Top 1% Income Shares: Comparing Estimates Using Tax Data

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Many studies have used individual tax return data to estimate top income shares in the United States, including a seminal study by Piketty and Saez (2003, hereafter PS). While tax data provides better measures of top incomes than surveys, it misses important sources of income. Some studies have explored ways to incorporate the missing income. But this has resulted in widely divergent results. Such differences highlight the sensitivity of results to choices about which missing income sources to include, about the unit of observation, and about how missing income is allocated. Thus, the use of tax return data can lead to distorted estimates of inequality trends if researchers are not careful.

Tax returns miss a considerable amount of personal and national income, including underreported income and employer provided insurance benefits. Tax reforms, especially the Tax Reform Act of 1986, have significantly changed the rules and incentives for realizing and reporting income. Using tax units as the unit of observation, as in PS, also has limitations. Marriage rates have declined over time, except for those at the top of the income distribution. As a result, basing income groups on tax units rather than adults or all individuals mechanically increases top income shares.

This paper examines how these issues are addressed by Congressional Budget Office (2018, hereafter CBO) and a version of Auten and Splinter (2018, hereafter AS), and briefly discusses Piketty, Saez, and Zucman (2018).

I. Comparing Top 1% Series

Figure 1 shows three estimates of top 1% pre-tax income shares: PS fiscal income including capital gains, CBO pre-tax and transfers (since 1979), and AS pre-tax national income plus social insurance benefits. Levels and trends of the top 1% income shares diverge sharply among these measures. While PS estimated the top 1% share increased by 12 percentage points since 1979, CBO and AS estimated much smaller increases of 8 and 4 percentage points (Table 1). Estimated levels also diverge substantially in recent decades. In 2014, top 1% shares are 21.5 for PS, 16.7 for CBO, and 13.1 for AS. What explains these large differences?
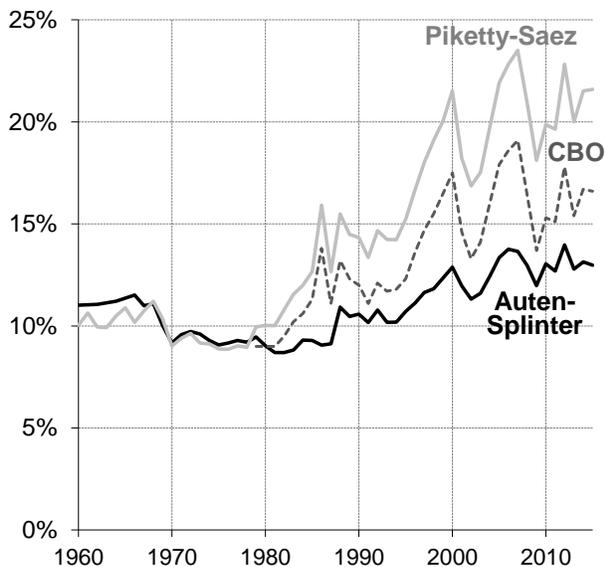
FIGURE 1. TOP 1% PRE-TAX INCOME SHARES

TABLE 1— TOP 1% PRE-TAX INCOME SHARES AND CHANGES

	1960	1979	2014	1960–2014 Change	1979–2014 Change
PS	10.0	10.0	21.5	11.5	11.6
CBO	---	9.0	16.7	---	7.7
AS	11.0	9.5	13.1	2.1	3.7

Notes: PS and CBO incomes include capital gains. AS income excludes capital gains and includes corporate retained earnings.
Source: PS (2003 and updates), CBO (2018), and authors' calculations.

II. Explaining Differences in Top 1% Series

To explore the reasons for these differences we start with PS *fiscal income*—adjusted gross income (AGI) less Social Security and unemployment compensation—and make step-by-step changes to replicate the top 1% for the CBO and AS estimates (Table 2). This decomposition allows for a simple explanation of how alternative approaches affect estimates of top income shares. Note that because these changes stack one after another, the effect on top shares may be sensitive to the order of changes.

A. CBO Top 1% Shares

To move from fiscal income to the CBO approach, we first change from the PS grouping by tax units to the CBO approach of grouping by the number of individuals. That is, each percentile has an equal number of individuals instead of an equal number of tax units, which have varying numbers of individuals across income groups. We also change from PS ranking by tax unit income to CBO ranking by size-adjusted income, which divides income by the square-root of household size but only for ranking purposes. These changes adjust for two major social changes: falling marriage rates outside the top of the income distribution and the increase in single-parent households. To approximate CBO's use of synthetic households, we remove filers under age 20 (and increase the number of non-filing tax units by an equal number) and for ranking purposes account for the difference between top 1% tax unit and household sizes. In 1979 and 2014, these adjustments reduce top 1% shares by 0.9 and 2.8 percentage points (pp). The smaller effect in 1979 is because marriage rates were more similar across the income distribution than in recent years. The 2014 estimate is similar to the 2.4 pp reduction for 2010 found by Bricker et al. (2016b) when changing from tax units to families in the Survey of Consumer Finances.

The addition of social insurance benefits and employer contributions also results in larger reductions in top 1% shares over time. CBO adds Social Security benefits, unemployment and workers' compensation, and Medicare benefits, which reduces the top 1% share by 0.6 and 2.0 pp in 1979 and 2014. Adding employer contributions for health insurance reduces top 1% shares by 0.3 and 0.6 pp in 1979 and 2014.

The CBO inclusion of corporate income taxes adds nearly a full percentage point to the top 1% share in both 1979 and 2014. These large effects are primarily the result of CBO allocating 75 percent of the burden by capital income as reported on individual tax returns and 25 percent by wages. This is partly offset by adding employer payroll taxes that fund social insurance benefits.

The addition of employee contributions to deferred compensation plans reduces the top share by 0.2 pp in 2014. Finally, there are small and largely offsetting effects from adding tax-exempt interest and removing state and local tax refunds from the prior year, which are included in AGI but are adjustments to prior year itemized deductions rather than income.

In summary, over half of the –5.1 pp change in the 2014 top 1% share from fiscal income to the CBO approach is from grouping by individuals and ranking by size-adjusted income. Most of the remaining difference is

from adding social insurance benefits and employer-sponsored insurance. The CBO estimate of the 1979–2014 change in the top 1% share is about 30 percent less (4 pp) than the PS estimate.

TABLE 2— TOP 1% PRE-TAX INCOME SHARES, 2014: MOVING FROM FISCAL INCOME TO EXPANDED INCOME DEFINITIONS

	CBO		Auten-Splinter	
	1979	2014	1979	2014
Panel A: Summary of changes				
Fiscal income with cap. gains	9.9	21.8	9.9	21.8
Total changes (see Panel B)	–0.9	–5.1	–0.4	–8.7
Expanded income definitions	9.0	16.7	9.5	13.1
Panel B: Changes from fiscal income				
Unit of observation & sample	–0.9	–2.8	–0.9	–2.2
+ social insurance benefits	–0.6	–2.0	–0.7	–2.4
+ employer-sponsored insur.	–0.3	–0.6	–0.3	–1.0
+ corporate income taxes	0.8	0.9	0.4	0.2
+ payroll & other taxes	–0.2	–0.5	–0.4	–0.9
+ private retirement income	---	–0.2	–0.1	–0.1
+ income corrections	0.3	0.1	1.0	*
+ underreported income	---	---	0.8	–0.3
+ imputed rent	---	---	–0.1	–0.1
– realized capital gains	---	---	–1.3	–2.4
+ corporate retained earnings	---	---	1.2	0.5

*Notes: * denotes changes less than 0.05 percentage point and --- denotes no adjustment made.*
Source: Authors' calculations using tax return data.

B. Auten-Splinter Top 1% Shares

Compared to CBO, the AS approach makes additional adjustments and some different allocation assumptions. While both AS and CBO define groups by individuals and rank by size-adjusted income, AS use tax unit size rather than household size for ranking purposes. In 2014, this reduces the top 1% income share by 2.2 pp relative to PS fiscal income, a smaller effect than CBO's approach.

The addition of social insurance benefits reduces in the top 1% share by 0.7 and 2.4 pp

in 1979 and 2014. Adding employer-sponsored insurance reduces the top 1% share by 0.3 and 1.0 pp in 1979 and 2014. These are both larger than CBO estimates, which exclude social insurance benefits of the institutionalized population and the employee portion of pre-tax contributions for insurance.

The addition of corporate income taxes increases the top 1% share by 0.4 and 0.2 pp in 1979 and 2014, a much smaller effect than in the CBO estimates. The primary reason for this is that AS allocate a share of the capital income component of the corporate tax burden to retirement account owners. Between 1960 and 2015, retirement account holdings increased from 4 to 50 percent of corporate ownership. CBO allocates the capital income component only by the more highly concentrated taxable capital income reported on tax returns.

While both AS and CBO include taxable retirement income, AS also include non-taxable income accrued inside retirement accounts, while CBO includes contributions to retirement accounts. AS also correct for several important issues in how income is reported on tax returns. For example, AS add back deductions for prior year net operating losses that do not reflect current year income and account for gambling losses because gambling winnings are in AGI but losses are only an itemized deduction. The AS online appendix discusses details about these and other allocations.

Additional adjustments are made to conform to national income totals. Underreported income—the gap between income reported in tax data and national income totals—is allocated based on underreporting rates by reported income class in IRS audit data (Johns and Slemrod, 2010) with 15% allocated to non-filers. Realized capital gains reported on tax returns are replaced by corporate retained earnings, which are less volatile and roughly account for the same amount of income over time, but more equally distributed because of allocations to non-taxable retirement accounts.

In 2014, AS top 1% income shares are –3.6 pp lower than CBO estimates. This results from a –0.7 pp difference from expanded social insurance benefits and employer-sponsored insurance, –0.7 pp from different corporate tax allocations, –0.5 pp from including state and local taxes, –0.4 pp from including underreported income and imputed rents, and –1.8 pp from replacing realized capital gains with retained earnings. These effects are offset by a +0.7 pp difference in size-adjusting.

Our adjustments to account for the effects of the Tax Reform Act of 1986 are included in these differences. While top 1% fiscal income shares increased by 3.6 pp between 1985 and 1989, our tax reform adjustments offset 1.3 pp

of this increase. These adjustments include accounting for the reduction in business losses from tax shelters, the dramatic increase in young dependent filers, and the shift from C corporations to pass-through businesses that reduced corporate retained earnings (Auten, Splinter, and Nelson, 2016).

C. Piketty-Saez-Zucman Top 1% Shares

Piketty, Saez, and Zucman (2018, hereafter PSZ) is based on the concept of distributing total national income. As compared to PS (2003), their new paper makes a number of improvements: a broader measure of income and basing income groups on adults age 20 and over, which accounts for declining marriage rates over time (but not the increase in single-parent households). PSZ estimate that the top 1% share increased by 9.0 pp between 1979 and 2014, from 11.2 to 20.2 percent. Relative to PS, these estimates suggest only a slightly smaller increase over this period and share in 2014, and are much larger than CBO's and our estimates, as well as other researchers considering expanded income definitions.[1]

Our current research is investigating the reasons for these differences. A key issue is that a large fraction of national income cannot be observed directly in tax data and must therefore be imputed. Our initial results suggest that top income estimates can be highly sensitive to assumptions about how to allocate this missing income. One important factor is the PSZ allocation of underreported business income only by positive reported business income and none to returns with business losses, rather than on the basis of IRS detailed audit data.

The PSZ data are the basis for U.S. income in the World Wealth and Income Database (WID.world), which is intended to allow researchers to make more accurate comparisons of income levels and distributions between countries and over time. Because of concerns about some of the assumptions behind the U.S. data, we hope that improvements can be made to this important new database.

III. Conclusions

This paper compares three estimates of top 1% pre-tax income shares based on tax returns. Starting from PS fiscal income, we show step-by-step the changes needed to replicate CBO estimates and to compute our estimates of top 1% shares. This shows which factors are most important in explaining the widely different results.

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[1] For example, Burkhauser, et al. (2012). Fixler and Johnson (2017) do not estimate top 1% shares, but their results based on allocating personal income also imply lower levels of inequality and a smaller increase over time than PS and PSZ.

Defining income groups in a way that accounts for declining marriage rates and increased single-parent households has one of the greatest effects. Changing from tax units as in PS to individuals, as well as ranking by size-adjusted household incomes, as in CBO reduces the top 1% share by 2.8 pp in 2014. When using individuals to define income groups, but tax units instead of households for size adjustments, AS estimate a reduction of only 2.2 pp.

Incorporating income missing from tax returns generally reduces top income shares in recent decades. In 2014, adding social insurance benefits reduces the top 1% share estimate by CBO and AS by 2.6 and 3.4 pp, respectively. In 1979, it only reduces them by about 1 pp in both studies.

The sensitivity of results to differences in which income sources are included and how they are allocated is illustrated by the choice between using realized capital gains and corporate retained earnings. CBO and PS include realized capital gains results in top 1% shares that are almost 2 pp larger in 2014 than when replacing capital gains with corporate retained earnings, as in AS and PSZ. Assumptions about allocating underreported income explain a similar difference between AS and PSZ estimates.

Other studies have also found lower levels and smaller increases in top income shares in recent decades. Bricker et al. (2016a) found that the top 1% share increased only 3 pp between 1988 and 2012 using the Survey of Consumer Finance, which oversamples high-income families. Burkhauser et al. (2012) estimated an increase of only 2 pp between 1967 and 2004 using internal Census data to address issues with top-coding.

Different measures of top incomes also have large impacts on changes in top tax burdens and the distribution of economic growth. For example, AS (2018) estimate that despite the top individual tax rate decreasing from 91 to 39.6 percent, top 1% effective tax rates have fluctuated around 40 percent since 1960. This is largely due to accounting for sheltered income in earlier decades.

This paper examines the sensitivity of estimated top income shares to researchers' choices about which sources of income to include, how to allocate income missing from tax returns, and how to account for changes in family structure and changes in tax laws. Our estimates suggest that careful accounting for these factors results in estimates of top income shares that show significantly lower levels and smaller increases.

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Online Appendix

This online appendix provides additional details of the changes needed to move from tax return based fiscal income definitions to expanded income definitions in order to compare top 1% income share estimates for Piketty and Saez (2003 and on-line updates, hereafter PS), the Congressional Budget Office (2018, hereafter CBO) and our approaches.

I. Piketty-Saez Fiscal Income

The baseline population for PS is the estimated number of tax units the U.S. Census resident population age 20 and over. The number of non-filer tax units is the difference between the number of filed tax returns and the estimated total. Tax units include all individuals on a tax return, or who would file together in the case of non-filers. Tax units can differ from Census households. For example, some households have multiple tax units

The income definition (called market income by PS and fiscal income in Piketty, Saez, and Zucman (2018) and in our paper) equals Adjusted Gross Income (AGI) less Social Security benefits and unemployment compensation included in AGI. To account for repeal of the capital gains exclusion in 1987 and non-filers, fiscal income includes capital gains excluded from AGI before 1987 and non-filer income. PS assumes that non-filer income is 20% of the average income of filers. Tabulations of key information returns for non-filers age 20-99 suggest that 20% is a conservative but reasonable assumption for this definition of income. We follow that assumption here as well as in AS (2018)

The estimates of fiscal income reflect our replication of the methodology of PS and therefore can differ by small amounts. The primary example is that PS estimates after 2001 are based on IRS published summary data, while our estimates are based on the internal data files corrected by dropping duplicate returns, some of which have very high incomes. For example, in 1979 and 2014, the most recent PS estimates of top 1% shares are 9.96 and 21.52 and our replications are 9.95 and 21.82. The 2014 estimates differ slightly because PS use Pareto interpolations of summary data, whereas we use microdata.

Limitations of the PS approach include:
- Fiscal income excludes important income sources (Social Security and other social insurance benefits and income accrued inside corporations) and the ratio of fiscal income to national income has declined over time to about 60% in recent years.
- The income reported on individual income tax returns has changed over time due to statutory changes in tax laws and changes in incentives to report income (especially the Tax Reform Act of 1986 and the Economic Recovery Tax Act of 1981).
- A number of tax unit issues tend to overstate top income shares. There are many more tax units than there are households and as much of 10 percent of filed returns are not in the baseline tax unit population (under age 20, and non-resident filers). Some married couples file separate tax returns, but are counted as only one tax unit in the baseline population. While most dependent filers are under age 20, several million are full-time students deriving over half their support from their parents or guardian who claim a personal exemption for them. These dependent filers are also being treated in PS as if they were independent economic units with very low incomes.

II. CBO Income

CBO adds a number of income sources to fiscal income (including capital gains) to estimate pre-tax/pre-transfer income. For our CBO replication, we match these totals for each source. Table A1 shows the 2014 totals of these sources, as well as the share of each earned by the top 1%, as estimated by CBO. Note that these totals are less than the national income totals used by AS. This is because CBO focuses on federal taxes (excluding state and local taxes, such as sales and property taxes) and limits their sample to the civilian non-institutional population, which appears to reduce Social Security and Medicare benefits by about 10 percent in recent years.

Table A1 also shows that only 8.8 percent of these additional income sources are earned by the top 1%, significantly less than the 21.8 percent of fiscal income earned by the top 1%. Therefore, adding these more equally distributed sources tends to lower top income shares. To allocate these additional income sources to tax returns and non-filers, we generally follow AS allocation approaches, although the allocation of corporate tax differs significantly.

While both CBO and AS allocate 25 percent of the corporate tax by wages, AS allocate a share of the non-wage component (i.e., the capital component) of the corporate tax to the owners of retirement accounts. Between 1960 and 2015, this share increased from 4 to 50 percent of corporate ownership. CBO allocates the entire non-wage component by the more highly concentrated taxable capital income reported on individual tax returns

To more closely approximate the household-based CBO approach, we need to make a number of adjustments to the tax unit-based sample. CBO creates synthetic households by statistically merging tax returns and non-filers based on CPS data. This accounts for households containing multiple tax units. For the sample correction step, we remove filers younger than 20 years old (and increase the number of non-filing tax units an equal amount), rather than also removing older dependent filers or non-resident filers, as in AS. These older dependent filers are primarily full-time students age 20 to 23. Census may count such students as separate households in some cases but not others. Such issues complicate distribution estimates and comparisons among studies. AS (2018) drop such dependent filers from the sample but include their income in returns claiming dependents. In addition, we reduce the number of non-filing adults by the institutional population (following the Census estimate of 4 million in 2014) to account for the CBO sample being limited to the civilian non-institutional population. The institutional population includes the prison population and individuals residing in retirement homes, of which there were far fewer in earlier decades so this adjustment is not made for 1979. The estimated CBO non-filer income may also differ from the Piketty and Saez (2003) assumption of 20% of average filer income, but we do not make an adjustment for this possibility.

For the purposes of ranking only, we account for top households having larger household sizes than tax unit sizes. We increase the number of individuals in top tax units, following the estimates Larrimore, Mortenson, and Splinter (2017): 22 percent of top 1% households have one additional tax unit (i.e., the household consists of two or more tax units), 10 percent have two more tax units, and 6 percent have three more tax units. These adjustments are not made in 1979 because high-income tax units and households should have been much more similar in earlier decades, in part because of the much lower prevalence of cohabitation. Note that this approach will only provide an approximation of the CBO household-based approach for top 1% income shares and further adjustments would be needed to consider the rest of the income distribution.

III. Auten-Splinter Income

The Auten-Splinter income series shown in this paper is the Auten and Splinter (2018) definition of pre-tax national income plus social insurance benefits (Social Security, including disability insurance, unemployment insurance, and Medicare). Note that Auten and Splinter (2018) pre-tax national income excludes transfers so as to be more consistent with the definition of national income. As a result, the total of the modified income definition used in this paper exceeds national income, but more closely matches the CBO definition of including both payroll taxes (including the employer share) and benefits. The addition of social insurance benefits is important because instead of many retirees having little income, as in the Auten and Splinter pre-tax national income-based definition, their Social Security benefits are included in the income definition used in the current paper.

Medicare benefits are based on allocating national income totals. A tenth of benefits is allocated to non-filers and remaining amounts to filers, with a share proportional to the number of adult individual tax filers aged 65 or older and with wages below $150,000 (2015 dollars and indexed), assuming that if the primary filer is aged 65 or older then the secondary is also. The wage limitation is intended to account for the fact high wage-earners over age 65 are likely to be receiving health insurance through their employers. We subtract Medicare premium payments based on totals from Medicare Trustees Reports. We allocate Part D premiums and Part B premiums before 2007 proportionally to Medicare benefits. CBO makes similar adjustments in all years of their estimates. Since 2007, however, we add an additional step of allocating Part B premiums according to AGI-based progressive rates (and allocate only 7 percent, rather than 10 percent to non-filers).

This paper incorporates adjustments that account for technical features of how income is reported on tax returns. These include:

- Net operating loss carryover deductions are added back because these reflect prior year rather than current year income.
- Tax exempt interest and exempt combat pay are added to income.
- Itemized deductions for gambling losses are subtracted up to the amount of gambling winnings included in other income.
- State and local tax refunds included in AGI are subtracted because these are an adjustment for claiming too large a deduction in the prior year rather than income.
- Ordinary gains reported on Form 1040 are treated the same as Schedule D capital gains because tax reforms such as increasing the recapture of depreciation deductions changed previous capital gains into ordinary income. Tax reforms also tightened the rules for deducting losses.
- To account for the effects of the Tax Reform Act of 1986, post-TRA treatment of losses is imposed on income prior to 1987 by limiting business losses to post-TRA levels. Prior to 1987, excluded dividends and capital gains are added to income.

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Table A1: CBO additional income totals, 2014 (millions of dollars)

	NIPA	CBO		
	Totals	Total	Top 1% total	Top 1% Share
Employee cont. to deferred comp. plans	---	261,215	14,305	5.5
Contributions to health insurance	754,366	435,358	9,080	2.1
Employer payroll taxes	547,972	460,236	17,539	3.8
Corporate taxes	408,416	335,848	161,953	48.2
Tax-exempt interest	62,103	62,194	33,087	53.2
Social Security benefits	846,595	771,206	7,588	1.0
Medicare benefits	600,907	447,797	3,980	0.9
Unemployment insurance benefits	35,449	37,316	124	0.3
Workers' compensation	---	12,439	124	1.0
Total		**2,823,608**	**247,781**	**8.8**

Notes: NIPA totals only show sources added to the Auten-Splinter income definition. Underlying CBO values are rounded to the nearest hundred dollar per household amount.
Sources: U.S. Bureau of Economic Analysis, Congressional Budget Office (2018) supplemental data, and authors' calculations.