	Non-taxable (%)
Panel A: By Centiles								
AGI<0	6	3	4	54.5	3	2	1	24.8
0–10	15	7	8	54.5	3	3	1	21.4
10–20	25	18	7	28.7	6	5	1	11.9
20–30	32	24	7	23.4	8	6	1	16.2
30–40	38	28	10	25.6	10	8	2	20.2
40–50	49	36	13	26.2	10	9	1	11.6
50–60	67	51	16	24.2	14	12	2	11.4
60–70	108	78	30	27.7	26	20	5	20.9
70–80	155	106	49	31.8	36	32	4	11.5
80–90	220	137	83	37.8	56	47	9	15.6
90–95	161	88	72	44.9	39	34	6	14.3
95–99	175	72	103	58.6	51	43	8	15.6
Top 1 %	59	14	45	76.0	17	13	4	23.1
Total	**1,110**	**663**	**447**	**40.3**	**279**	**235**	**44**	**15.7**
Panel B: By AGI group								
AGI<$0	6	3	4	54.5	3	2	1	24.8
$0–25K	88	61	27	30.8	20	17	3	15.2
$25–50K	134	100	34	25.2	29	25	4	14.3
$50–100K	321	221	100	31.1	77	65	12	15.5
$100–250K	411	230	181	44.1	104	89	15	14.6
$250K–$1M	129	44	85	66.1	39	32	7	18.1
$1M +	21	4	17	79.3	6	5	2	26.5
Total	**1,110**	**663**	**447**	**40.3**	**279**	**235**	**44**	**15.7**

Sources: Authors' calculations using 2014 Statistics of Income individual income tax file.

Table B9a: Top Income Shares, 1960–2019

Year	Pre-tax income		Pre-tax income plus transfers		After-tax income	
	Top 1%	Top 0.1%	Top 1%	Top 0.1%	Top 1%	Top 0.1%
1960	10.3	3.5	9.8	3.3	3.3	2.5
1961	10.7	3.8	10.3	3.6	3.6	2.7
1962	11.1	4.0	10.6	3.8	3.8	2.9
1963	11.4	4.1	10.8	3.9	3.9	3.0
1964	11.5	4.2	11.0	4.0	4.0	3.1
1965	11.5	4.2	11.0	4.0	4.0	3.1
1966	11.5	4.2	11.0	4.0	4.0	3.1
1967	11.3	4.0	10.7	3.8	3.8	2.8
1968	11.1	4.1	10.6	3.9	3.9	2.8
1969	10.1	3.5	9.6	3.3	3.3	2.4
1970	9.3	3.1	8.7	2.9	2.9	2.1
1971	9.6	3.2	8.9	3.0	3.0	2.2
1972	9.7	3.3	9.0	3.1	3.1	2.3
1973	9.5	3.1	8.9	2.9	2.9	2.3
1974	9.2	3.0	8.5	2.7	2.7	2.2
1975	9.3	3.0	8.5	2.7	2.7	2.2
1976	9.4	3.1	8.6	2.8	2.8	2.2
1977	9.3	3.1	8.6	2.8	2.8	2.3
1978	9.3	3.0	8.6	2.8	2.8	2.3
1979	9.4	3.2	8.7	2.9	2.9	2.4
1980	9.2	3.0	8.4	2.7	2.7	2.1
1981	8.8	2.8	8.1	2.5	2.5	2.1
1982	9.1	3.0	8.3	2.7	2.7	2.1
1983	9.4	3.1	8.6	2.8	2.8	2.2
1984	9.6	3.2	8.8	2.9	2.9	2.3
1985	9.7	3.5	8.9	3.1	3.1	2.4
1986	9.7	3.2	8.8	2.9	2.9	2.1
1987	9.7	3.2	8.8	2.9	2.9	2.2
1988	11.2	4.5	10.3	4.1	4.1	3.3
1989	10.8	4.2	9.9	3.8	3.8	3.0
1990	10.8	4.1	9.8	3.7	3.7	3.0
1991	10.5	3.8	9.5	3.4	3.4	2.6
1992	11.2	4.3	10.0	3.9	3.9	2.9
1993	10.6	4.0	9.4	3.5	3.5	2.4
1994	10.6	4.0	9.5	3.5	3.5	2.5
1995	11.1	4.3	10.0	3.8	3.8	2.7
1996	11.6	4.6	10.4	4.1	4.1	2.9
1997	12.2	4.9	11.0	4.3	4.3	3.2
1998	12.4	5.0	11.2	4.5	4.5	3.2
1999	12.8	5.3	11.6	4.8	4.8	3.5
2000	13.3	5.6	12.1	5.0	5.0	3.7
2001	12.3	4.9	11.1	4.4	4.4	3.1
2002	11.7	4.5	10.4	4.0	4.0	2.9
2003	12.1	4.8	10.8	4.3	4.3	3.1
2004	13.0	5.5	11.7	4.9	4.9	3.7
2005	14.1	6.2	12.6	5.5	5.5	4.1
2006	14.5	6.4	13.0	5.7	5.7	4.3
2007	14.5	6.4	13.0	5.7	5.7	4.1
2008	13.7	5.9	12.0	5.1	5.1	3.6
2009	12.8	5.3	11.1	4.6	4.6	3.2
2010	13.8	6.0	12.0	5.2	5.2	3.6
2011	13.4	5.6	11.7	4.8	4.8	3.2
2012	14.9	6.6	13.0	5.7	5.7	4.0
2013	13.6	5.6	11.9	4.8	4.8	3.1
2014	14.2	5.8	12.4	5.1	5.1	3.3
2015	13.8	5.7	12.0	4.9	4.9	3.2
2016	13.4	5.4	11.7	4.7	4.7	3.0
2017	14.1	5.8	12.4	5.0	5.0	3.3
2018	14.2	5.8	12.5	5.1	5.1	3.3
2019	13.8	5.4	12.0	4.7	4.7	3.0

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.

Table B9b: Top 1% Income Shares, 1960–2019

Auten-Splinter		PSZ: 2018 Original		PSZ: 2023 Updates	
Pre-tax income	**After-tax income**	**Pre-tax income**	**After-tax income**	**Pre-tax income**	**After-tax income**
10.3	8.1	12.6	10.0	12.5	9.1
10.7	8.4	12.5	9.7	12.5	8.9
11.1	8.6	12.6	10.1	12.9	9.5
11.4	8.8	12.7	10.3	13.0	9.7
11.5	8.9	12.9	10.5	13.1	9.8
11.5	9.0	12.8	10.3	13.0	9.7
11.5	9.1	12.6	10.2	13.0	9.6
11.3	8.5	12.3	9.6	12.6	9.2
11.1	8.2	12.2	9.3	12.4	8.9
10.1	7.6	11.5	8.8	11.6	8.3
9.3	6.8	11.0	8.5	11.0	8.0
9.6	7.0	11.1	8.5	11.1	8.1
9.7	7.2	11.1	8.6	11.0	8.1
9.5	7.4	10.9	8.6	10.8	8.1
9.2	7.0	10.7	8.4	10.5	7.9
9.3	6.9	10.6	8.4	10.4	7.9
9.4	7.1	10.5	8.4	10.4	7.9
9.3	7.2	10.7	8.6	10.5	8.0
9.3	7.4	10.8	8.8	10.5	8.2
9.4	7.4	11.2	9.1	10.9	8.5
9.2	7.0	10.7	8.6	10.4	8.1
8.8	6.9	11.0	9.3	10.7	8.7
9.1	6.9	11.3	9.4	11.0	9.1
9.4	7.1	11.5	9.7	11.5	9.6
9.6	7.5	12.5	10.8	12.2	10.4
9.7	7.6	12.6	10.7	12.3	10.5
9.7	7.3	12.2	10.0	12.0	10.0
9.7	7.3	13.3	11.0	13.2	11.1
11.2	8.8	14.9	12.4	15.2	13.1
10.8	8.4	14.5	12.1	14.7	12.6
10.8	8.3	14.5	12.1	14.7	12.5
10.5	7.8	13.9	11.5	13.6	11.4
11.2	8.2	15.0	12.3	14.7	12.1
10.6	7.3	14.6	11.7	14.1	11.3
10.6	7.5	14.7	11.6	14.0	11.1
11.1	7.9	15.3	12.0	14.5	11.4
11.6	8.0	16.0	12.5	15.2	11.9
12.2	8.6	16.6	13.0	16.0	12.5
12.4	8.7	16.9	13.1	16.3	12.7
12.8	9.0	17.7	13.7	16.8	13.0
13.3	9.4	18.3	14.1	17.3	13.4
12.3	8.6	17.3	13.8	16.6	13.2
11.7	8.2	17.1	13.9	16.1	13.2
12.1	8.8	17.2	14.1	16.3	13.5
13.0	9.3	18.3	14.8	17.1	13.8
14.1	9.9	19.4	15.3	18.1	14.4
14.5	10.1	20.1	15.8	18.5	14.6
14.5	9.8	19.9	15.3	18.4	14.1
13.7	8.9	19.5	15.3	17.9	13.9
12.8	8.2	18.5	15.1	16.8	13.4
13.8	8.9	19.8	15.9	17.9	14.5
13.4	8.6	19.6	15.8	18.2	14.7
14.9	9.9	20.8	16.7	19.5	15.8
13.6	8.6	19.6	15.3	18.5	14.6
14.2	9.1	20.2	15.7	19.0	14.9
13.8	8.8	---	---	18.9	14.7
13.4	8.5	---	---	18.7	14.6
14.1	9.1	---	---	19.1	14.9
14.2	9.2	---	---	19.3	15.3
13.8	8.8	---	---	19.1	15.1

Sources: Authors' calculations, and Piketty, Saez, and Zucman (PSZ, 2018 and updates as of March 2023).

Fiscal Income Corrections, Correct Sample & Increases

Fiscal Income Corrections, Decreases
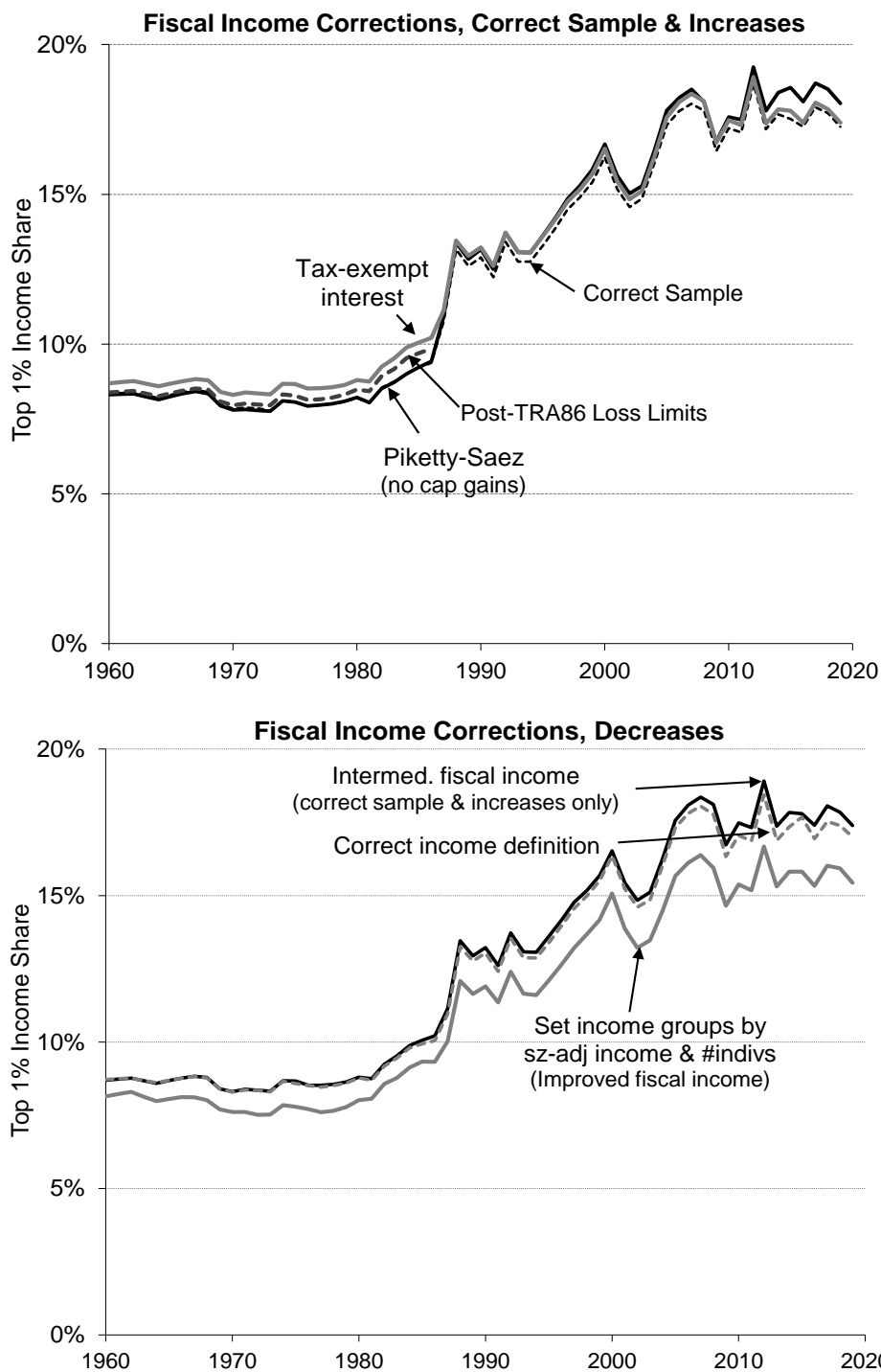
Figure B1: Top 1% income shares: Improved fiscal income adjustments

Notes: Replicated Piketty and Saez series is shown, where income is adjusted gross income less adjustments, government transfers, and capital gains. See text for description of adjustments.
Sources: Authors' calculations and Piketty and Saez (2003 and updates).
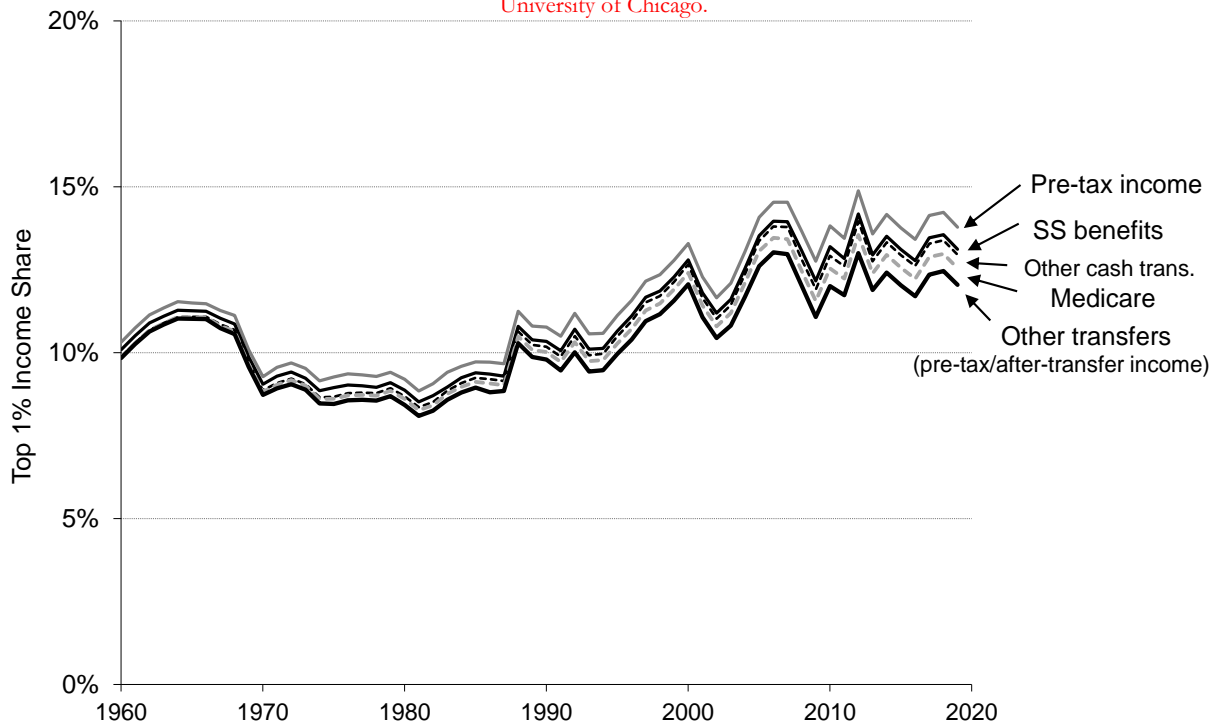
Figure B2: Top 1% income shares: Inclusion of transfers in pre-tax income

Notes: The effect of unemployment insurance is not shown separately from other cash transfers due to its small effect.
Source: Authors' calculations.

After-tax Income, increases
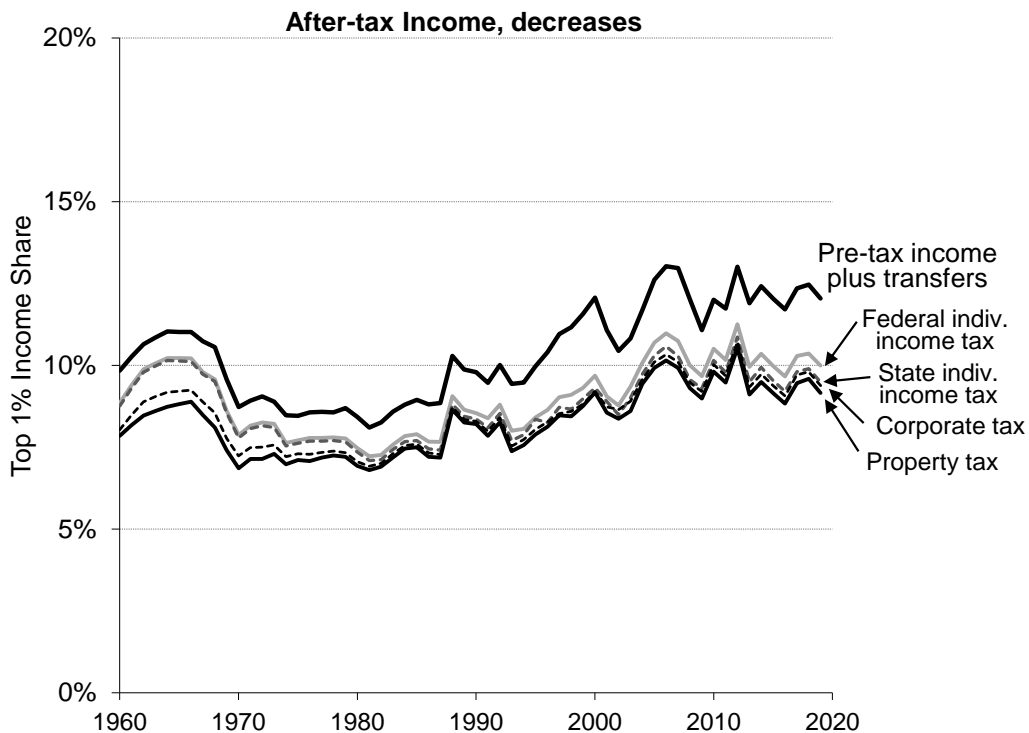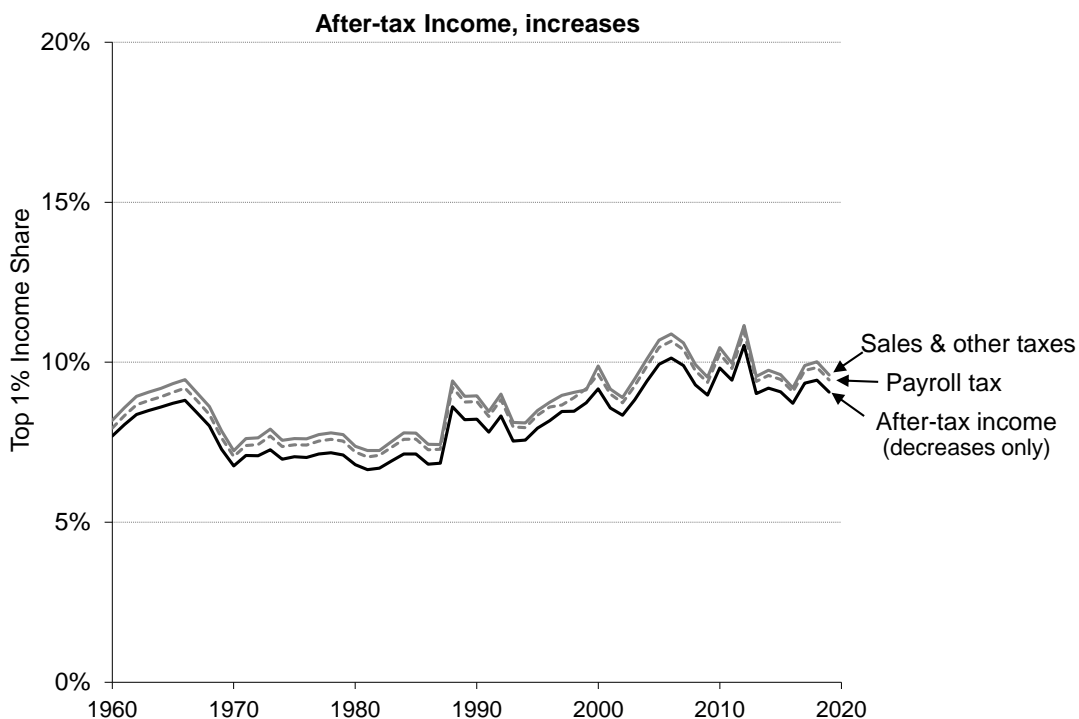
Figure B3: Top 1% income shares: Tax adjustments

Notes: Taxes that decrease top income shares are in the top figure and those increasing them in the bottom figure. Excludes adjustments for government deficits/surplus and consumption (see Table 1 in main paper).
Source: Authors' calculations.
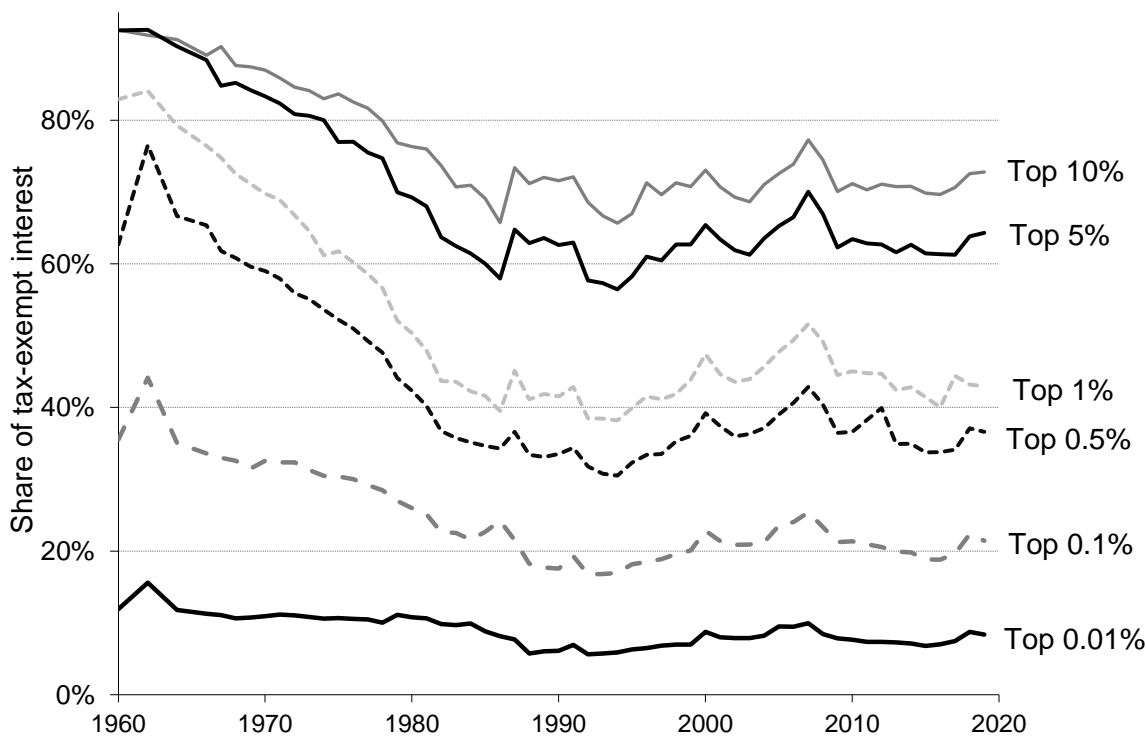
Figure B4: Share of tax-exempt interest by income group

Notes: Income groups are PS income excluding capital gains with non-deductible losses removed.
Tax-exempt interest was only reported on tax returns since 1987 and shares are estimated in previous years based on the 1983 Survey of.Consumer Finances and the 1962 Survey of Financial Characteristics of Consumers.
Source: Authors' calculations.
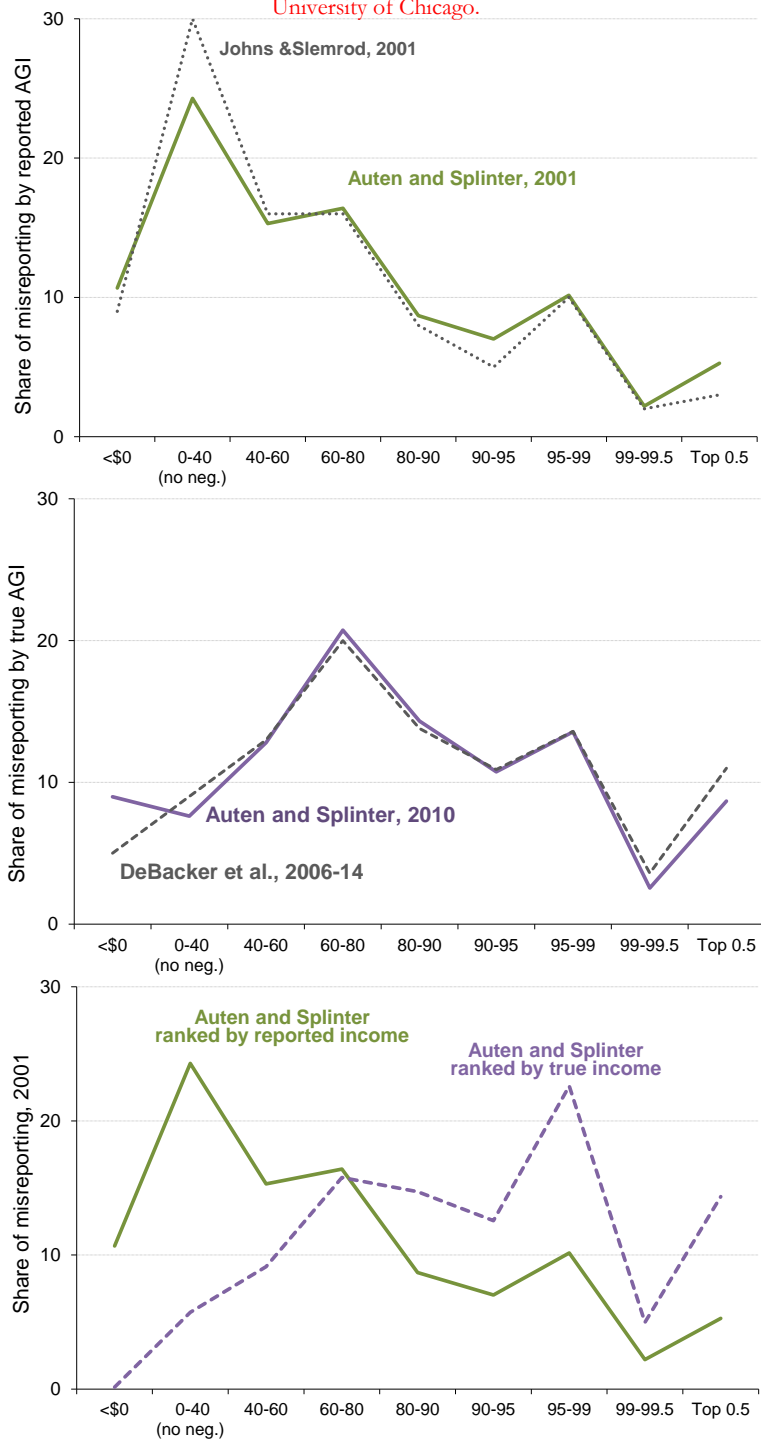
Figure B5: Share of misreporting when ranking tax returns by reported and true AGI

Notes: The top panel ranks tax returns by reported AGI and the share of misreporting (detected and undetected) is similar when using the AS indirect method for 2001 tax data or direct estimates in Johns and Slemrod using the 2001 NRP (shares by reported AGI are not shown in DeBacker et al. for more recent years). The middle panel ranks tax returns by "true" AGI (AGI plus detected misreporting). The share of misreporting is similar when using the AS indirect method for 2010 or estimates in DeBacker et al. using the 2006–2014 NRPs (ranked by true AGI excluding DCE). The bottom panel shows that moving from ranking by reported income to true income (AGI plus detected and undetected misreporting) causes upward re-ranking of misreported income. Weights are by the number of tax returns to compare across studies.

Sources: Authors' calculations, Johns and Slemrod (2010), and DeBacker et al. (2020).
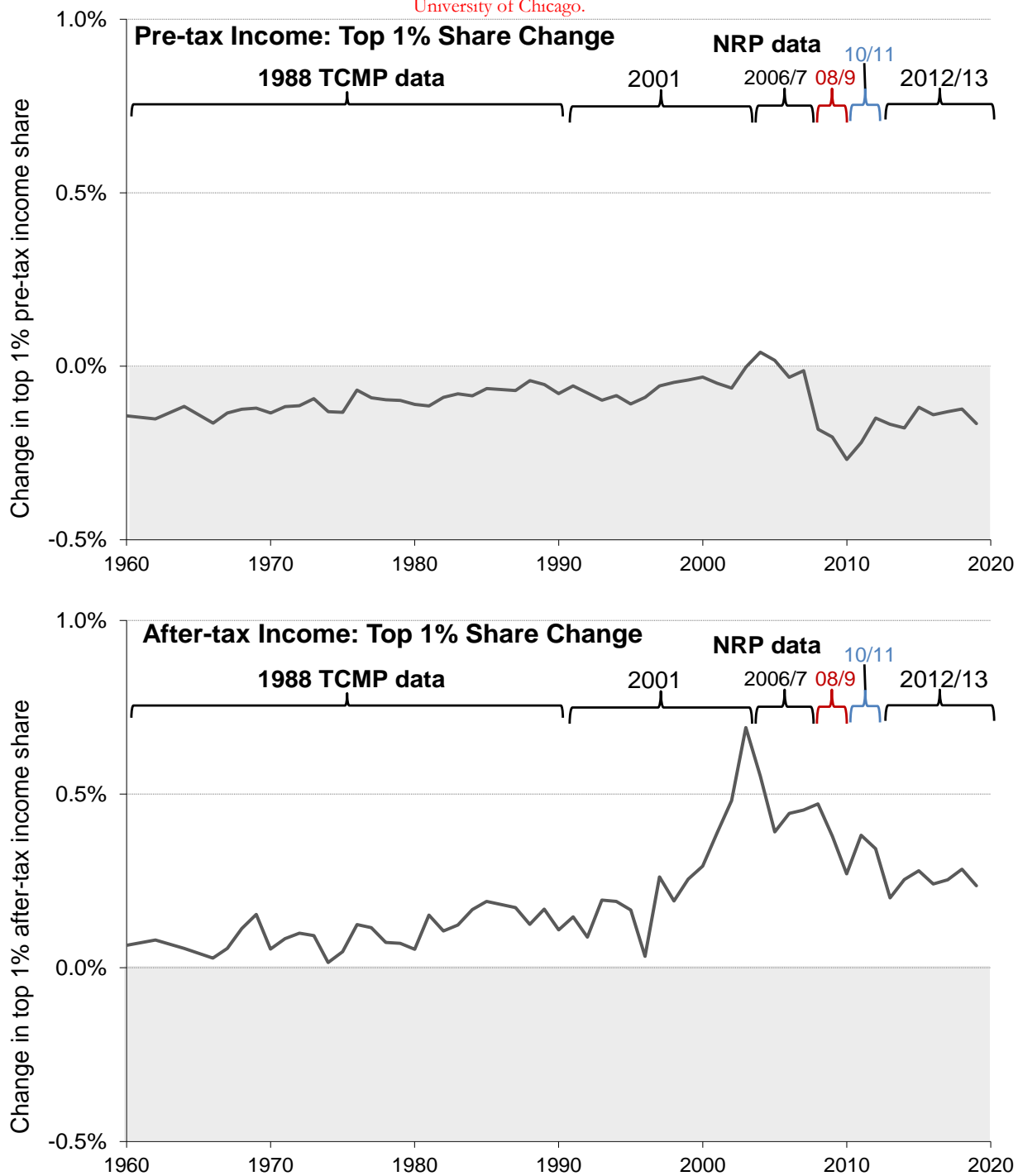
Figure B6: Change in top 1% income share from adding misreporting and proprietor adjustments

Notes: Changes include re-ranking effects because they are relative to before and after adding misreporting and making proprietor income adjustments for capital consumption and other differences. 1986 and 1992 (pre-tax only) are excluded due to outlier effects, likely from large capital gains realizations.

Sources: Authors' calculations.
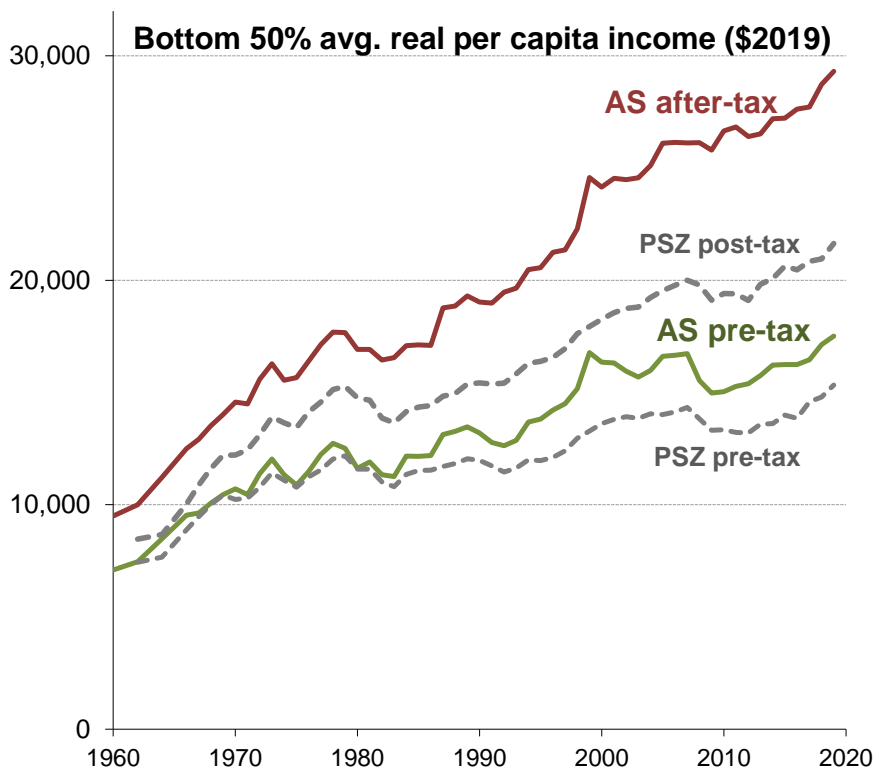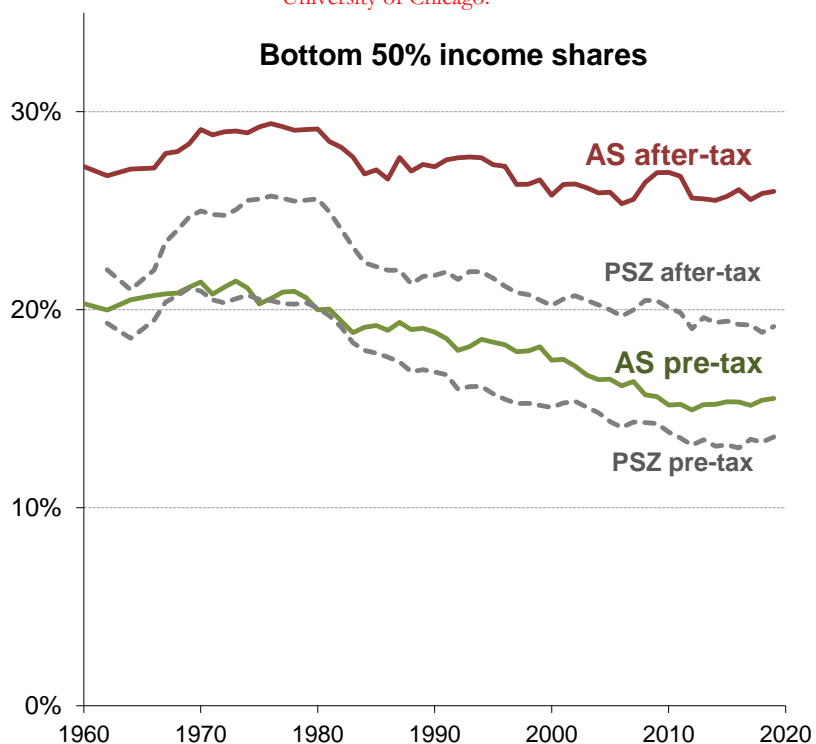
Figure B7: Bottom 50 percent income shares and average incomes

Notes: Incomes are real per capita incomes (not size-adjusted) indexed using the PCE.
Source: Authors' calculations using IRS and PSZ data.
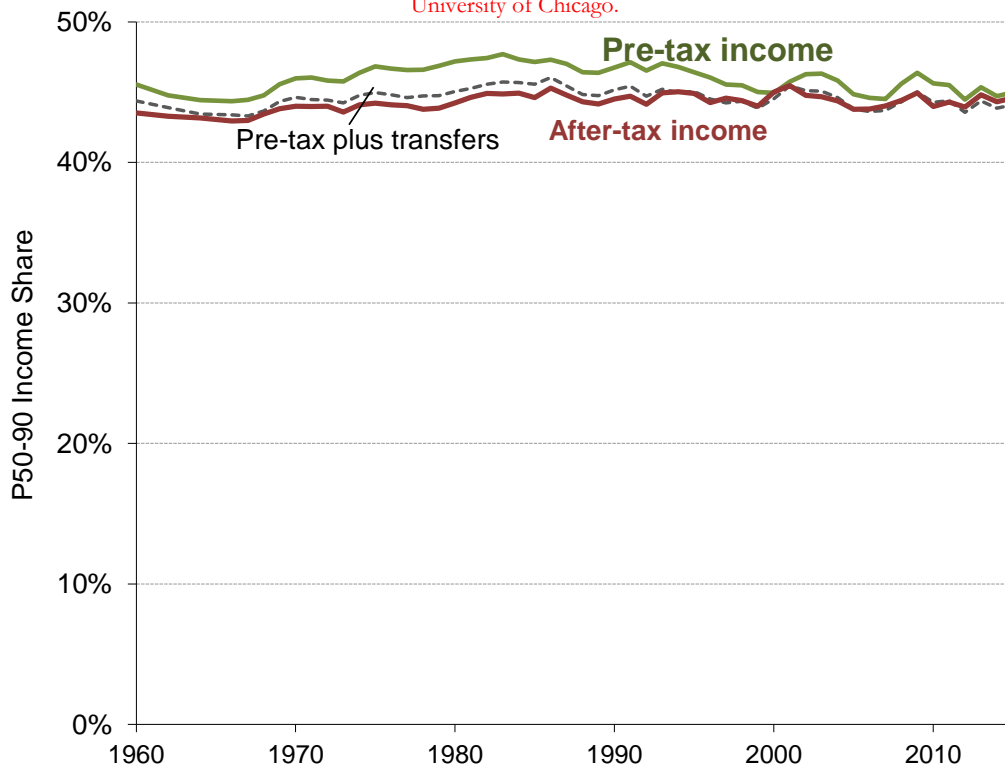
Figure B8: Income shares of top half excluding top 10% (P50-90)
Notes: Incomes are real per capita incomes (not size-adjusted) indexed using the PCE.
Source: Authors' calculations.
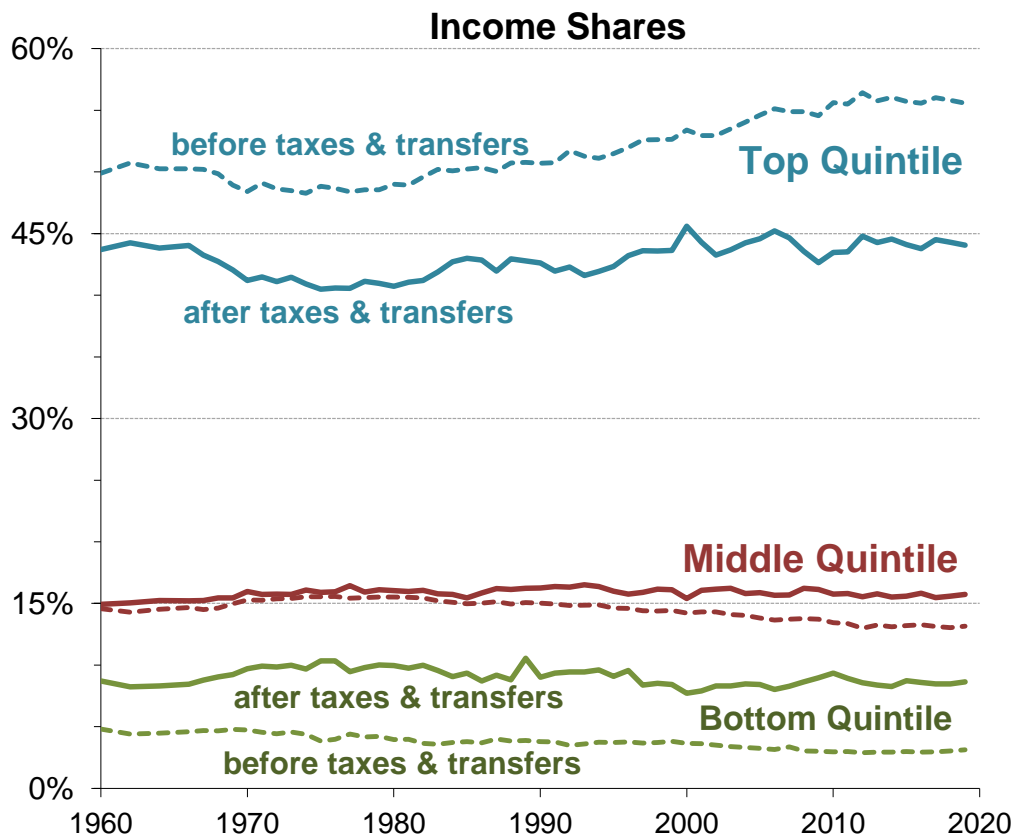
Figure B9: Income shares by quintile
Notes: Bottom quintile excludes negative incomes.
Source: Authors' calculations.
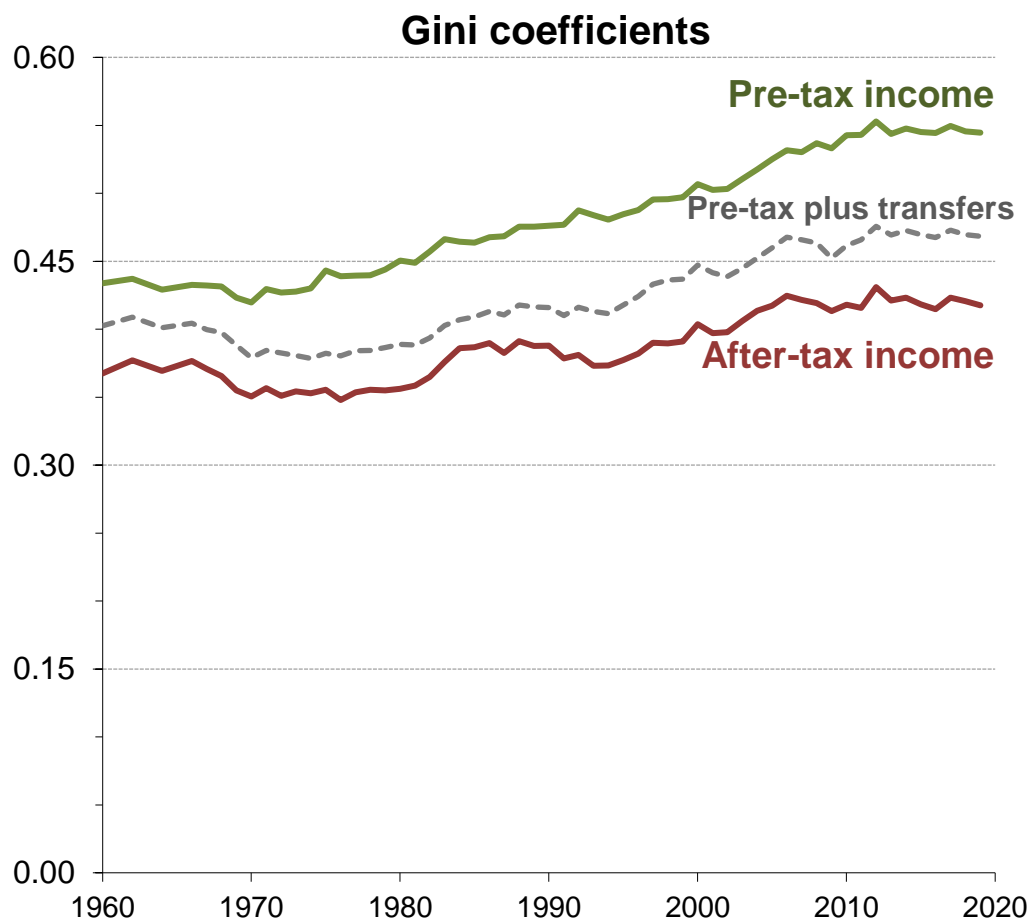
Figure B10: Gini coefficients by income type
Source: Authors' calculations.
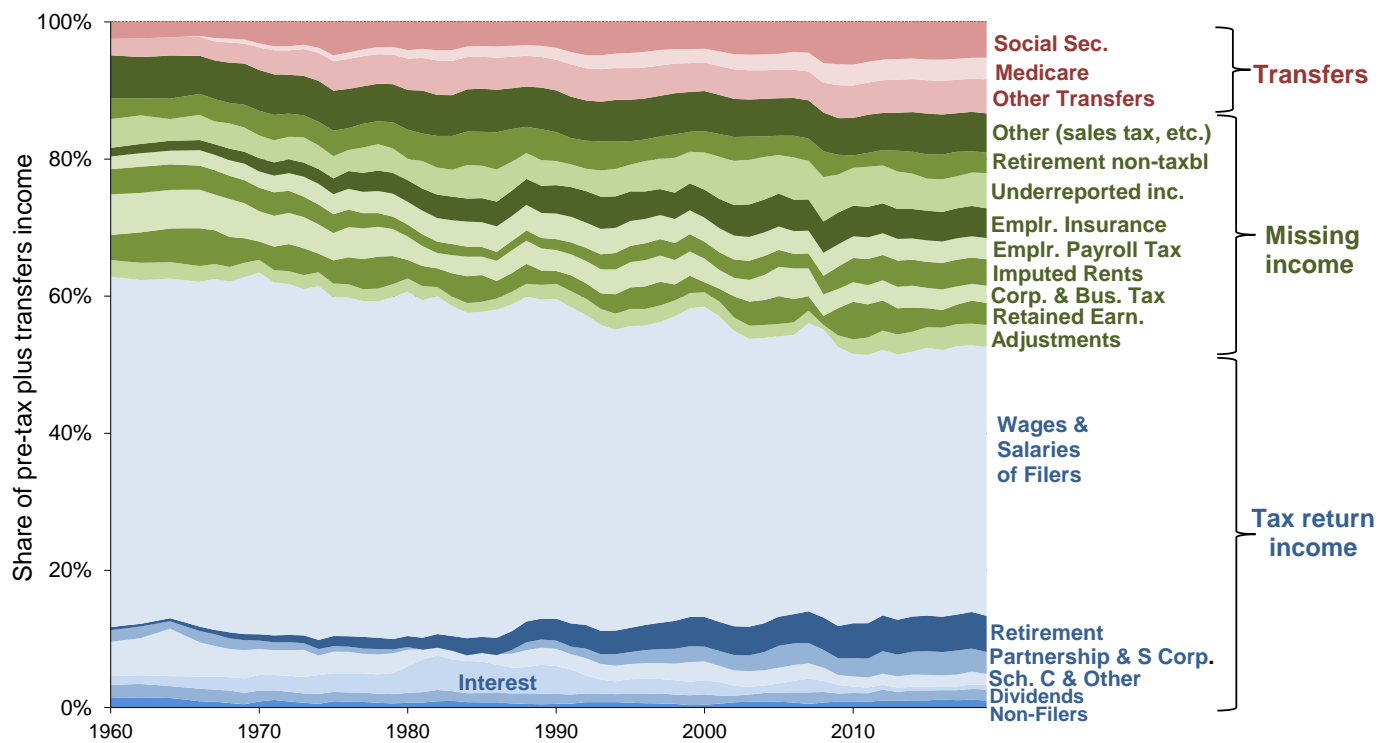
Figure B11: Income sources as a share of pre-tax income plus transfers

Notes: Adjustments to tax return income are listed in Tables 1 and 2. Sch. C and Other includes small amounts from unlisted sources, such as alimony, rents, etc. Corp. & Bus. Tax is federal and state corporate income tax and business property taxes.

Sources: Authors' calculations.
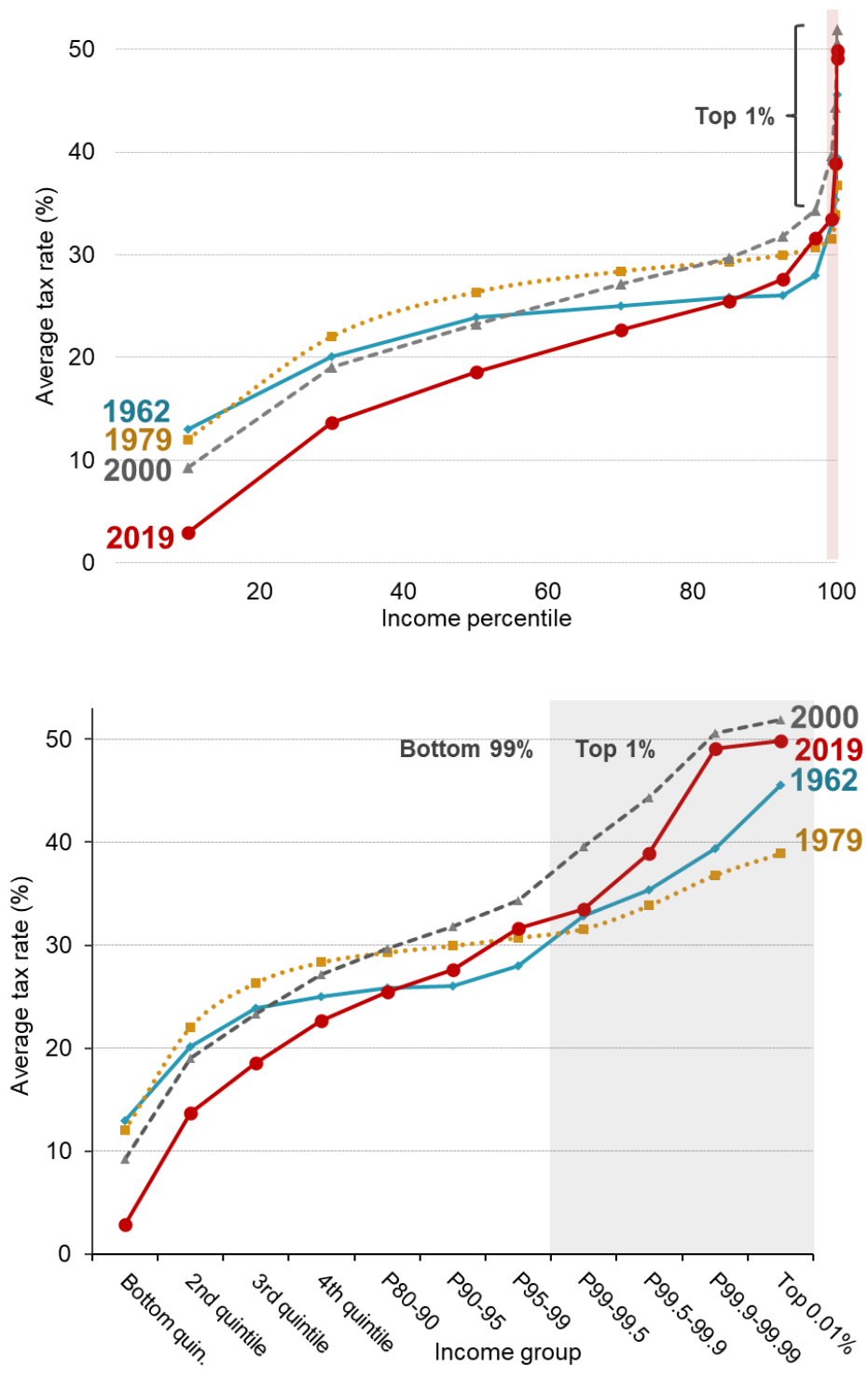
Figure B12: Average tax rates by income group, including payroll taxes

Notes: Average tax rates are taxes (federal, state, and local taxes, including payroll taxes) divided by the pre-tax income plus transfers measure. The upper panel shows income groups proportionally along the x-axis, with the top quintile split into four groups: P80–90, P90–95, P95–99, and the top 1%. The top 1% is shown in the narrow (proportional) range in gray. The lower panel disaggregates the top quintile such that it is not proportional along the x-axis. The top 1% is shown in the wide (non-proportional) range in gray. 1962 is the first non-recession year available and other years are business cycle peaks. *Sources:* Authors' calculations.
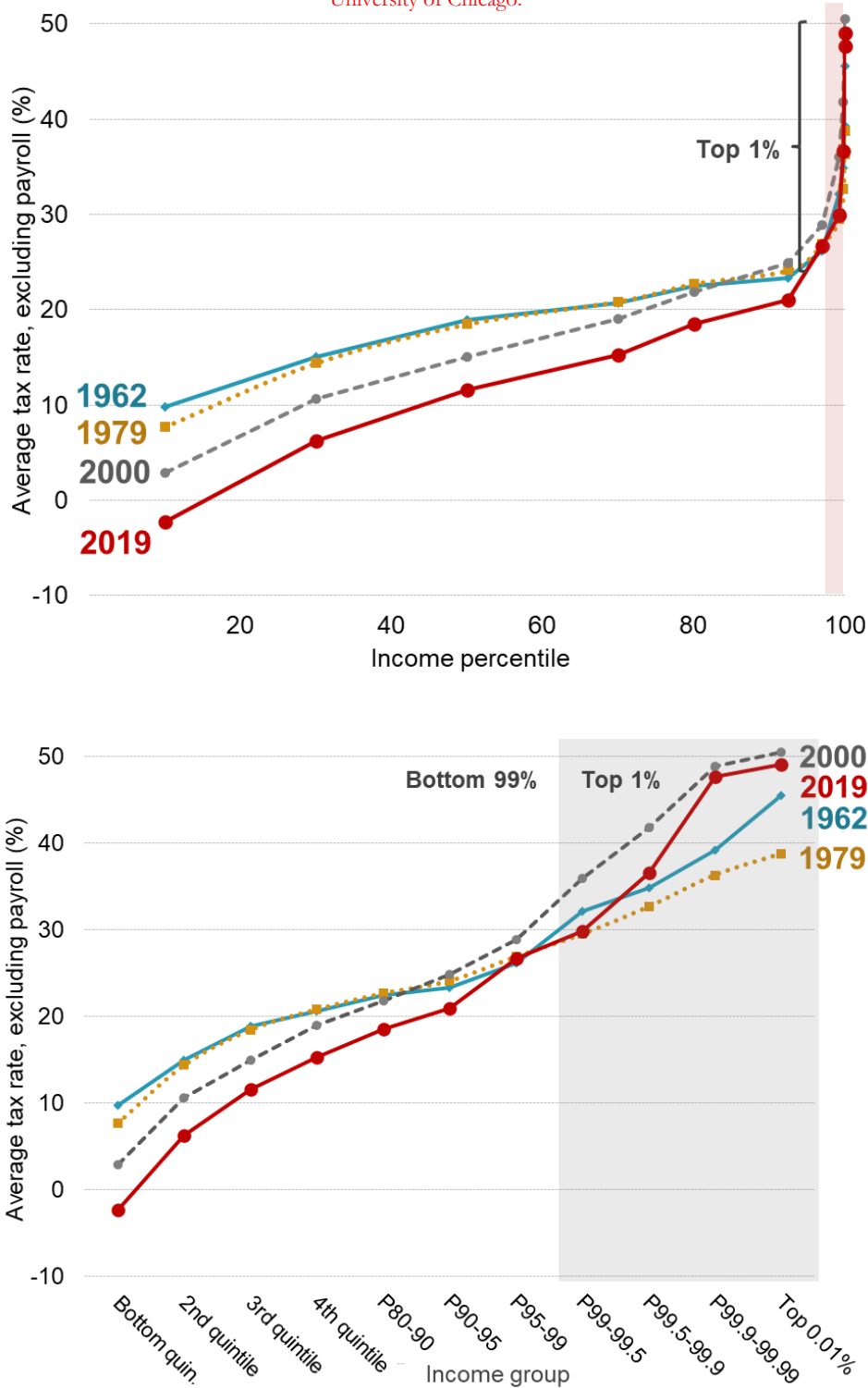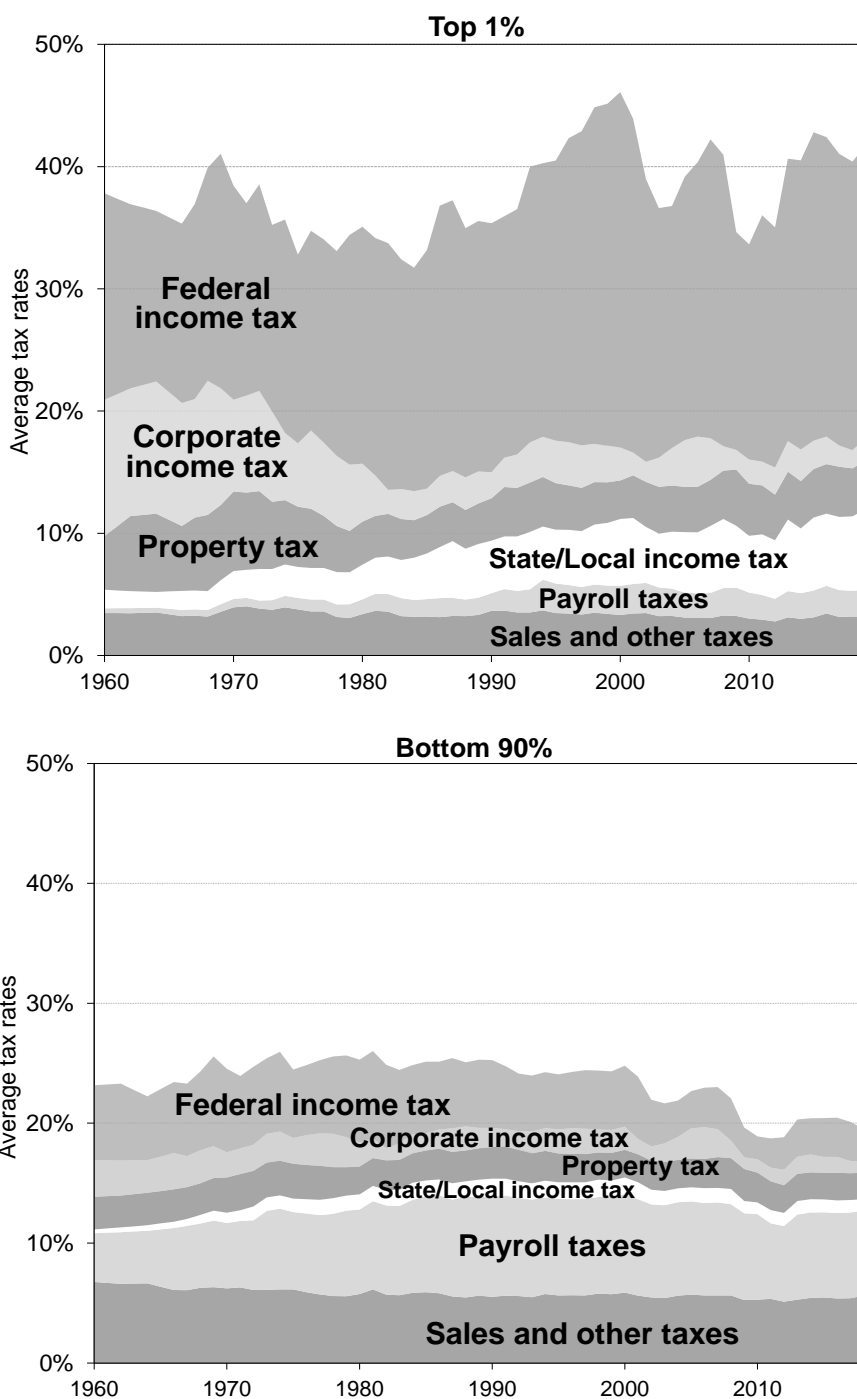
Figure B13: Average tax rates by income group, excluding payroll taxes

Notes: Average tax rates are taxes (federal, state, and local taxes, excluding payroll taxes) divided by the pre-tax income plus transfers measure. The upper panel shows income groups proportionally along the x-axis, with the top quintile split into four groups: P80–90, P90–95, P95–99, and the top 1%. The top 1% is shown in the narrow (proportional) range in gray. The lower panel disaggregates the top quintile such that it is not proportional along the x-axis. The top 1% is shown in the wide (non-proportional) range in gray. 1962 is the first non-recession year available and other years are business cycle peaks. *Sources:* Authors' calculations.

Figure B14: Taxes rates by source, including payroll taxes, 1960–2019

Notes: Tax rates are average effective tax rates, i.e., group-level taxes divided by the pre-tax income plus transfers measure. Income groups are defined using pre-tax income plus transfers. *Sources:* Authors' calculations.
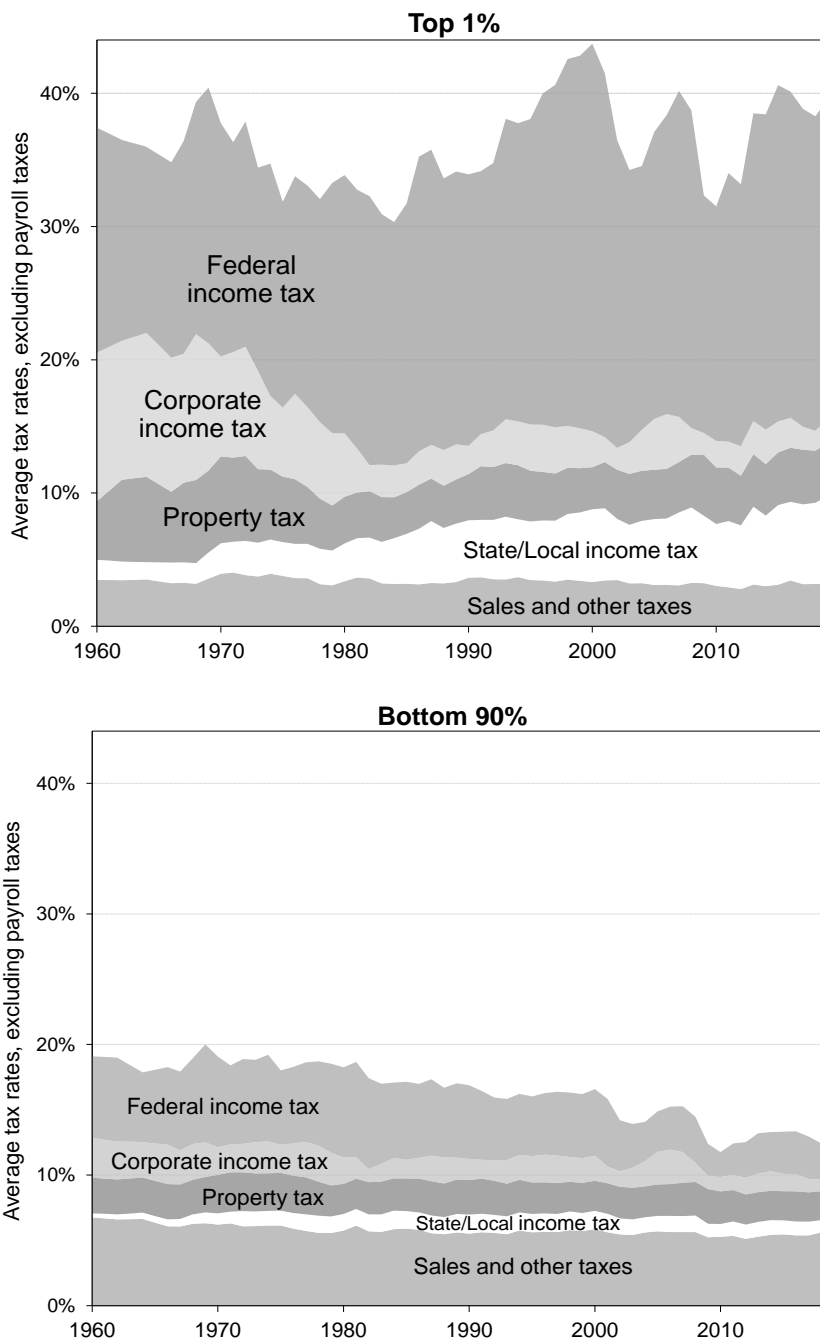
Top 1%

Bottom 90%

Figure B15: Taxes rates by source, excluding payroll taxes, 1960–2019

Notes: Tax rates are average effective tax rates, i.e., group-level taxes excluding payroll taxes divided by the pre-tax income plus transfers measure. Payroll-tax-inclusive tax rates are shown above and in the main paper. Income groups are defined using pre-tax income plus transfers. *Sources:* Authors' calculations.
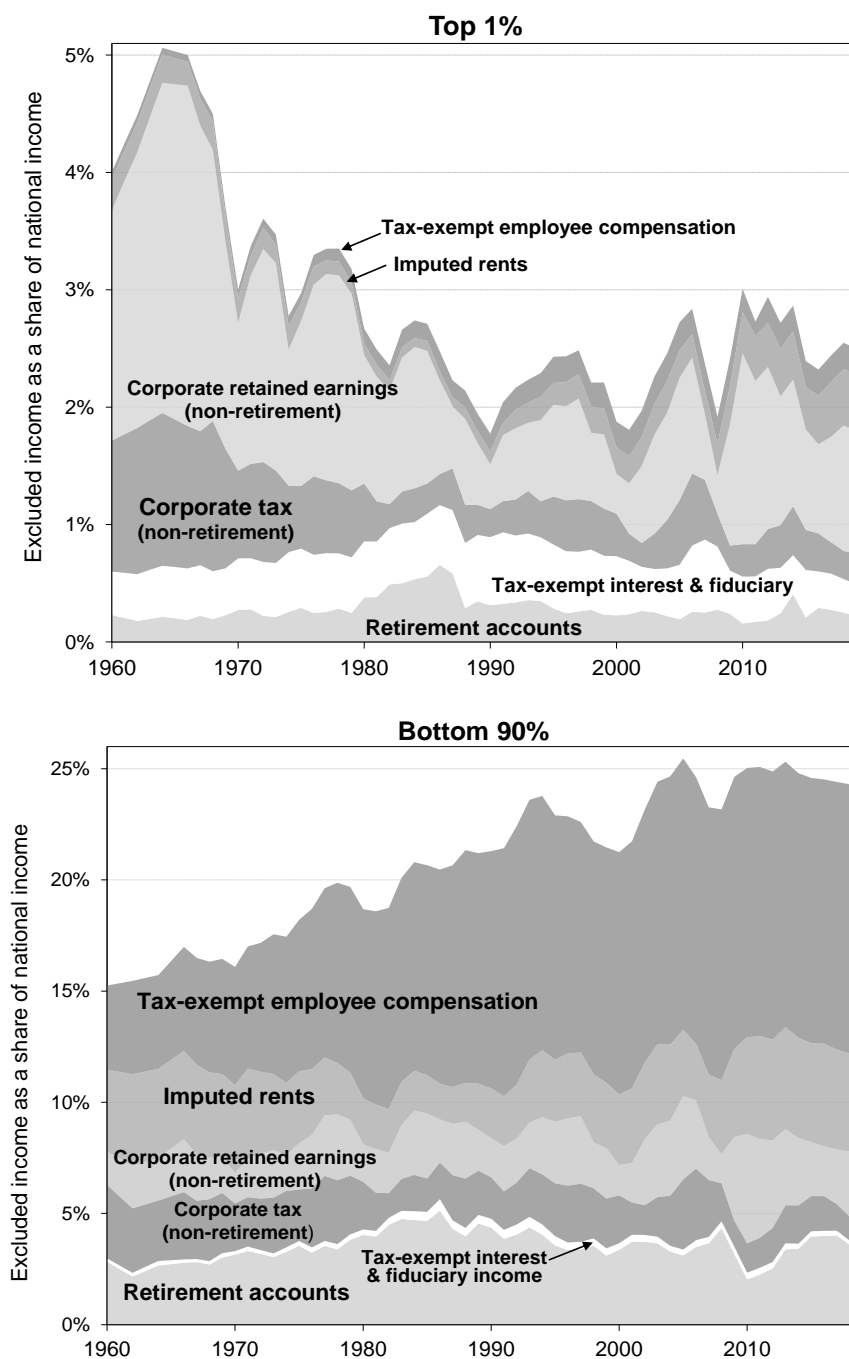
Figure B16: Distribution of income sources excluded from fiscal income, 1960–2019

Notes: Includes income sources excluded from fiscal income but included in pre-tax national income: imputed rents, tax-exempt interest, undistributed fiduciary income, retirement investment income, corporate retained earnings and taxes, and tax-exempt employee compensation (FSA contributions and employer-paid health insurance and taxes). Excludes adjustments and other income effects.
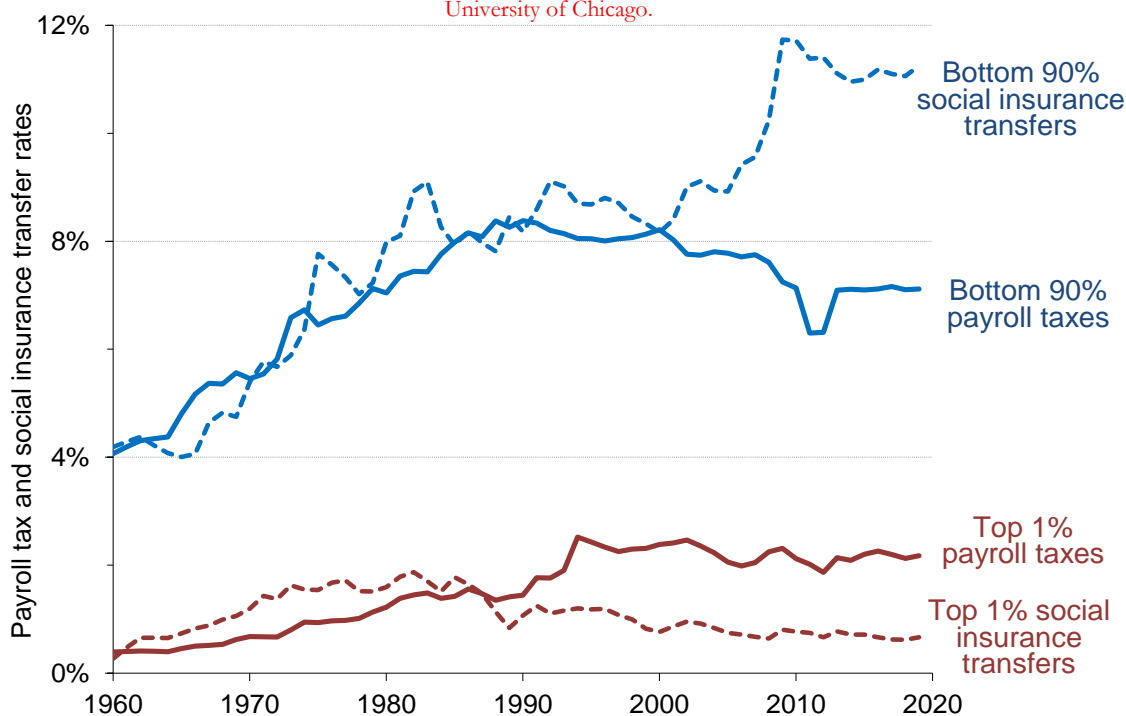
Sources: Authors' calculations.

Figure B17: Payroll tax and social insurance transfer rates, 1960–2019

*Note*s: 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.

DISCUSSION: 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.[72]

The distributional asymmetry of social insurance transfers and associated payroll taxes suggests they should be considered jointly, as in Figure B17. 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.

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[72] 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.
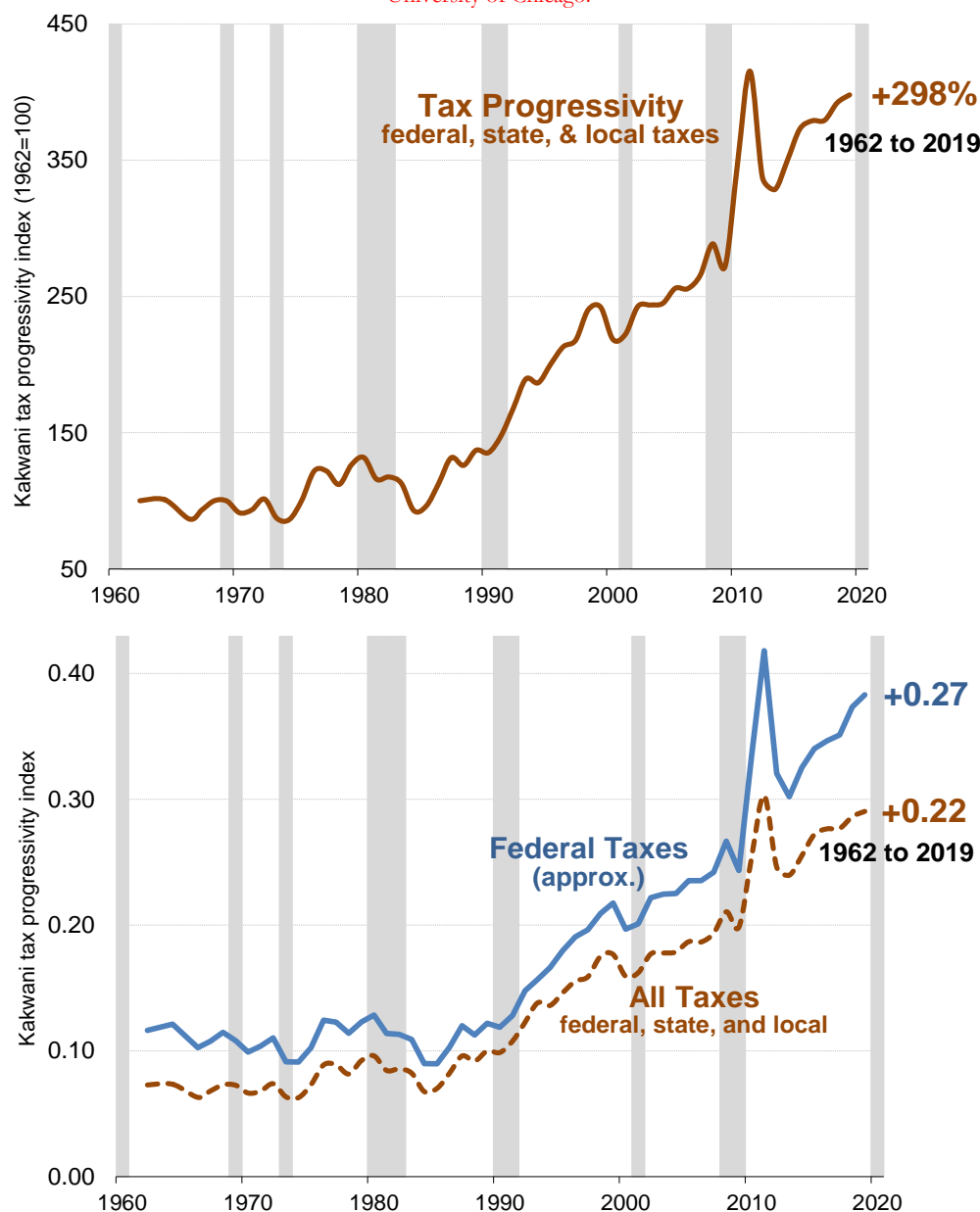
Figure B18: Increase in tax progressivity (Kakwani index), 1962–2019

Notes: Years are shaded if a recession occurs during at least one quarter. The Kakwani index is the difference between the tax concentration index and the pre-tax plus transfers Gini index (for details, see Splinter 2020). Federal taxes are approximate because they include all corporate, estate, and payroll taxes (i.e., some non-federal taxes). Fleck et al. (2021) estimate that state and local taxes (excluding corporate and estate taxes) are about proportional to income. Tax progressivity increased more when the sharing unit is tax units (shown here) than households (e.g., CBO estimates) because increases in tax credits are better targeted at low-income tax units (see Larrimore, Mortenson, and Splinter 2021).

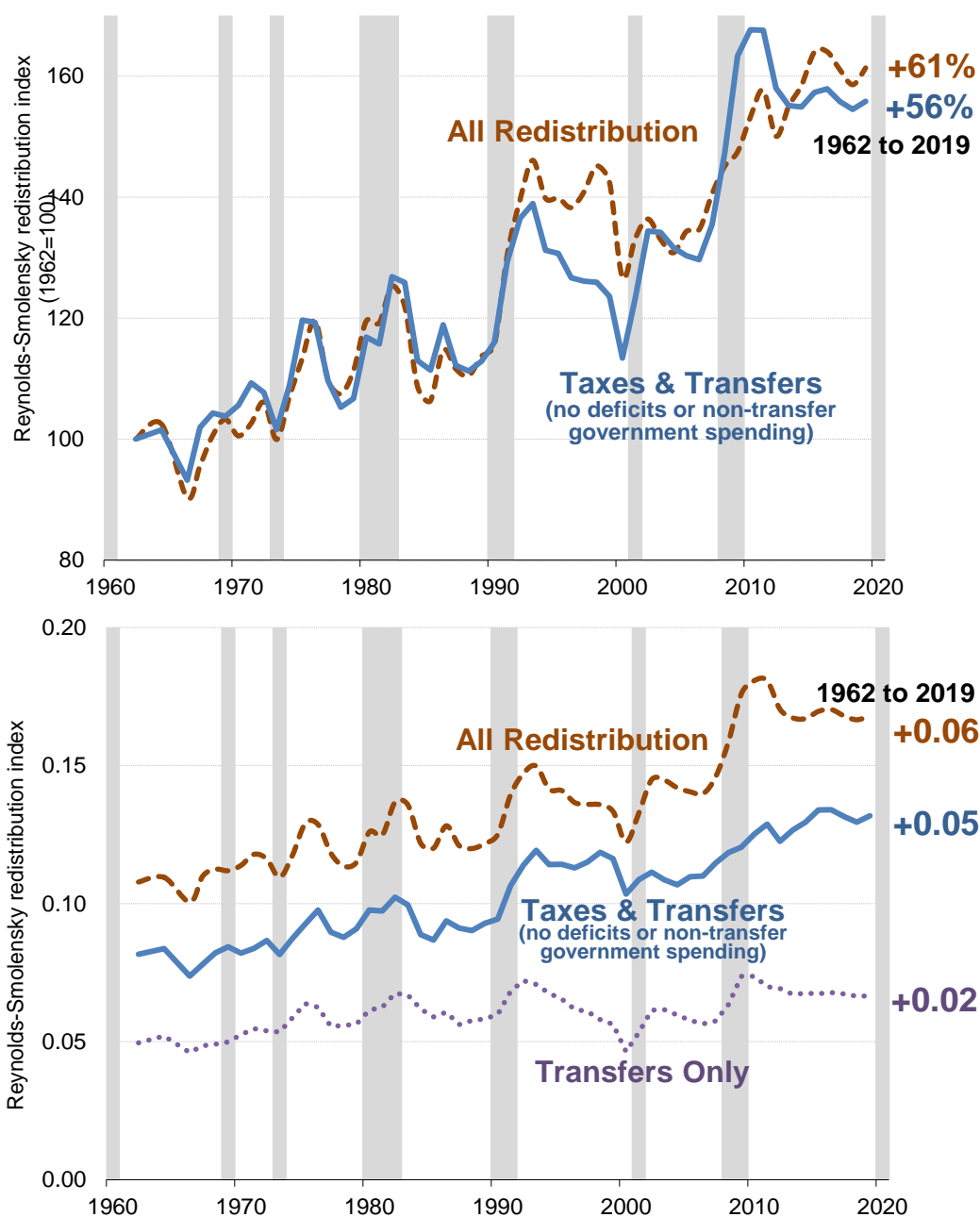*Sources:* Authors' calculations and NBER for recessions.

Figure B19: Increase in redistribution (Reynolds–Smolensky index), 1962–2019

Notes: Years are shaded if a recession occurs during at least one quarter. The Reynolds–Smolensky index is the difference between the pre-tax Gini index and the after-tax income concentration index (for more details, see Splinter 2020). Redistribution tends to increase over the short-term during recessions. The 59% increase in all redistribution from 1962 to 2019 is one-half from increased transfers, one-third from more redistributive taxes, and one-fifth from deficits/non-transfer government spending.
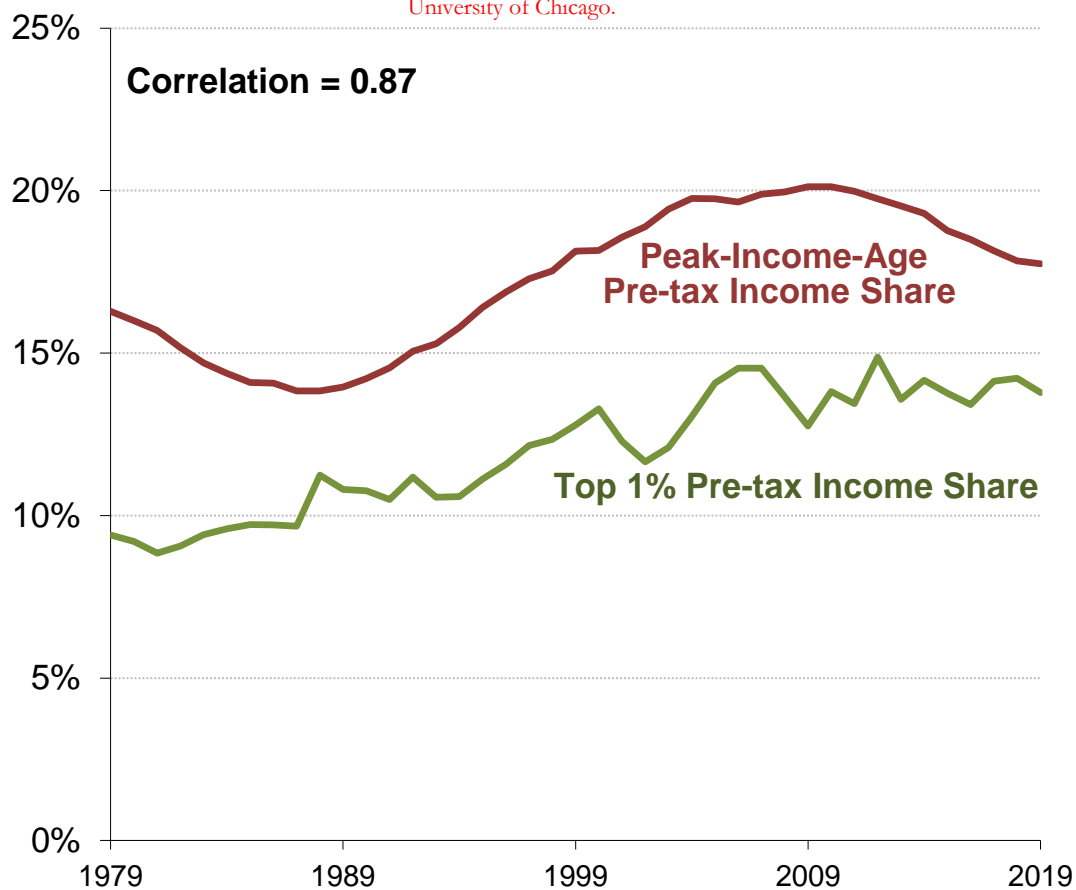
Sources: Authors' calculations.

Figure B20: Correlation of pre-tax income shares of peak-income-ages (48-57 years old) and top 1%
Sources: Authors' calculations.