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ABSTRACT

Recent studies argue that US inequality has increased less than previously thought, in particular due to a more modest rise of wealth and capital income at the top (Smith et al., 2019; Smith, Zidar and Zwick, 2020; Auten and Splinter, 2019). We examine the claims made in these papers point by point, separating genuine improvements from arguments that do not appear to us well grounded empirically or conceptually. Taking stock of this body of work, and factoring in other improvements, we provide a comprehensive update of our estimates of US income and wealth inequality. Although some of the points raised by the revisionists are valuable, the core quantitative findings of this literature do not appear to be supported by the data. The low capital share of private business income estimated in Smith et al. (2019) is not consistent with the large capital stock of these businesses. In Smith, Zidar and Zwick (2020), the interest rate assigned to the wealthy is higher than in the datasets where both income and wealth can be observed, leading to downward biased top wealth shares; capitalizing equities using almost only dividends dramatically underestimates the wealth of billionaires relative to the Forbes 400. In Auten and Splinter (2019), business profits earned by the top 1% but not taxable (due in particular to generous depreciation rules) are classified as tax evasion; tax evasion is then allocated to the bottom 99% based on an erroneous reading of random audit data. Our revised series show a rise of inequality similar to Saez and Zucman (2016) and Piketty, Saez, and Zucman (2018) while allowing for a more granular depiction of the composition of wealth and income at the top.

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1 Introduction

By how much has inequality increased in the United States? And what is the contribution of capital to the dynamic of top-end inequality? A recent series of studies argues that inequality has increased less than previously thought, in particular due to a more modest increase of wealth and capital income at the top. Smith, Zidar and Zwick (2020) write that the rise of the top 0.1% share of wealth is "half as large as prior estimates." Classifying "three-quarters of pass-through profit as human capital income," Smith, Yagan, Zidar, and Smith (2019) find that labor income is more prevalent at the top than in the estimates of Piketty, Saez and Zucman (2018). Auten and Splinter (2019) argue that the top 1% income share has not increased at all on a post-tax basis since the 1960s.

This paper makes two contributions. First, we examine the claims made in these papers point by point, separating genuine improvements from arguments that do not appear well-grounded empirically or conceptually. Second, taking stock of this body of work, and factoring in numerous other improvements, we update our estimates of US income and wealth inequality. In so doing, we provide a comprehensive reconciliation between the revisionists and the findings in Saez and Zucman (2016) and Piketty, Saez and Zucman (2018).

Empirically, we draw on all available public data sources about income and wealth in the United States, including new sources which had not been exploited before in this context, such as business income statements and balance sheets, and foundation tax returns. Conceptually, we clarify key aspects of the methodology involved in distributing the totality of household wealth and national income, what we call distributional national accounts. In particular, building on the heterogeneous returns model in Saez and Zucman (2016, Section IV), we discuss how the capitalization method should be applied to estimate wealth from reported income when rates of return are heterogeneous within an asset class. Building on the prototype distributional national accounts of Piketty, Saez and Zucman (2018), we discuss the sources of the gap between taxable business income and the true economic income of businesses, and how this gap should be allocated.

Our main findings can be summarized as follows. Although some of the points raised by the revisionists are valuable, the core quantitative findings of this literature are not supported by the data. First, the low capital share of private business income estimated in Smith et al. (2019) is not consistent with the large capital stock of these businesses. Classifying 25% of pass-through business income as deriving from capital income implies an implausibly low rate of return to capital in these businesses, especially in large firms. Second, in Smith, Zidar and Zwick (2020),

the interest rate assigned to the wealthy is higher than in the datasets where both income and wealth can be observed, leading to downward biased top wealth shares. Moreover, equities are capitalized using almost only dividends, which dramatically underestimates the wealth of billionaires relative to the Forbes 400 list. Last, in Auten and Splinter (2019), business profits earned by the top 1% but not taxable (due in particular to increasingly generous depreciation rules) are classified as tax evasion; tax evasion is then allocated to the bottom 99% based on an erroneous reading of random audit data.

There are also well-founded results in the studies we consider. Smith, Yagan, Zidar, and Zwick (2019) show that not 100% of S-corporation profits should be seen as capital income, as is standard practice (e.g., in the official national accounts). Smith, Zidar and Zwick (2019) provide evidence that business wealth is more important at the top than estimated in Saez and Zucman (2016), in particular because the official Financial Accounts estimates of private business wealth are conservative. Auten and Splinter (2019) raise a valuable point about the allocation of untaxed pension income.

Taking stock of these findings, and factoring in many other improvements—reflecting newly available or updated source data, improved estimation procedures, and a greater harmonization of methods across countries (Alvaredo et al. 2020)—we provide a comprehensive revision of our estimates of the distribution of US income, wealth, taxes, and government spending. Our revised series show a rise of inequality similar to Saez and Zucman (2016) and Piketty, Saez, and Zucman (2018), while allowing for a more granular depiction of the composition of wealth and income at the top. Figure 1 compares our revised estimate of the 0.1% wealth share to the original series printed in Saez and Zucman (2016). Figure 2 compares our revised estimate of the top 1% share of pre-tax national income to the original series printed in Piketty, Saez and Zucman (2018). The top 1% pre-tax income share has increased by 8.5 points from 1978 to 2014 (the last year printed in Piketty, Saez and Zucman, 2018), as opposed to 9.4 points in the original printed series. Since all our estimates are anchored to the official national account totals, differences between the revised and original series reflect in part (especially for recent years) the effect of revisions that have been made to the national accounts themselves—such as the 2020 comprehensive revision of the National Income and Product Accounts (Bureau of Economic Analysis, 2020) and a recent increase in the estimate of the value of real estate in the Financial Accounts (Gallin et al. 2019). Other differences reflect methodological improvements, as documented point by point in the last section of this paper. As shown in Figures 1 and 2, the original and revised series track each other closely.

The three most notable differences are the following. First, our revised wealth series incorpo-

rate a higher interest rate for the wealthy than for the average household since 2008, consistent with the evidence from matched estates-income tax data from 1997 to 2012 analyzed in Saez and Zucman (2016) and extended to 2016 in Smith, Zidar and Zwick (2019). As a result, in our revised series interest-bearing assets play a smaller role in the portfolios of the rich than previously reported. Interest-bearing assets account for 25% of the wealth of the top 1% in 2018, consistent with the asset composition seen in the official Federal Reserve Distributional Financial Accounts. Second, private business assets play a more prominent role at the top, following new estimates in Saez and Zucman (2020) of the labor/capital split of business income. This revision also improves consistency with official Federal Reserve data from the Survey of Consumer Finances. Last, our revised income series include an improved allocation of untaxed pension income, leading to less pension income going to the top 1%.

Two active areas of research—and sources of potential future revisions—deserve to be noted. First, in the Financial Accounts to which our wealth estimates are anchored, the valuation of private business wealth is conservative. If and when the Federal Reserve upgrades its estimates of business wealth, and since this form of wealth is highly concentrated, our top wealth shares will rise. Second, in the national income and product accounts, tax evasion is included on the basis of random individual income tax audits. Random audits, however, are currently not designed to detect tax evasion occurring in pass-through businesses and via foreign legal and financial intermediaries. Recent work suggests that incorporating these forms of evasion is important to improve the accuracy of tax gap and income distribution estimates (Alstadsæter et al., 2019; Guyton et al., 2020). For these reasons, our updated inequality estimates should also be seen as conservative.

More broadly, we stress the need for more and improved public statistics on inequality. We could and should do better to measure US wealth inequality than rely on a triennial survey of 6,200 families (the Survey of Consumer Finances) or indirectly infer asset ownership based on income flows (the capitalization method). There is a growing gap between the richness of individual data collected by corporations (such as Google, Facebook, Visa or Mastercard) for private commercial purposes and the paucity of what is available to governments for public statistical purposes. A merit of a well-administered wealth tax is that it would provide better information on the distribution of wealth, one of the most hotly debated issue in democratic societies (Saez and Zucman, 2019). Even without a wealth tax, the tax administration could collect information on assets and debts from third parties (banks, pension funds, brokers, etc.), as is already done for income, and ownership of closely held corporations. These data could be used to estimate individual wealth—as done in a country like Denmark—and allow for the

construction of more accurate Distributional National Accounts.

The rest of this paper proceeds as follows. Section 2 discusses the wealth inequality estimates of Smith, Zidar and Zwick (2020). Section 3 discusses the income inequality estimates of Auten and Splinter (2019). Section 4 discusses the capital vs. labor income share estimates of Smith et al. (2019). In Section 5, we present our revised series of wealth and income inequality. These updated series are posted online, along with the list of improvements implemented since the publication of the original Saez and Zucman (2016) and Piketty, Saez and Zucman (2018) series. Section 6 draws some conclusion from our experience responding to these studies.

2 Estimating Wealth Inequality By Capitalizing Income

Smith, Zidar and Zwick (2020),[1] henceforth SZZ, present estimates of US wealth inequality using the same data (income tax returns) and methodology (income capitalization) as in Saez and Zucman (2016), modifying the benchmark Saez and Zucman (2016) capitalization technique. They find a more modest rise in the top 0.1% wealth share than in Saez and Zucman (2016).

There are two main issues with the SZZ methodology. First, SZZ under-estimate the interest-bearing assets of the wealthy because they assume the interest rate earned by the rich is much higher than in the existing evidence. Second, the SZZ under-estimate billionaire equity wealth, because they infer equity wealth based on dividend income despite the fact that the wealthiest Americans often own equities that do not pay dividends. Once the conceptually correct interest rate is used to capitalize interest and the SZZ estimates are fixed to match the estimates of billionaire wealth from *Forbes*, the SZZ estimates are very close to the benchmark Saez and Zucman (2016) series.

2.1 Consistency Check

Before 2001, the SZZ and original Saez and Zucman (2016) estimates are very close in level and trend.[2] The estimates diverge starting around 2001. The top 0.1% wealth share (among adults, with wealth equally shared between spouses) has increased by 4.1 points from 2001 to 2016 according to the original Saez and Zucman (2016) estimates as opposed to 0.9 points in SZZ.

To assess whether the modifications of the Saez and Zucman (2016) methodology favored

[1] "Top Wealth in the United States: New Estimates and Implications for Taxing the Rich," 24 April 2020. This section is a revised and abridged version of detailed comments on SZZ available online at `http://gabriel-zucman.eu/files/SZ2020CommentsOnSZZ2.pdf`.

[2] Between 1978 and 2001, the SZZ top 0.1% wealth share rises 6.9 points vs. 8.0 points in the benchmark

by SZZ are well-founded, it is useful to compare the SZZ results to the existing evidence about the dynamic of top-end US wealth since 2001.

According to the public-use Survey of Consumer Finances data, the top 0.1% wealth share has increased by 4.3 points between 2001 and 2016. The SCF by design excludes the Forbes 400. Appending the Forbes 400 to the public-use SCF data, the top 0.1% wealth share has increased by 5.0 points. This increase is in line with the rise found using the Saez and Zucman (2016) methodology, but not consistent with the quasi-stagnation in SZZ.

Similarly, the SZZ estimates are not consistent with the rise in the top 1% wealth share observed since the turn of the 21st century in the official Federal Reserve data on wealth inequality. According to the official SCF results,[3] the top 1% wealth share rose 6.2 points between 2001 and 2016, and by 6.7 points when adding the Forbes 400. According to the Federal Reserve Distributional Financial Accounts, the top 1% wealth share rose 5.2 points over the same period.[4] By contrast, according to SZZ the top 1% wealth share rose only 1.4 points.

The SZZ estimates are also inconsistent with the level of top-end wealth observed in the SCF. Figure 3 shows the amount of wealth owned by tax units with more than $50 million in net wealth in the public-use SCF 2016 micro-file, appended to the 2016 Forbes 400 list—following SZZ who also focus on this $50 million threshold to assess the revenue potential of a wealth tax. As shown by Figure 3, SZZ under-estimate the wealth of tax units with more than $50 million by a factor of 1.7 compared to existing sources. SZZ have both less billionaire wealth than in *Forbes*, and less wealth for tax units with wealth between $50 million and $1 billion than in the SCF, in both cases by a factor of 1.7. By contrast, as shown by Figure 3, the benchmark Saez and Zucman (2016) methodology is consistent with the level of wealth above $50 million found in both *Forbes* and the SCF.

Methodologically, there are two main differences between SZZ and Saez and Zucman (2016). The first involves the choice of the interest rate used to capitalize interest income for the wealthy. The second involves the weight to put on dividends vs. capital gains when estimating equity wealth. We discuss these two issues conceptually and empirically in turn.

Saez and Zucman (2016) series, starting from the same level in 1978.

[3]By official SCF results, we mean the results as published in the Federal Reserve Bulletin, e.g., here box 3 pp. 10-11, Figure B. These official results are based on the internal-use SCF files, which slightly differ from the public-use files.

[4]The Distributional Financial Accounts do not report statistics for the top 0.1%.

2.2 Interest Rate Capitalization

Saez and Zucman (2016) and SZZ both infer interest-bearing assets by capitalizing interest income. In the benchmark Saez and Zucman (2016) series, income is capitalized homogeneously. Within an asset class, the same rate of return—e.g., for interest-bearing assets, the same interest rate—is assumed across the distribution. The choice to rely on homogeneous capitalization for benchmark series was motivated by the fact that this method generally produces correct estimates of top wealth shares in the data sources where both income and wealth can be observed: the Survey of Consumer Finances, linked income and estates tax data, and tax returns of private foundations. In the Saez and Zucman (2016) appendix series, interest income is capitalized heterogeneously: the wealthy are assigned a higher interest rate than average.[5] This was motivated by the fact that in matched estates-income tax data, an interest rate premium for the rich seemed to have appeared at the top after the Great Recession (Saez and Zucman, 2016, Figure V.B). Bricker et al. (2018) also construct series of wealth inequality by capitalizing income tax returns using heterogeneous interest rates, for instance assigning the 10-year Treasury yield to the top 1% interest-income earners.

SZZ depart in two ways from the sensitivity analysis conducted in the Saez and Zucman (2016) appendix series. First, in addition to assuming that the top 1% earns the 10-year Treasury yield, they assume that the top 0.1% earns an even higher rate, the Moody's long-maturity corporate bond Aaa rate. Second, unlike Saez and Zucman (2016) who rank tax units by total income or estimated wealth, SZZ apply heterogeneous interest rates to tax units ranked by interest income, as in Bricker et al. (2018, Figure 4).

The difference in SZZ relative to earlier work is to use the Moody's Aaa rate at the very top. The Moody's Aaa rate is an index of high-quality corporate bonds with maturity of at least 20 years. It has averaged 6.0% over 2000–2009 and 4.2% over 2010–2016. As one moves up the wealth distribution, all tax units end up being in the top 0.1% of the interest income distribution (e.g., virtually all the top 0.01% by wealth ends up in the top 0.1% by interest, a group 10 times more numerous) and thus all the wealthiest tax units in the SZZ methodology end up having the Moody's Aaa rate.[6]

[5] Appendix Tables B40, B41, B41b in Saez and Zucman (2016) assign the 10-year Treasury yield to the top 1% by income; Appendix Table B41c assigns the interest premium seen in matched estates-income tax data to the top 0.1% by wealth; the results are discussed in Saez and Zucman (2016, pp. 549-551).

[6] Section 2.2.4 below discusses re-ranking when moving from the interest to the wealth distribution in detail.

2.2.1 Evidence on the Interest Rate of the Wealthy

Do the wealthiest investors earn the Moody's Aaa yield on average on their interest-bearing assets? A systematic investigation of all the available evidence on this issue delivers a clear answer: "no."

Linked estate and income tax returns. The only administrative data where both income and wealth can be observed is estates tax returns matched to income tax returns. Saez and Zucman (2016) linked estates tax returns filed over the period 1997–2012 to the income tax return of decedents the year prior to death, and used this dataset to study how interest rates vary with wealth. SZZ successfully replicate this analysis and extend it to 2016. Figure 4 shows the result from the Saez and Zucman (2016) analysis extended by SZZ.[7] It also depicts the macro interest rate, obtained by dividing total taxable interest income by the stock of assets paying taxable interest.[8] For comparison, the figure depicts the Moody's Aaa rate and the 10-year Treasury rate. Over the 2001-2016 period, the interest rate observed among the largest estates was always much below the Moody's Aaa rate. It was also almost always below the 10-year Treasury yield.

One potential concern with matched estates-income tax data is that decedents may not be representative of the entire population. This issue is addressed in the SZZ series by weighting estate data by the inverse mortality rate by age and gender to be representative of the entire population. This is a valuable addition compared to Saez and Zucman (2016) who did not weight by the inverse mortality rate (see Saez and Zucman, 2016, pp. 549, and SZZ footnote 43). Interest rates in the weighted decedent sample are virtually identical to the interest rate in the unweighted sample used by Saez and Zucman (2016), showing that young decedents have low interest rates like elderly decedents.

Survey of Consumer Finances. The SCF provides information on interest income (as reported on tax returns) in addition to wealth asset by asset. Thus one can estimate how interest rates vary with wealth in the survey. As a previous literature has established, there is no evidence in the SCF that the wealthy earn the Moody's Aaa interest rate. Bricker, Henriques and Hansen (2018, Table 1, col. 2) found interest rates for the top one percent richest households of 3.0% on average for the 2001, 2004, and 2007 waves of the SCF (close to the average SCF

[7] The estimates are taken from Saez and Zucman (2016, Appendix Table C6b) for 2000–2011 and from SZZ Appendix Figure A.15 Panel A for 2012–2016.

[8] Relative to Saez and Zucman (2016), this aggregate interest rate is revised to exclude bond mutual funds from the denominator, as such bonds pay taxable dividends and not interest.

interest rate of 2.8% over these 3 years), and slightly higher-than-average interest rates at the top in the 2010, 2013 and 2016 SCF (2.0% for the top one percent wealthiest households vs. 1.5% on average in the SCF, a difference of a factor of 1.3), in all cases way below the Moody's Aaa rate. Saez and Zucman (2019, Figure 3) also showed that the interest rate of the top 1% wealthiest is only moderately higher than the aggregate interest rate in the SCF, and always below the Moody's Aaa rate.

This earlier evidence did not perfectly map interest income to interest-bearing assets. We have re-examined SCF data to provide the tightest connection possible between taxable interest income and asset classes generating taxable interest. First, we have removed all fixed-income claims held through mutual funds (money market mutual funds, bond mutual funds, the portion of balanced mutual funds in bonds, and other mutual funds), as interest received from such mutual fund is called a dividend-interest and reported as (non-qualified) dividend income on tax returns.[9] Second, we have removed checking accounts and pre-paid cards, as such assets generally do not pay interest. In Saez and Zucman (2016), these assets are estimated based on their observable distribution in the SCF, not by capitalizing interest. Third, we have added the portion of trusts invested in interest-bearing assets.[10]

Last and more importantly, our re-analysis of the SCF has uncovered a key issue when estimating interest rates in this survey. It is not possible in the SCF to identify the fixed-income claims held by pass-through businesses (the bank deposits, notes receivable, bonds, loans, repurchase agreements, etc., owned by S-corporations and partnerships). These assets generate taxable interest for their owners in the SCF, because interest flows to their individual income tax return, and respondents are asked about interest as reported on their individual income tax return. But these assets are typically counted as business assets in the SCF—not as bank deposits, bonds, loans, etc., owned by households. This means that interest rates estimated in the SCF are upward biased.[11] Moreover, because partnerships and S-corporation assets are highly concentrated, SCF interest rates are more upward biased at the top.

Consider for example a hedge fund manager, who owns a stake of $100 million in her fund (a partnership), half of which is invested in fixed-income claims with a yield of 1.5%.[12] She also

[9] In turn, in our revised wealth inequality series, we now estimate holdings in such mutual funds by capitalizing non-qualified dividends instead of interest as originally in Saez and Zucman (2016).

[10] Before 2004, there is no breakdown of trust assets into fixed-income claim vs. equities in the SCF. We classify 50% of trust assets as fixed-income claims (as about half of trust assets are in fixed-income claims when such breakdown is available starting in 2004).

[11] This also implies that the SCF business asset category includes fixed-income claims (and other securities) that are not classified as such in the Financial Accounts, an important point recently made by Bricker and Volz (2020).

[12] According to Federal Reserve balance sheets published in September 2020 (Financial Accounts Table B.101.f), US domestic hedge funds held about $2 trillion in financial assets in 2016, of which $1 trillion in fixed-

directly owns certificates of deposits worth $10 million with an interest rate of 1.0%. In the SCF, $100 million in business wealth and $10 million in fixed-income claims are recorded. In that person's tax return like in the SCF, there is $850,000 in interest income (corresponding to the pro-rata interest earned by the fund, $50 million times 1.5%, plus interest earned on certificates of deposits). In the SCF this person thus has an observed interest rate of 8.5% ($850,000 / $10 million), much higher than her true interest rate of 1.4% ($850,000 / $60 million).

This issue is quantitatively significant because interest flowing from pass-through businesses is large and has been rising fast. Figure 5 shows that about 30% of taxable interest flows from partnerships and S-corporations in 2016, up from 10%–15% in the 1990s.[13] If all the corresponding assets are classified as business wealth in the SCF, average SCF interest rates are over-stated by a factor of 1.4, more so at the top where pass-through income is prevalent, with a bias rising over time.

Figure 6 depicts the interest rate earned on average and by the top 1% wealthiest households in the SCF after taking into account these considerations. This is the interest rate on assets that generate taxable interest.[14] We partially address the issue of pass-through businesses by subtracting interest earned via pass-throughs from reported interest income, using the aggregate ratio of interest earned from pass-throughs to total interest (Figure 5) and assuming that this ratio is constant across the wealth distribution. By construction this correction has no effect on interest rate differentials observed in the SCF (it only affects the level of interest rates). As shown by Figure 6, and consistent with earlier analysis (Bricker et al., 2018; Saez and Zucman, 2019) the interest rate of the rich follows the average interest rate, except over the 2007-2016 period when a small interest rate premium arises at the top. The interest rate of the top 1% wealthiest households is consistently 1.4 times higher than the overall interest rate after the Great Recession. Taking into account the fact that interest earned via pass-throughs is likely concentrated among the wealthy would reduce the small interest rate premium of wealthy

income claims, half of which were zero- or low-yield instruments (foreign currency, deposits, cash and other cash equivalents, money market fund shares, repurchase agreements, and Treasury securities).

[13] In 2011, Cooper et al. (2016) report that about $22 billion was paid as taxable interest by partnerships to individuals (around 7% of all partnership income paid to individuals is interest (Figure 8), and about 35% of partnership income is paid to individuals (Figure 3), so out of a total of $895 billion in partnership income in 2011 (p. 122), 0.07 x 0.35 x $895 = $22 billion was paid as interest to households). In addition, according to IRS statistics, an extra $11 billion was distributed by S-corporations as taxable interest, for a total of $33 billion in pass-through interest income, i.e., 28% of the total taxable interest income in forms 1040 line 8a ($120.1 billion in 2011).

[14] Such assets include saving accounts ("saving"), money market accounts ("mmda"), call accounts at brokerage firms ("call"), certificate of deposits ("cds"), saving bonds ("savbnd"), all bond directly held ("bond") that are not tax exempt ("notxbnd"), and fixed-income claims held through trusts. It excludes all fixed-income claims held through mutual funds as such assets pay dividends and not interest for tax purposes.

households in the SCF. The interest rate of the rich is always well below the Moody's Aaa rate.[15]

Foundation tax returns. Another source of information on the rate of return of very wealthy investors comes from public foundation tax returns. In these tax returns, interest from bonds is lumped with dividends from equities, and thus it is not directly possible to compute the interest rate on fixed-income claims. However, a number of foundations, including the Bill and Melinda Gates foundation, publish holdings on a security-by-security basis, which makes it possible to separate interest from dividends.

We focus here on the wealthiest foundation (the Gates foundation); a comprehensive analysis of all other foundations is provided in Section 2.2.3 below. We merged each equity position of the Gates foundation to its dividend yield (from Morningstar), allowing us to estimate separately the dividends and interest received by the foundation. We find that the interest rate of the Gates Foundation was 1.6% in 2016. Specifically, the Gates foundation owned $12.3 billion in bonds and other interest-bearing assets (other than saving and temporary cash investments), covering a wide range of issues and maturities—US government bonds, foreign government bonds, mortgage-backed securities, corporate bonds; long term and short term. The foundation earned $207 million in interest on this portfolio, i.e., an interest rate of 1.7%. Moreover, the Gates foundation owned $636 million in saving and temporary cash investments (which are recorded separately in foundation tax returns), which yielded 0.14% ($0.8 million in interest). Combining bonds with saving and temporary cash investments, the overall interest rate earned by the Gates foundation on all its interest-bearing assets was 1.6% in 2016—way below the Moody's Aaa rate of 3.67%.

Publicly listed corporations. To further assess the plausibility of the hypothesis that the wealthiest Americans earn the Moody's Aaa interest rate on their fixed-income claims, as in the SZZ methodology, it is useful to look at the interest rate earned by the largest private holders of fixed-income claims: publicly listed corporations. Figure 7 shows the average interest rate earned by listed companies on their interest-bearing assets (cash, deposits, and fixed-income portfolio securities), as estimated in Compustat. Figure 8 shows this graph separately for four of the largest holders of fixed-income claims: Apple, Microsoft, Alphabet (Google), and Pfizer. In each case, the interest rate of large listed corporations is very close to the aggregate interest

[15]The interest rate of the top 0.1% in the SCF is more erratic, sometimes lower and sometimes higher than the interest rate of the top 1%. This is most likely due to sampling noise, since there are only about 300 SCF households in the top 0.1% of the wealth distribution.

rate used in the benchmark Saez and Zucman (2016) capitalization method, and much below the Moody's Aaa rate.

Consider, for example, the case of Apple. According to its 2016 annual 10-K, Apple earned $4.0 billion in interest. The company owned $237.5 billion in cash, cash equivalent, and marketable securities (of which $132 billion in corporate bonds, $42 billion in US Treasury bonds, $19 billion in mortgage and asset-back securities, $8.6 billion in cash). The interest rate earned by Apple on this portfolio of fixed-income claims was thus 1.7%, much below the Moody's Aaa yield of 3.67%. In most years, Apple's interest rate has been usually close to the aggregate interest rate used in the benchmark Saez and Zucman (2016) capitalization method. The same patterns can be observed for the other major holders of fixed-income claims (Figure 8).

S-corporations. Another source of information on how interest rates vary with wealth comes from the tax returns of S-corporations. Using publicly available SOI tabulations of S-corporations tax returns, we compute interest rates by dividing taxable interest by the sum of cash, US government obligations, loans to shareholders, and mortgage & real estate loans. The results are presented in Figure 9. In 2016, S-corporations had an average interest rate of 1.0%. This interest rate rose from 0.5% for the smallest S-corporations (with less than $1 million in total assets) to 1.3% for S-corporations with assets in between $10 and $100 million, before falling back to 1.0% for the S-corporations with more than $100 million in total assets.[16]

We can also focus on S-corporations which are holding companies. These S-corporations are akin to incorporated wealthy households. They owned $109 billion in fixed-income claims generating taxable interest, and earned 1.4 billion in taxable interest, a rate of return of 1.3%.

These interest rates should be seen as upper bound, as our measure of interest-bearing assets excludes notes receivables (which cannot be isolated from account receivables) and the fraction of other current assets invested in fixed-income securities (which cannot be isolated from other current assets). Even this upper bound delivers low interest rates, including for the largest S-corporations and for holding companies that are the legal owners of the portfolios of very rich households.

Summary. There is no data source where wealthy investors earn an average interest rate remotely close to the Moody's Aaa rate, no matter how wealthy the investor. As shown by Figure 10, whether one looks at matched-estates income tax (covering individuals with wealth

[16]S-corporations with more than $100 million in total assets had on average $77 million in interest-bearing assets.

in the tens and hundreds of millions of dollars), S-corporations (with wealth in the hundreds of millions of dollars), listed corporations (with wealth in the billions of dollars), the wealthiest foundation (with wealth in the tens of billions of dollars), or the wealthiest corporation (with wealth in the hundreds of billions of dollars), the interest rate is in a range of 1.0%–1.7% in 2016. In the revised Saez and Zucman (2016) series presented in this paper, we assume that the wealthiest individuals have the interest rate premium seen in matched estates-income tax data, i.e., an interest rate of close to 1.5% in 2016.

Why do the wealthiest investors earn less than the Moody's Aaa rate on average? The Moody's Aaa rate is only representative of a small share of all interest-bearing assets. First, it only includes corporate bonds; it excludes government bonds that pay lower yields for a given maturity. Second, it only includes corporate bonds with a maturity of 20 years or more. Bonds with a shorter maturities pay an interest rate significantly lower. This explains why the Moody's Aaa rate is higher than other corporate bond benchmarks that include shorter maturities. For example, the ICE Bank of America AAA US Corporate Index yield was 2.57% in 2016. Third, wealthy investors own (directly and indirectly through partnerships) interest-bearing assets other than bonds, such as saving accounts, certificates of deposits, and repurchase agreements, which pay lower interest rates. Wealthy investors value the liquidity and low price risk of short-term assets, explaining why they invest only a fraction of their fixed-income portfolio into long-term corporate bonds.[17]

SZZ justify the use of a very high interest rate to capitalize interest income as follows. They note that although the interest rate they assume is higher than the interest rate r of people at the top of the *wealth distribution*, it is similar to the interest rate $\bar{r}$ of people at the top of the *interest income* distribution. From there, SZZ assume that using $\bar{r}$ and ranking by interest income is the appropriate way to capitalize interest when returns are heterogeneous. SZZ do not formally demonstrate that capitalizing interest using $\bar{r}$ leads to unbiased estimates, or even informally discuss why this might be the case, or what the biases with such a method might be.[18] The fact that top-interest income earners have a high interest rate $\bar{r}$, higher than r, is

[17]Note that the relatively low average interest rate of the wealthiest investors is consistent with the high rates of return recorded by certain fixed-income investments funds. For instance, a hedge fund can borrow money and invest in low-yield bonds. With a high enough leverage, the return from such an investment strategy can be high, despite the fact that the fund only holds low-yield securities. For the capitalization method, what matters is the interest rate on assets and the interest rate on liabilities separately, because interest received and interest paid by hedge funds both pass through to investors, and hedge funds' assets and liabilities both show up separately in the household balance sheet of the Financial Accounts.

[18]SZZ defend their approach in their appendix J by arguing that it is "more practically useful" to apply heterogeneous returns to bins of interest income, since interest income is observable in the data and wealth is not. But this argument conflates two issues—what is the conceptually correct return to apply, and how, practically, to implement the capitalization method. Conceptually, as we show below, the interest rate to apply is the

unsurprising. It's selection: people are at the top of the interest income distribution because they have high interest rate. It's also a consequence of measurement errors. In the 2001 SCF, for example, the top 0.1% interest income earners have a 20% interest rate—an implausibly high rate due to data inconsistencies, such as mis-classification of non-interest income as interest or under-reporting of interest-bearing assets (as in the hedge fund example described above).

We now show conceptually and empirically that using the interest rate of top interest earners, $\bar{r}$, to capitalize interest income when interest rates are heterogeneous is conceptually incorrect and generates a first-order downward bias in top wealth shares.

2.2.2 Capitalizing Interest Using r vs. $\bar{r}$: Model

Saez and Zucman (2016) formally discuss biases in the capitalization method when returns are idiosyncratic (Section IV.A), biases when returns are correlated with wealth (Section IV.B), and how theoretical biases change with multiple asset classes. Building on this earlier work, we provide here a model that allows one to consider these three issues simultaneously. We then examine theoretical biases that arise when using the rate of return of the wealthy vs. the rate of return of high interest earners.

To preview the conclusion: using as SZZ the rate on return of high interest earners, $\bar{r}$, generates a downward bias in estimated top wealth shares that is first order in the share of bonds in the wealth of the wealthy. By contrast, using the rate of return of the wealthy, r, generates an upward bias that is only second order in the share of bonds in the wealth of the wealthy. Therefore, zero first-order bias requires using r, the interest rate of the wealthy, as in the updated Saez and Zucman (2016) series presented in this paper.

Formal model and assumptions. In a population of size one, individual i has wealth W_i. We assume that W_i is Pareto distributed above percentile p_0 so that

$$Pr(W_i \geq W) = 1 - F(W) = p_0 \cdot (W_{p_0}/W)^a$$

with W_{p_0} the wealth threshold at percentile p_0 (think of p_0 as the top 5%). The goal is to estimate the share of wealth sh_p owned by the top p percentile (where p is a percentile above p_0, for example the top 1% or top 0.1%).

We assume that there are two asset classes: interest-bearing assets and other assets. For

interest rate of the wealthy. Practically, one can apply this rate to the wealthy by proceeding by iteration, as explained in Bricker et al. (2018, pp. 17-18) and done in the updated Saez and Zucman (2016) series presented in this paper (see section 5.1 below). Capitalizing interest using the rate of top-interest earners is conceptually incorrect; ranking people by interest is not more practically useful than alternatives.

short, we call interest-bearing assets simply "bonds". Individual i's share of bonds in her wealth W_i is denoted by β_i. To zoom in on the issue of how to estimate bond wealth, we assume that returns on bonds are heterogeneous while the other asset class can be estimated perfectly (either because the rate of return is constant for these other assets or because the value of these other assets is observed perfectly). Let r_i be the rate of return on bonds of person i. Bond wealth of person i is $\beta_i W_i$ and interest income is $r_i \beta_i W_i$.

Denote by r the average rate of return of the wealthy within percentile p and by $\bar{r}$ the rate of return of top interest earners (those in the top p percentile of the interest income distribution). Empirically, based on matched estates-income tax data and the SCF, $\bar{r}$ is much higher than r, around 2-3 times as high in recent years. The bias in SZZ precisely arises because of a large gap between r and $\bar{r}$.

In the general population, W_i, β_i, and r_i may be correlated in complex ways. It is natural, however, to assume that the distribution of β_i and r_i conditional on wealth W_i converges at the top of the wealth distribution. Let us further assume for tractability that β_i and r_i are iid within the top p percentile of the wealth distribution.[19] To prove our results the following lemma is necessary:

Lemma: Suppose W_i is Pareto distributed with Pareto parameter a (above percentile p_0). Let W_i' be a transformation of W_i such that $W_i' = e_i W_i$ that preserves means ($EW_i' = EW_i$) and such that $0 \leq e_i \leq \bar{e}$ is bounded and independent of W_i (within the top p_0 percentile of W_i). Then $W_i' = e_i W_i$ is also Pareto distributed with parameter a at the top (above $\bar{e} W_{p_0}$) and the top shares of W_i' and W_i (above percentile p of their respective distributions) are related by

$$sh_p' = sh_p \cdot (Ee_i^a)^{\frac{1}{a}}.$$

In words, the top wealth share for W' is corrected with the power mean of e_i with coefficient a.

Proof. Let $F'(W')$ denote the distribution of W_i'. We have:

$$1 - F'(W) = Pr(e_i W_i \geq W) = \int_{e_i=0}^{\bar{e}} Pr(W_i \geq W/e_i) dE(e_i) = \int_{e_i=0}^{\bar{e}} p_0 \cdot (e_i W_{p_0}/W)^a dE(e_i).$$

where the second equality uses the assumption that W_i is Pareto distributed and independent of e_i.[20] Therefore, we have:

$$1 - F'(W) = p_0 \cdot (W_{p_0}/W)^a \cdot \int_{e_i=0}^{\bar{e}} e_i^a dE(e_i) = (1 - F(W)) \cdot Ee_i^a.$$

[19] To obtain closed-form formulas, we do not need to assume that β_i is uncorrelated with r_i but this assumption is needed to sign biases.

[20] Note that as e_i is bounded above, W_i/e_i will fall in the top tail p_0 as long as $W_i/\bar{e} \geq W_{p_0}$.

Therefore W_i' is also Pareto distributed with the same parameter a (and this calculation goes through as long as $W \geq \bar{e}W_{p_0}$). Since a Pareto distribution is a power function, any multiplicative disturbance factors out multiplicatively. From this, it follows that the percentile p of W_i' and W_i are related by $W_p' = (Ee_i^a)^{\frac{1}{a}} \cdot W_p$ and therefore that $sh_p' = sh_p \cdot (Ee_i^a)^{\frac{1}{a}}$ as stated.[21] $\square$

Suppose we capitalize interest using r, the average interest rate of the wealthy—the method we favor. Bond wealth of person i is $\beta_i W_i$, interest income of person i is $r_i\beta_i W_i$ which capitalizes into $r_i\beta_i W_i/r$. Other wealth $(1-\beta_i)W_i$ is observed or perfectly estimated. Hence, estimated wealth for person i is $W_i' = (\beta_i r_i/r + 1 - \beta_i)W_i$. Applying the lemma with $e_i = \beta_i r_i/r + 1 - \beta_i$, we obtain:

Top wealth share using the average interest rate r of the wealthy:

$$sh_p^{SZ} = sh_p \cdot (E[(1 - \beta_i + \beta_i r_i/r)^a])^{\frac{1}{a}} \geq sh_p, \text{ with } r = Er_i \tag{1}$$

There is an upward bias because the power mean of $(1 - \beta_i + \beta_i r_i/r)$ is higher than the straight mean itself equal to 1, a point made formally by Saez and Zucman (2016, p. 540) in the special case $\beta_i \equiv 1$.

Suppose instead we capitalize interest using $\bar{r}$, the average interest rate of high interest earners, as in SZZ. In this case, estimated wealth for person i is $W_i' = (\beta_i r_i/\bar{r} + 1 - \beta_i)W_i$. Applying the lemma with $e_i = \beta_i r_i/\bar{r} + 1 - \beta_i$, we obtain:

Top wealth share using the interest rate $\bar{r}$ of high interest income earners:

$$sh_p^{SZZ} = sh_p \cdot (E[(1 - \beta_i + \beta_i r_i/\bar{r})^a])^{\frac{1}{a}}, \text{ with } \bar{r} = \frac{Er_i^a}{Er_i^{a-1}} > r = Er_i \tag{2}$$

Proof. Proving $\bar{r} = Er_i^a/Er_i^{a-1}$ goes as follows. Let y_p be the p percentile threshold in the distribution of interest income $y_i = r_i\beta_i W_i$. Then:

$$\bar{r} = \frac{\int_{r_i\beta_i W_i \geq y_p} r_i\beta_i W_i}{\int_{r_i\beta_i W_i \geq y_p} \beta_i W_i} = \frac{\int_{r_i,\beta_i} r_i\beta_i \int_{W_i \geq y_p/(r_i\beta_i)} W_i dF(W_i)}{\int_{r_i,\beta_i} \beta_i \int_{W_i \geq y_p/(r_i\beta_i)} W_i dF(W_i)}$$

with $dF(W_i) = p_0 a W_{p_0}^a / W_i^{1+a}$ Paretian and independent of r_i and β_i in the upper tail. Hence routine computations show that $\bar{r} = \int_{r_i,\beta_i} r_i^a \beta_i^a / \int_{r_i,\beta_i} r_i^{a-1}\beta_i^a = \int_{r_i} r_i^a / \int_{r_i} r_i^{a-1}$ where the latter equality uses the fact that β_i and r_i are independent at the top (if they are not, one can only use the first equality). $\square$

[21] Formally, $1 - F(W_p) = p = 1 - F'(W_p') = p_0 \cdot (W_{p_0}/W_p')^a \cdot Ee_i^a = p_0 \cdot ((Ee_i^a)^{\frac{1}{a}} W_{p_0}/W_p')^a = 1 - F(W_p'/(Ee_i^a)^{\frac{1}{a}})$

Equations (1) and (2) provide a simple way to estimate the relative biases of the two methods. Obviously, if r_i is homogeneous in the population then $r_i = \bar{r} = r$ for all i and both methods generate no bias. Theoretically with dispersion, $\bar{r}$ is the average of r_i weighted by r_i^{a-1} that are larger for large r_i so that $\bar{r} > r$. Empirically, $\bar{r}$ is two to three times higher than r since the highest interest earners are also selected on high r_i.

Capitalizing interest using r, the method we favor, uses the same r as the r_i in the expectation so r_i/r averages to one. The SZZ method, by contrast, uses a much higher $\bar{r}$ than the average r_i so that r_i/r averages to $r/\bar{r}$ which is typically below 1/2, creating downward bias. In words, the SZZ method attributes too little bond wealth at the top because it uses too high a rate of return. The formulas, however, do not have a straight mean but a power mean with coefficient a. As $a > 1$, the power mean is more than the straight mean, creating an upward bias in both cases.

To assess the magnitude of the net bias, it is useful to consider the case of a small bond share (so that β_i which averages to β is fairly small relative to 1 and is independent of r_i). In that case, the bias when capitalizing using r is second order in β. By contrast, the bias is first order in β when capitalizing using $\bar{r}$ as in SZZ. Formally, with β_i small, when capitalizing using r we have $(1 - \beta_i + \beta_i r_i/r)^a \simeq 1 + a\beta_i(r_i/r - 1)$ and hence $[E(1 - \beta_i + \beta_i r_i/r)^a]^{1/a} \simeq (1 + a\beta E(r_i/r - 1))^{1/a} = 1$. There is no first-order bias. By contrast with the SZZ methodology using $\bar{r}$, we have $(1 - \beta_i + \beta_i r_i/\bar{r})^a \simeq 1 + a\beta_i(r_i/\bar{r} - 1)$ and hence $[E(1 - \beta_i + \beta_i r_i/\bar{r})^a]^{1/a} \simeq [1 + a\beta E(r_i/\bar{r} - 1)]^{1/a} = 1 - \beta(1 - r/\bar{r})$. There is a first-order bias in the share of bonds β. Intuitively, when the share of bonds is small, ranking with or without estimated bonds is pretty much the same, and therefore to a first approximation the SZZ method just creates a straight downwards bias, as it uses too high a return.

Simple illustrative and calibrated example. Suppose the individual rate of return r_i is either $\bar{r} > 0$ with probability λ or 0 with probability $1 - \lambda$. Only a fraction λ of the wealthy has interest income. The average rate is $r = \lambda\bar{r}$ while the rate on high interest earners is $\bar{r}$. Suppose that $\beta_i = \beta$ is constant. In this case, it is easy to show that:

$$sh_p^{SZ} = sh_p \cdot \left((1 - \lambda) \cdot (1 - \beta)^a + \lambda \cdot \left[1 - \beta + \frac{\beta}{\lambda} \right]^a \right)^{\frac{1}{a}},$$

$$sh_p^{SZZ} = sh_p \cdot \left((1 - \lambda) \cdot (1 - \beta)^a + \lambda \right)^{\frac{1}{a}}.$$

so that $W_p = W'_p/(Ee_i^a)^{\frac{1}{a}}$.

Take $\lambda = 0.5$ (i.e., $\bar{r} = 2 \cdot r$) and $a = 1.5$. For $\beta = 20\%$ (a number close to SZZ's preferred estimates), then $sh_p^{SZ} = 1.01 \cdot sh_p$: the power mean upper bias is second-order, only 1%. By contrast, $sh_p^{SZZ} = 0.902 \cdot sh_p$, so that the bias is almost exactly due to imputing only half of the bond wealth to the wealthy (10% instead of 20%) because of using a rate of return twice too high. For $\beta = 40\%$, $sh_p^{SZ} = 1.04 \cdot sh_p$: the power mean upper bias grows four times as large to 4% (as it is second-order in β). By contrast, $sh_p^{SZZ} = 0.812 \cdot sh_p$ so that the first order bias (of 20%) continues to largely dominate.

To sum up: When interest rates are heterogeneous and higher on average among the wealthy, capitalizing interest income using the interest rate of top-interest income earners $\bar{r}$ generates a large downward bias in estimated top wealth shares. Thus, the SZZ methodology produces downward-biased top wealth shares by construction.

2.2.3 Capitalizing Interest Using r vs. $\bar{r}$: Empirical Illustration With the Case of Foundations

We now confirm this theory by applying it to US foundations. Foundation data are more adapted than the SCF, because, as we have seen, it is impossible to measure the value of all assets generating taxable interest in the SCF.

Foundations are required to report assets and income on their annual 990 tax forms.[22] On the asset side, they report the balance on all interest-bearing saving deposits. On the income side, they report interest income earned specifically on such accounts.[23] We assume that wealth excluding this savings deposit component is perfectly observed. We can then estimate savings deposits balances using interest income and the various capitalization strategies we have discussed.

Figure 11 depicts the interest rate on savings accounts of US foundations from 1990 to 2016. The first series in dark blue circles depicts the interest rate when using all foundations (total interest earned summed across all foundations divided by total savings accounts, i.e., interest rate weighting by savings account size). The second series in orange diamonds depicts the interest rate of the top 1% wealthiest foundations (this is r of the theory). These two series track each other very closely: wealthy foundations do not earn a higher interest rate on savings accounts than average. The third series in grey straight line depicts the revised Saez and Zucman (2016) interest rate used to capitalize interest income on individual income tax returns. This

[22] These data are available at `https://www.irs.gov/statistics/soi-tax-stats-private-foundations-harmonized-microdata-files-ascii`.

[23] Unfortunately, while foundations report separately on the asset side (1) government bonds, (2) corporate bonds, (3) mortgage and notes, (4) equity, on the income side, they report jointly interest and dividends earned on these asset classes (see above).

series tracks fairly closely the interest rate earned by foundations (overall and wealthy ones) on their savings accounts. The fourth series in yellow triangles depicts the interest rate of the top 1% interest-earning foundations (this is $\bar{r}$ of the theory). This interest rate is much higher due to selection as high interest income selects both on savings accounts size and interest rate. It is comparable in magnitude to the Moody's Aaa interest rate (depicted in dashed line as the fifth series). This graph is similar to the SCF results presented by SZZ showing that top interest-earners have a much higher interest rate than the wealthy. It has the advantage of being cleaner, as the interest reported by foundations corresponds exactly to the asset class of savings deposits, allowing us to provide a compelling test of the various capitalization methodologies.[24]

Next, we can apply the various capitalization methods for savings accounts. Figure 12 depicts the share of total foundation wealth owned by the top 1% foundations, ranked by size of net wealth. The first series in solid black line is the true wealth share using net wealth reported on the foundations' tax returns. The next three series report the top 1% wealth shares obtained using different methodologies to estimate saving accounts based on reported interest income for this specific asset class. All other asset classes are estimated using actual reported wealth (as in the situation described in our theory). In the dark-blue-circles series, interest is capitalized using the average interest rate across all foundations, as in the benchmark Saez and Zucman (2016) methodology. In the orange-diamonds series, interest of the top 1% wealthiest foundations (ranked by wealth excluding savings accounts) is capitalized using the average interest rate of the top 1% wealthiest foundations, as in the updated Saez and Zucman (2016) series presented in this paper. Finally, in the yellow-triangles series, interest of the top 1% interest-earning foundations is capitalized using the average interest rate of the top 1% interest-earning foundations, as in SZZ. In the last two series, the interest rate used to capitalize interest income for the remaining 99% foundations is computed as a residual to match total savings account, as in the SZZ and revised Saez and Zucman (2016) methodologies.

As Figure 12 shows, both the original and revised Saez and Zucman (2016) methods provide accurate estimates. The original Saez and Zucman (2016) methodology works well because the interest rate of wealthy foundations is similar to the average interest rate of all foundations (Figure 11). In contrast, the SZZ method underestimates top wealth shares. It underestimates savings accounts at the top as predicted by our theory. The bias is more severe in recent years

[24]It is possible that the high interest rate for top interest-earning foundations is driven in part by measurement error (e.g., foundations reporting interest from bonds in the wrong box) rather than heterogeneity in true interest rate across savings accounts. As discussed above, the same issue arises in the SCF, and measurement error is even larger in the SCF because of the imperfect correspondence between interest income and interest-bearing asset classes.

when the interest rate is lower (and hence the ratio $\bar{r}/r$ is higher). The bias is modest relative to total wealth because savings accounts account for a small fraction of total foundation wealth (generally below 5%). But the bias is large relative to the share of wealth invested in saving accounts (β in the theory), as predicted.

2.2.4 Magnitude of the Bias in SZZ

How large is the bias caused by capitalizing interest income using $\bar{r}$ in SZZ? There are a number of ways to quantify it.

First, we can compare the amount of fixed-income claims owned by the top 1% according to SZZ and according to the Federal Reserve Distributional Financial Accounts in 2016 (Figure 13). In both cases, fixed-income claims include checkable deposits and currency, time deposits and short-term investments, money market fund shares, debt securities, loans, and the fraction of mutual fund assets invested in bonds and loans, minus fixed-income claims held in individual retirement accounts (which are part of pension wealth). In both cases, the same aggregate ($15.0 trillion in mid-2016, i.e., the official Financial Accounts total for fixed-income claims) is distributed across the population. The SZZ series (which are among equal-split adults) can be directly compared to DFA estimates (which are based on households), because the share of wealth owned by the top 1% wealthiest adults is very close to the share of wealth owned by the top 1% households.[25] As shown by Figure 13, SZZ only capture 68% of the fixed-income claims owned by the top 1% recorded in the Distributional Financial Accounts. The $2.2 trillion gap represents 2.9% of household wealth in 2016. This gap explains the bulk of the difference between the SZZ top 1% wealth share and the DFA top 1% wealth share.[26]

Since the Distributional Financial Accounts are obtained by applying the SCF distributions to the Financial Accounts aggregates, the SZZ distribution of fixed-income claims is inconsistent with the distribution of these assets in the SCF. Note that because the Survey of Consumer Finances has significantly less fixed-income claims than the Financial Accounts, by a factor of about half (Batty et al., 2019, Table 1), comparing the absolute amount of fixed-income claims in SZZ (which distribute the official Financial Accounts aggregates) and in the SCF is not informative. The SCF has less fixed-income claims than in the Financial Accounts in part because the fixed-income claims owned by hedge funds and private equity funds are recorded

[25]The top 1% households include about 1.26 million households. Given that about 90% of people in the top 1% are married, this corresponds approximately to about 2.38 million adults, i.e., 1% of the 238 million adults.

[26]SZZ Fig. 14 Panel C report $5.8t in fixed-income claims in DFA (instead of $6.7 trillion, the true number) because SZZ exclude bonds held through mutual funds (about $1 trillion) in their DFA fixed-income series. We correct this here.

as business assets in the SCF but as fixed-income claims in the Financial Accounts.[27]

Second, we can use the theoretical formulas established in Section 2.2.2 to quantify the bias caused by using $\bar{r}$. In 2016, the average interest rate of the wealthy (estates above \$20 million) in matched estates-income tax data r is 1.4%, the rate used by SZZ to capitalize interest at the top is the Moody's rate $\bar{r} = 3.67\%$, so that with a share of fixed-income claims in wealth $\beta = 0.25$ there is a first-order bias of $1 - \beta(1 - r/\bar{r}) = 0.85$. Starting from the SZZ top 0.1% wealth share of 14.3%, getting rid of the bias by capitalizing interest using the conceptually correct rate, $r = 1.4\%$, increases the estimated top 0.1% wealth share to $14.3\%/0.85 = 16.9\%$, i.e., it adds 2.6 points of total wealth.

In practice, SZZ use an $\bar{r}$ which is below the Moody Aaa rate. This is because SZZ do not apply the Moody's Aaa rate to all top 0.1% interest-income earners. SZZ treat differently interest earned outside of trusts, and interest earned and retained in trusts.[28] To compute ranks in the interest income distribution, SZZ disregard interest in trusts, while to capitalize interest, SZZ include all interest. Individuals who are in the top 0.1% of the total interest income distribution (including trusts) but in the bottom 99% of the interest income distribution excluding trusts are assigned the interest rate of the bottom 99%, which is very low in recent years, around 0.25% in 2016. These individuals are few in number, but because they are assigned such a low interest rate, they significantly reduce $\bar{r}$. In 2016, the interest rate assumed by SZZ to be earned by people in the top 0.1% of the total interest rate distribution (i.e., SZZ's actual $\bar{r}$) is 3.0%, as opposed to the Moody's Aaa rate of 3.67%. The gap between $\bar{r}$ and the Moody's Aaa rate grows over time, because the gap between the Moody's Aaa rate and the rate assumed by SZZ to be earned by the bottom 99% increases from a factor of 2 in 2000 to a factor of 15 in 2016.[29] Recalibrating the theoretical formula using $\bar{r} = 3.0\%$, there is a bias of $1 - \beta(1 - r/\bar{r}) = 0.867$ in SZZ. Getting rid of this bias by capitalizing interest using the conceptually correct rate, r, adds 2.2 points of total wealth to the top 0.1%.

Third, we can compute the interest rate of the wealthy implied by the SZZ methodology and compare it to the available evidence. SZZ do not report the interest rate of the wealthy

[27] In 2016, according to IRS tabulations of partnership tax returns, financial partnerships owned \$729 billion in cash, \$190 billion in trade notes and accounts receivable, \$150 billion in US government obligations, \$71 billion in mortgage and real estate loans, and \$2 trillion in other current assets (listed equities, corporate and foreign bonds, etc.). Assuming one-third of other current assets were interest-bearing, financial partnerships had \$1.8 trillion in taxable-interest-bearing assets.

[28] Source: communications with the authors. This point is not discussed in SZZ.

[29] Treating interest in trusts differently from other interest earned by the wealthy is not justified. A growing fraction of interest is earned through trusts. According to IRS statistics, \$16 billion of taxable interest was earned through trusts in 2001, the equivalent of 8% of the total taxable interest reported in 1040s. This fraction rose to 11% in 2014. This is inconsistent with the view that fixed-income claims held through trusts have a very low yield as assumed by SZZ.

generated by their model and their code is not publicly available. We replicate their model by using our own updated code (which among other things has more business wealth concentration than in our original estimates; see Section 5.1), estimating equity wealth as in SZZ (i.e., with a weight of 10% on capital gains and 90% on dividends, see below) and capitalizing interest as in SZZ. According to these computations, the top 0.1% ranked by wealth using the SZZ methodology has an interest rate of about 2.5% in 2016.[30] This rate is slightly lower than the $\bar{r}$ used by SZZ (3.0%) because of re-ranking when moving from the interest income distribution to the wealth distribution. As shown by Figure 14, after re-ranking, the interest rate of the top 0.1% by wealth is still much higher than the interest rate actually earned by the top 0.1% wealthiest Americans according to the existing evidence analyzed above. According to the matched estates-income tax data analyzed by Saez and Zucman (2016) and extended to 2016 by SZZ, Americans who died with more than $20 million in wealth (a threshold close to the top 0.1% threshold) had an interest rate of 1.4% in 2016, 1.8 times lower than the interest rate of the top 0.1% by wealth in the SZZ methodology. Thus, SZZ under-estimate the fixed-income claims owned by the top 0.1% by a factor of about 1.8 in 2016.

Fourth, we can compute top wealth share using the conceptually correct interest rate (i.e., the interest rate of the wealthy, r, as proved in Section 2.2.2), and then keeping everything else the same, implement instead the SZZ methodology of ranking by interest and applying the conceptually incorrect $\bar{r}$. Specifically, we run our updated income capitalization code which, among other things, applies heterogeneous interest rates to tax units ranked by estimated wealth iteratively and at the top uses the observed r of the top 0.1% by wealth (as seen in matched estates-income tax data); see Section 5.1. We find that implementing the SZZ method (in lieu of this conceptually correct method) to estimate fixed-income claims reduces the top 0.1% wealth share by close to 2.0 points in 2016, consistent with the theoretical predictions. This explains half of the 4 points gap between SZZ and the updated estimates of Saez and Zucman (2016).[31]

2.3 Estimation of Equity Wealth

The second key difference between SZZ and the benchmark Saez and Zucman (2016) methodology involves the estimation of equity wealth. Saez and Zucman (2016) and SZZ both estimate equity wealth by capitalizing dividends and capital gains. But SZZ capitalize equity wealth using almost entirely dividends (90% weight on dividends, 10% weight on capital gains) in-

[30] This is consistent with private communications with the authors, who write that "in our data, [the interest rate of the top 0.1% by wealth is] somewhere in between the Moody's Aaa [3.67% in 2016] and 10-year Tresury yield [1.84% in 2016], and is closer to the 10-year Tresury yield in 2016."

[31] This 2 points gap is reduced by about a third when estimating fixed-income claims held through mutual

stead of using a combination of dividends and realized capital gains as in Saez and Zucman (2016) benchmark series. Saez and Zucman (2016) extensively analyzed this issue and reported supplementary series using only dividends (Appendix Tables B36, B37 and B37b discussed pp. 534–535). Saez and Zucman (2016) chose a "mixed method" of using dividends only to estimate wealth for ranking and dividends plus capital gains to estimate wealth shares based on a careful analysis of private foundation data (Appendix Figure C5 discussed in p. 542) where this "mixed method" proved to be the best. It was also the method that came closest to match the wealth of the Forbes 400. The key reason this mixed method works best is because capital gains are often realized in a lumpy way (e.g., selling a business at retirement). Averaging them out for each fractile smooths this lumpiness.

Estimating equity wealth based on dividend income as done by SZZ does not allow one to capture top-end wealth accurately, because the wealthiest Americans often own equities that do not pay dividends. For instance, 5 of the top 10 richest Americans—Jeff Bezos (Amazon), Mark Zuckerberg (Facebook), Warren Buffett (Berkshire Hathaway), Sergey Brin (Alphabet), and Larry Page (Alphabet), collectively worth more than $250 billion in 2016—were the main shareholders of corporations that did not pay dividends in 2016. The SZZ methodology assigns them a negligible amount of wealth relative to their true wealth.

SZZ under-estimate billionaire wealth by about 40% relative to the existing evidence. According to SZZ (2020, p. 32) billionaires owned $1.7 trillion in wealth in 2016. According to Forbes, the top 400 wealthiest Americans (who had wealth above $1.7 billion) owned $2.4 trillion in 2016. Billionaires with more than 1 billion and less than $1.7 billion add close to an extra $600 billion, for a total billionaire wealth of around $3 trillion.[32] As shown by Figure 15, the benchmark Saez and Zucman (2016) capitalization method captures close to 100% of the amount of billionaire wealth implied by *Forbes.* By contrast, the SZZ methodology, which under-estimates top-end equity wealth, under-estimates billionaire wealth by almost 50%.

Forbes is certainly not perfect. However, to learn about the wealth of the richest American, the *Forbes* approach of looking at ownership in large businesses to figure out the true wealth of Jeff Bezos, Mark Zuckerberg, Warren Buffett, Sergey Brin, Larry Page, Elon Musk, Michael Dell,

funds using non-qualified dividends, instead of interest as in the SZZ methodology and original Saez and Zucman (2016) methodology.

[32]There are two ways to arrive at the $600 billion number for non-Forbes 400 billionaire wealth. First, one can make the classical assumption that the tail of the wealth distribution is Pareto distributed. As the average wealth of the Forbes 400 in 2016 ($6.0b) was 3.5 times the threshold to belong to the Forbes 400 ($1.7b), the corresponding Pareto parameter is $a = 3.5/(3.5-1) = 1.4$. Standard calculations imply that the wealth between $1bn and $1.7bn is $[(1.7/1)^{(a-1)} - 1] = 23.6\%$ of the wealth above $1.7bn, i.e., $567 billion. Second, one can look at SCF data: the public-use 2016 SCF file, which by construction excludes the Forbes 400, has $583 billion in billionaire wealth (with by construction wealth below 1.7 billion).

etc., is obviously superior to trying to infer wealth from dividends that haven't yet materialized. Saez and Zucman (2016) opted for a method with a higher weight on capital gains precisely because it did a good job at matching *Forbes*.

SZZ justify their methodology by pointing out that in the Survey of Consumer Finances, putting a weight of 10% on capital gains minimizes mean-square error. There are two issues with this argument. First, mean-square error is not the relevant statistic to assess the reliability of various capitalization methods. If only billionaires own a lot of equities that pay no dividends, putting a 90% weight on dividends can minimize mean-square-error for a given person's wealth in the SCF, while severely under-estimating the equity wealth of billionaires, who own about 40% of the equity wealth of the top 0.1%. Second, as noted above for interest, there is an inconsistency between income flows and assets in the SCF. Equities held via pass-through businesses (e.g., hedge funds) are typically not recorded as equities but as business assets. However, the dividends and capital gains these equities generate are recorded as such. Dividends flowing from pass-throughs are relatively small (about 14% of all dividends reported on 1040s), but capital gains flowing from pass-throughs are large, about a third of all capital gains reported on 1040s.[33] Since a large fraction of capital gains arise from assets that are not classified as corporate equities (but as business wealth), capital gains in the SCF may not be as predictive of equity ownership as they actually are.

2.4 Other Differences and Reconciliation

2.4.1 Business Wealth

The methodology used by SZZ to estimate business wealth (other than equity in listed equities) at the top has two downward biases.

First, there is a conceptual issue in the estimation of equity in large pass-through businesses. SZZ estimate equity in pass-through businesses (S-corporations, partnerships) by capitalizing business profits, assets, and sales, using capitalization factors observed for listed firms in the same sector. In their benchmark methodology, they divide reported pass-through profits by 4, following Smith et al. (2019) who found that three-quarters of pass-through business profits reflect labor income. However, the main estimates of Smith et al. (2019) are based on an equal-weighted sample of pass-through businesses, in which a doctor's practice enters with the same weight as a businesses with $1 billion in assets. As we show in Section 4, there is little empirical

[33] In 2011, about $73 billion in capital gains were distributed to individuals by partnerships: capital gains accounts for close to 25% of partnership income received by individuals (Cooper et al., 2016, Figure 8B), and individuals received $297b from partnerships. An extra $52 billion flew from S-corporations, for a total of $125 billion, or 33% of taxable capital gains in forms 1040s line 13.

reason to believe that in large pass-through businesses, which for all intents and purposes are similar to large listed corporations where profits are pure capital income, three-quarters of business profits are disguised wages.

For example, consider the case of Bloomberg L.P. According to press reports based on disclosures made when Michael Bloomberg was running for mayor of New York City, this business is an S-corporation. We do not know the profits of Bloomberg L.P., which are not public. Assume for illustrative purposes that this company made $4 billion in profits in 2016, and that comparable listed firms had a price/earnings ratio of 15. This would call for valuing Bloomberg L.P. at $60 billion ($54 billion after applying a 10% discount for illiquidity as SZZ do). However, SZZ divide Bloomberg's profits by 4, leading to an income-based valuation of $15 billion before discount. This valuation is then averaged with the valuation based on sales and assets, so that the final value is reduced by a factor of about 0.75 compared to a valuation capitalizing all profits. There is no indication, however, that Bloomberg L.P. was less profitable when Michael Bloomberg gave up his title of CEO to serve as mayor between 2002 and 2013. There is thus no reason to divide Bloomberg L.P.'s profits by four. This issue is likely to explain part of the gap between the SZZ estimates of billionaire wealth and Forbes.

Second, there is a specific issue with the estimation of equity in real estate pass-through businesses. For the purpose of capitalizing profits, profits are defined by SZZ as one quarter of business income, plus interest paid, plus depreciation. In the real estate sector, the bulk of interest and depreciation is not reported on forms 1120S (for S-corporations) or 1065 (for partnerships), but expensed on form 8825. However, SZZ do not include interest or depreciation expensed on form 8825 to compute real-estate pass-through profits (while such interest and depreciation is included for listed firms). Figure 16 shows that for real-estate S-corporations, the SZZ measure or profits (and thus the SZZ income-based valuation) is too low by a factor of 5. A similar problem arises for the sales-based valuation. For the purpose of capitalizing sales, sales are defined as business receipts as reported on forms 1120S and 1065. However, in the real estate sector a large fraction of sales is gross rents, which are not on form 1120S or 1065 but on form 8825. This issue matters quantitatively because real estate S-corporations and especially real-estate partnerships are large and their ownership highly concentrated.

2.4.2 Reconciliation

There is a gap of 4.3 points between the top 0.1% wealth share estimated by SZZ (14.3% among equal split adults in 2016) and the original Saez and Zucman (2016) estimate (18.6% among equal-split adults in 2016). After the revision we implement in this paper (see Section 5.1), the

gap is reduced to 4 point. This remaining gap can be reduced to zero as follows.

First, theory and evidence suggest that the fixed-income claims of the top 0.1% estimated by SZZ are too low by about 2 points of total wealth. Second, the SZZ estimates of billionaire wealth are lower than those implied by Forbes by 1.7 point. Finally, two identified downward biases in business wealth lead to an under-estimation of the top 0.1% wealth share, by perhaps 0.5–1 point. Using the conceptually correct rate to capitalize interest income, upgrading the values of real-estate and other pass-through businesses, and matching Forbes billionaire wealth (should any gap remain after the first two corrections) would close virtually all the gap between SZZ and the original and updated Saez and Zucman (2016) top 0.1% wealth share.

3 Distributing the Totality of National Income

Auten and Splinter (2019),[34] henceforth AS, present estimates of US income inequality using income tax returns and various assumptions on non-taxable income. AS find that the share of pre-tax income earned by the top 1% has not increased much from 1962 (11.1%) to 2015 (14.1%), the last year in AS, and that the share of after-tax income earned by the top 1% has not increased. Moreover, according to AS, the US tax system has become more progressive since the early 1960s.

As discussed in Piketty, Saez, and Zucman (2019), because the concentration of fiscal income has increased so much, you need to assume that income not reported on tax returns has in reverse become much less concentrated to replicate the AS results.

There are three main issues with the AS methodology. First, AS classify income earned by the top 1% but legally exempt from tax (importantly, business income reduced by generous depreciation rules) as tax evasion. Second, AS allocate the vast majority of tax evasion to the bottom 99% based on an erroneous reading of random audit data. Third, the allocation of taxes in AS delivers a spurious increase in tax progressivity whenever businesses organize as pass-through entities.

Once legally exempt business income is allocated to the people who actually earn it, under-reported income is allocated in accordance with IRS random audit studies, and the allocation of taxes is fixed, the AS estimates are close to the benchmark Piketty, Saez and Zucman (2018) series.

[34] "Income Inequality in the United States: Using Tax Data to Measure Long-term Trends," 20 December 2019. We take all our AS numbers from the online files posted at `http://davidsplinter.com`, downloaded on May 28, 2020.

3.1 The Allocation of Untaxed Income

AS under-estimate the top 1% pre-tax income share because of the interaction of two issues. First, non-corporate business profits which are legally exempt from the individual income tax, due in particular to generous tax depreciation rules, are classified by AS as tax evasion. Second, tax evasion is allocated disproportionately to the bottom 99% based on an erroneous reading of random audit data. The combination of these two issues explains about half of the level difference between the top 1% pre-tax income share in AS and Piketty, Saez and Zucman (2018) in recent years. It also explains most of the difference in the rise of this top share, as the generosity of tax depreciation has dramatically increased since the turn of the 21st century.

3.1.1 Source of the Gap Between Fiscal Income and National Income

The goal of the national accounts is to provide a consistent measure of aggregate income that is not affected by specificities of the tax law. There are thus numerous differences between income as reported in tax returns and income in the national accounts. In particular, there is a large gap between non-corporate business income (sole proprietorships and partnerships) recorded in the national accounts, and sole proprietorship and partnership income recorded in individual income tax returns. In turn, a large and growing fraction of this gap owes to deprecation.

Since the turn of the 21st century, business income subject to taxation has been reduced by increasingly generous tax depreciation rules. Bonus depreciation rules in force in 2001–2004 and 2008–2017 allowed businesses to deduct from taxable income a large percentage of the cost of investments the year they made these investments. In 2018, the Tax Cut and Jobs Act doubled the bonus depreciation deduction from 50% in 2017 to 100%. US tax law has moved toward full expensing of business investment.

In the national accounts, following international statistical standards, investment is not subtracted from income; investment is capitalized and assets are depreciated over their useful life. Whenever depreciation becomes more generous in the tax law and taxable business income falls, an adjustment—called the capital consumption adjustment—is increased to neutralize this fall and maintain a consistent measure of economic income.

Figure 17 shows the capital consumption adjustment for partnerships and sole proprietorships in the national accounts as a fraction of non-farm proprietor's income. In 2018, the capital consumption adjustment represent the equivalent of 31% of proprietor's income, as opposed to 0% before 1980. The adjustment increased following the Economic Recovery Tax Act of 1981 which introduced accelerated depreciation rules, then with bonus depreciation in 2001–2004

and 2008–2017, and finally with 100% depreciation in 2018. In 2018, the capital consumption adjustment amounts to $372 billion, i.e., 2.1% of national income; the adjustment was already large before full expensing, e.g., 1.6% of national income in 2015. Virtually all of this adjustment is for partnerships: sole proprietorships do not own a large asset stock, while a number of large, capital intensive businesses are organized as partnerships, in particular in the real estate sector, oil extraction, and pipeline transportation (see Section 5.1 below).[35] Partnership income is highly concentrated: in 2018 the top 1% of the fiscal income distribution earned about 90% of taxable partnership income. The capital consumption adjustment should thus primarily be allocated to the top 1%.

AS do not allocate the capital consumption adjustment to the top 1%. Instead, AS treat this income as tax evasion and allocate it primarily to the bottom 99%. Specifically, AS construct an aggregate they call "underreported income." This aggregate includes the national accounts estimate of how much business income is illegally hidden by taxpayers (based on IRS random audit studies, more on this below), plus the capital consumption adjustment, plus numerous other differences between taxable business income and business income in the national accounts.[36] AS call all of this "underreported income" and allocate this aggregate as if it was tax evasion, using IRS random audit studies.

AS proceed similarly for compensation of employees, rental income, S-corporation profits, and farm income. For each of these components of national income, there are numerous conceptual differences between income defined in the tax law and recorded in the national accounts and AS treat these difference as underreported income.[37] AS thus end up with an aggregate amount of underreported income in 2015 which is 1.7 times as large as the actual amount of underreported income—based on IRS random audit studies—included in national income. Specifically, the national accounts make an explicit allowance for underreported taxable individual income

[35]For example, when bonus depreciation is introduced in 2008, depreciation reported by sole proprietorships in IRS forms 1040 increases from 41.1 billion in 2007 to 42.9 billion 2008. Depreciation reported by partnerships in forms 1065 and 8825 increases from $158.3 billion to $221.2 billion (+ $62.9 billion). The capital consumption adjustment for non-farm proprietor income recorded in the NIPAs increases from $79.6 billion to $141.8 (+ $62.2 billion), in line with the rise in partnership depreciation.

[36]These other adjustments include bad debt expenses (deducted from taxable income, not from national income); adjustments to amortization (which is more generous for tax purposes); guaranteed payments to partners (which are deducted from business income in business tax returns, but included in proprietor's income in the national accounts); adjustments to meals and entertainment expenses (partially expensed in business tax returns; fully expensed in the national accounts), etc.

[37]AS, p. 15: "underreported income is estimated as the difference between amounts already in pre-tax income and NIPA totals separately for wages and salaries, rental income, farm income, non-farm proprietor income, and S-corporation net income." AS justify this methodology in their online appendix p. 14 by writing that "this approach leads to similar amounts as BEA "misreported" income," which is incorrect. They support this statement by referring to a 2000 study and a 2007 study, both written before the sustained boom in bonus depreciation which started in 2008 (Figure 17).

for two income categories only: non-corporate business profits (NIPA Table 7.14 line 2) and wages (NIPA Table 7.18 line 2).[38] In the official NIPA data used by AS, underreported taxable individual income adds up to 4.3% of national income in 2015; meanwhile, the AS aggregate of "underreported income" is much larger, 7.2% of national income in 2015[39]

In brief: AS call tax evasion many conceptual differences between income subject to tax and national income, chief among which is the large and growing amount of non-corporate business income which is not subject to taxation because of the expensing of business investment.

3.1.2 The Distribution of Underreported Income

Having labeled 7.2% of national income as underreported income, AS then proceed to allocate this aggregate across the distribution based on IRS random audits, as analyzed in particular in Johns and Slemrod (2010). In so doing AS make a second mistake which leads them to allocate too little income to the top 1%.

Figure 18 shows Johns and Slemrod's (2010) Table 3. As explained by AS (p. 15) and confirmed by their publicly available code,[40] AS use column 2 in John and Slemrod's (2010) Table 3 (in red) to allocate their aggregate "underreported income." This column shows under-reported income by *reported pre-audit income.* When ranking people by their pre-audit income, only 5% of under-reported income comes from the top 1%. But as shown by column 1 of the same table (in blue), when ranking people by their *true income* (i.e., reported plus estimated underreported income), 27% of underreported income comes from the top 1%. Why? Because tax evaders are obviously richer once we account for their underreported income. Moreover, a number of individuals who report negative taxable income (and hence show up at the bottom of the reported income distribution) are found in random audits to have in fact high incomes. For instance, these taxpayers may wrongfully declare large business losses; once these losses are corrected by IRS auditors, the taxpayers are in fact in the top 1%. Johns and Slemrod (2010) show that accounting for this re-ranking is key to paint an accurate picture of the distribution of tax noncompliance. In other words, the fact that sizable noncompliance is found in tax returns with negative incomes does not show that a lot of evasion is done by the poor, as AS seem to believe. It shows that it is critical to rank people by their adjusted (post-audit) income when studying the distribution of tax evasion.[41]

[38] An allowance for S-corporation tax evasion is included as part of corporate profits, but is not separately identified in the NIPAs.

[39] I.e., $1,135bn: see, e.g., AS online Excel file, Table C10 col. AQ.

[40] available at `http://davidsplinter.com/Auten_Splinter_SAScode.txt`

[41] Obviously, a person with true negative income does not have strong incentives to under-report and make their income even more negative.

A similar issue happens when dealing with non-filers. AS allocate 15% of "underreported income" to non-filers, who have zero reported income. But this does not mean that their true income is low, as AS assume. Indeed a detailed investigation by the Treasury Inspector General for Tax Administration (2020, p. 6) found that "high-income nonfilers, although fewer in number, contribute to the majority of the nonfiler tax gap."

AS are aware that re-ranking is a problem for their methodology and provide an ad hoc correction. "Specifically, 50% of tax units in the bottom 95 percent and 10% of tax units in the top 5 percent are selected to receive underreported business income" (AS, Appendix, page 16). This ad hoc correction does not address the problem. In their final series after re-ranking, AS attribute 9% only of all "underreported income" to the top 1%,[42] while Johns and Slemrod (2010) find that 27% of underreported income among tax filers goes to the 1% after re-ranking (see Figure 18).

AS point out that the allocation of what they call "underreported income" is the most important reason for the discrepancy between their findings and Piketty, Saez and Zucman (2018). This is correct—but the AS allocation is not. Of the 7.2% of national income in 2015 in what AS call "underreported income," 2.9 points is legally exempt income. About 60%-70% of this legally exempt income (primarily earned by partnerships) accrues to the top 1%. Of the 4.3 points of actual underreported income, about 27% is earned by the top 1% according to random audit data. Thus, overall about 3 points out of 7.2 points should be allocated to the top 1%. AS by contrast only allocate 0.6% of national income (9% of 7.2%) to the top 1%. The 2.4 points difference explains close to half of the gap between the top 1% pre-tax income share estimated by AS and Piketty, Saez and Zucman (2018) for the year 2015.

3.2 The Allocation of Taxes

A core claim in AS is that the tax system is more progressive in 2015 than in 1960, when the top marginal income tax rate was 91%, the top estate tax rate was 77%, the estate tax raised three times more revenue relative to national income than in 2015, and the corporate tax almost twice as much. However, there are four issues with the AS estimates of tax rates that invalidate this claim.

First, the effective tax rates estimated by AS at the top of the distribution in recent decades are too high because AS assign too little income to the rich. As we have seen, AS treat business

[42] AS online Excel file, sheet C1-incomes, columns DM minus DE gives the underreported income assigned to the top 1% after re-ranking: 99 billion in 2015, i.e., 9% of the total "underreported income" of $1,135bn (col. DJ minus DB).

income which is legally exempt from taxation (in particular due to bonus depreciation) as tax evasion; they then allocate tax evasion primarily to the bottom of the distribution. Because legally exempt business income is highly concentrated, the denominator used by AS to compute effective tax rates at the top is too low: top-end effective tax rates are upward biased. Because bonus depreciation was zero before 1981 and has increased dramatically since then (especially since 2001), the trend in top-end effective tax rates is upward biased too. In the AS methodology, whenever business income earned by the top 1% becomes legally exempt from taxation, the tax rate of the top 1% does not change despite the fact that it should fall; the tax rate of the bottom 99% falls, despite the fact that it should not change.

Second, the AS allocation of the corporate tax leads to a spurious trend of rising tax progressivity. AS distribute 25 percent of the corporate tax to wage earners and 75 percent to shareholders and owners of interest-bearing assets. As a result, tax progressivity mechanically rises whenever businesses choose to operate as pass-through entities. For example, if a C-corporation becomes an S-corporation, taxes that were partly assigned by AS to workers now are fully assigned to shareholders, who are higher up in the income distribution. The tax system looks more progressive despite the fact that nothing has changed in the economy or in the tax system. Because of the rise of pass-through businesses since 1986, and because pass-through business income is highly concentrated, this bias is large.[43]

Third, AS use a conceptually flawed income denominator to compute tax rates. While for their income distribution analysis, AS focus on pre-tax or post-tax income matching national income, for their tax rates computations, AS choose as denominator pre-tax national income plus all cash and in-kind transfers (e.g., Medicare, Medicaid), i.e., a total substantially larger than national income. This does not make sense conceptually: If one allocates more income to people overall than there actually is in the economy, tax rates will appear lower than they really are for at least some groups. Since cash and in-kind transfers go predominantly to the bottom of the distribution, the bias is concentrated at the bottom. Including Medicare and Medicaid as income at the denominator of effective tax rate computations is particularly hard to comprehend. Because Medicare and Medicaid transfers have increased massively since the 1960s, the trends in the AS estimates of effective tax rates of low-income groups are downward biased.

Fourth, AS have an unsatisfactory treatment of indirect taxes. To compute the distribution

[43]If AS believe that 25% of corporate taxes are "paid by" workers, they should allocate 25% of the individual income tax paid by the owners of pass-through businesses to workers, leading to lower effective tax rates at the top and higher tax rates at the bottom than what they report.

of national income, AS allocate indirect taxes proportionally to consumption. This allocation inflates income levels proportionately more for the poor than for the rich, who consume a lower fraction of their income. In turn, inflated incomes lead to downward biased tax rates at the bottom.[44] A more satisfactory treatment would involve allocating indirect taxes (for the purpose of distributing national income) neutrally, i.e., proportionally to income, not consumption. It is indeed purely conventional to include indirect taxes in national income (because nobody "earns" sales taxes as an income); and thus the distribution of national income should be the same as the distribution of factor-price national income (i.e., national income excluding indirect taxes). Alternatively, one could compute tax rates as a fraction of factor-price national income.

3.3 Other Differences And Reconciliation

Retirement Income. AS raise a valuable point about the allocation of pension income. In Piketty, Saez and Zucman (2018), pension distributions are allocated proportionally to taxable and non-taxable distributions (e.g., Roth IRAs) as reported in individual income tax returns. This is necessary to capture all pension income. However, Piketty, Saez and Zucman (2018) put too high a weight on non-taxable distributions, especially in recent years, because non-taxable pension income is inflated by rollovers. This led to allocating too much retirement income to the top. In our revised series, consistent with the available evidence on the distribution of pension wealth (see Section 5.2 below), we now allocate 10% of pension distributions proportionally to non-taxable pension income, with a weight that is constant over time. The effect of rollovers is thus neutralized. This revision closes about 10% of the gap between AS and Piketty, Saez and Zucman (2018). We are grateful to AS for bringing this issue to our attention.

While Piketty, Saez and Zucman (2018) had too much pension income going to the top, AS have too little, because their implicit estimates of pension wealth are not consistent with the evidence on this issue, namely the Survey of Consumer Finances (which only includes defined contribution pensions) supplemented by the Sabelhaus and Henriques-Volz (2019) estimates of defined benefit pensions. In these data, the top 1% by wealth owned $2.9 trillion in pension wealth in 2016,[45] which is 11% of all funded pension wealth and life-insurance reserves. The top 1% by income has a higher share of pension wealth than the top 1% by wealth. By contrast, in AS, the top 1% by income has less than 10% of pension wealth (p. 22). More generally, the

[44] For example, take a retiree who earns 100 in retirement income and consumes 100% of her income. Assume the consumption tax rate is 20%. AS add $20 to income so income equals 120. The tax rate in the AS series is $20/120 = 16.7\%$; in reality the true tax rate is $20/100 = 20\%$.

[45] Sum of retqliq variable in the SCF ($2.5T) and the defined benefit estimates of Sabelhaus and Henriques-Volz (2019) ($0.4T) for the top 1% tax units.

computations in Piketty, Saez and Zucman (2019) show that the implicit wealth distribution in AS is too equal and has not increased in line with the available evidence.[46] By contrast, in our updated series, the distribution of pension wealth is by design consistent with the share of pension wealth owned by the top 10% and top 1% seen in the Federal Reserve data (see Section 5.1 below). Fixing pension wealth in AS would close another 10% of the gap between AS and Piketty, Saez and Zucman (2018).[47]

Ranking of individuals. AS use different definitions of income to rank tax units and to compute their income. To rank tax units, AS use size-adjusted income, dividing tax unit income by the square-root of the number of individuals in the unit. But to compute income shares, they use the actual income of the tax unit, not adjusting for family size. Rich families with kids are moved down the income ladder and assigned high incomes, increasing the bottom 99% income share. AS justify this procedure by noting that it aims at obtaining "a measure more relevant to the distribution of economic welfare" (p. 11). In clear: since having kids is costly, high-income families with many kids are in fact less rich than they appear; the effect is non-linear since there are economies of scale within households (e.g., only one rent needs to be paid), hence the use of a square root.

This line of reasoning reflects a confusion between consumption and income inequality. The use of equivalence scales is common for the study of consumption inequality. But as far as the distribution of pre-tax national income is concerned, there is no conceptual basis for size adjustments of this kind. The fact that having kids is costly is not relevant for the question of how pre-tax national *income* is distributed. Dividing income by the square root of the number of individuals in a tax unit makes it impossible to decompose economic growth by social group, a key goal of distributing the totality of national income. It transforms income into a hybrid notion of economic resources somewhere in between income and consumption. Both income and consumption deserve to be studied (as both are relevant for economic theory and policy making), but separately. Hybrid measures that blend elements of income and consumption while calling the result "income" have, in our view, no merit: these measures play no role in economic modeling and are confusing for policymakers and the public.[48] For the study of income

[46] Although AS need to implicitly estimate wealth to allocate income (e.g., investment income earned on pension plans, corporate retained earnings), they do not report their wealth distribution.

[47] One indication that there is a problem with the AS treatment of pension is that according to AS Table IV, the AS treatment of pensions reduces the Piketty, Saez and Zucman (2018) top 1% pre-tax income share by 0.5 point in 1962. However both in the original and updated Piketty, Saez and Zucman (2018) series, the top 1% earns less than 0.5% of national income in pension income in 1962 (see Appendix Table II-B.2b col. 22), so that with the AS treatment the top 1% earns negative pension income.

[48] Since income equals consumption plus saving and saving rates rise with income, hybrid measures of income

distribution, the top 1% should include the 1% units with the highest incomes, and nothing else.

Altogether, the allocation of "underreported income," taxes, pension income, and size-adjustments for ranking tax units explain virtually all the difference between the AS and Piketty, Saez and Zucman (2018) estimates of pre-tax income inequality.

Government consumption. For post-tax income, a key difference is the allocation of government consumption expenditures. These expenditures have fluctuated around 18% of national income since 1980 with no trend. Defense spending has declined while spending on prisons and law courts has increased and spending on education has been stable at about 5.5% of national income. Auten and Splinter (2019) allocate government consumption half per capita and half by after-tax income; i.e., this spending is assumed to reduce inequality. In the AS methodology, if the government funds a mass incarceration policy by a tax strictly proportional to income, everything else equal, inequality falls.[49]

AS also allocate the government deficit proportionally to federal taxes paid. The top 1% pays about 25% of all federal taxes. The Congressional Budget Office projects an increase in the government deficit of 13 points of national income in 2020 relative to 2019.[50] In the AS methodology, this will reduce the top 1% post-tax income share by about 3.3 points relative to 2019, leading to a collapse in the top 1% income share from around 9% (according to AS) to about 5%–6% of national income, by far the lowest level ever recorded. In other words, on a post-tax basis according to AS, the United States has never been as equal as in 2020. In the Piketty, Saez and Zucman (2018) methodology, by contrast, the government deficit is allocated 50% proportionally to all taxes paid and 50% proportionally to government spending (other than Social Security and unemployment insurance) received. Since the overall tax-and-transfer system is slightly progressive (taxes—29% of national income—are roughly proportional to income, collective consumption expenditures—18% of national income—are assumed to be proportional to income, but non-Social Security individualized transfers—11% of national income—go primarily to the bottom), this will result in a slight increase in inequality, partly offsetting the equalizing effect of the increase in unemployment insurance and economic impact payments. There is no perfect way to allocate the government deficit, but an extreme case such as the large 2020 deficits highlights the meaning and usefulness of various methodologies.

that incorporate elements of consumption are more equally distributed than conceptually well-defined measures of incomes, which might explain their popularity.

[49]One might consider allocating public education spending on a per capita basis. However, because of the differences in school quality and in college attendance by parental income, such an allocation has little empirical justification.

[50]See `https://www.cbo.gov/publication/56542#_idTextAnchor011`.

4 Labor and Capital Shares of Top Incomes

In "Capitalists in the 21st century" Smith, Yagan, Zidar, and Zwick (2019), henceforth SYZZ, find that the majority of income earned in the top 1% derives from labor. They obtain this finding by noting that pass-through business income is a key source of income at the top and classifying 75% of this income as labor income as opposed to capital income. Their findings suggest that Piketty, Saez and Zucman (2018) over-estimate the capital share of income among the rich.[51]

However, the low capital share of pass-through business income estimated by Smith et al. (2019) is not consistent with the large capital stock of these businesses. Classifying 25% of pass-through business profit as capital income implies an implausibly low rate of return to capital in these businesses. Applying to the capital stock of pass-through businesses the rates of return observed for listed corporations of similar size in the same sector suggests that about 50% of pass-through business income derives from capital—and that a majority of income at the top derives from capital, as in Piketty, Saez and Zucman (2018).

4.1 The Capital Share of Pass-Through Business Income

4.1.1 Evidence from Rates of Return on Assets

To assess the plausibility of the notion that 25% of S-corporation business income is capital income, it is useful to start with macroeconomic statistics.

According to the Federal Reserve, the market value of S-corporations equity was $2,988 billion at the end of 2014, the reference year in SYZZ. The Federal Reserve obtains this estimate by starting with the book value of S-corporation equity (i.e., assets at book value minus non-equity liabilities, as reported to the IRS on 1120S forms), applying the market-to-book ratio observed for US listed firms in Compustat to the book value of S-corporation equity at the 2-digit-NAICS-industry level, and applying a 25% discount for illiquidity. By construction, this estimate only takes into account the non-human capital (i.e., the office space, equipment, etc.) of S-corporations. We were able to reproduce this estimate using the same raw sources and methodology as the Federal Reserve. We also obtained similar results at the 3-digit industry level. As argued in Smith, Zidar and Zwick (2020), the Federal Reserve valuation of S-corporation equity should be seen as conservative.

[51] "We classify 75% of pass-through income as human capital income. In contrast, Piketty, Saez and Zucman (2018) assume a labor share of 0% for one type of pass-through income (S-corporation) and 70% for the rest (partnership and other pass-through)... Under our approach, the top 1% labor share of imputed national income in 2014 increases from 45.4% in Piketty, Saez and Zucman (2018) to 52.1%." (SYZZ, Introduction, p. 1680–1681).

Using the Federal Reserve estimate of equity wealth, we can compute the return on S-corporation equity implied by the SYZZ methodology. In 2014, US households reported $354 billion in S-corporation profit. According to SYZZ, only a quarter of this number, namely $88.5 billion, is capital income, the rest being labor income. S-corporations thus had a pre-tax rate of return on equity of 3.0% ($88.5 billion / $2,988 billion). This rate of return is before income tax and includes all profits, whether distributed or reinvested in the firm, since all the profits of S-corporations flow through to shareholders. Excluding S-corporations with less than $250,000 in assets, which do not have to report balance sheets for tax purposes, the rate of return on S-corporation equity was 2.3%.[52]

These rates of return obtained when classifying 25% of S-corporation profits as capital income are much lower than the rate of return on non-pass-through corporate equity. According to Compustat, the rate of return on equity for listed US companies was 6.5% in 2014. The same number, 6.5%, can be obtained by using Financial Accounts and tax data for the full C-corporation sector (including unlisted firms), mimicking the computation made above for S-corporation.[53] Excluding the largest listed firms that have few counterparts among S-corporations, the return on equity for listed corporations was around 5.5%.[54] This is about twice as large as the return on S-corporation equity implied by the SYZZ methodology. It looks *prima facie* as if S-corporations own too much capital to be consistent with the view that only a quarter of their income derives from capital.

To better understand this gap in returns, one needs to go beyond macroeconomic statistics, since there are major sectoral difference between S- and C-corporations. Figure 19 considers the 10 largest 3-digit industries for S-corporations in terms of ordinary business income, excluding offices of health practitioners and legal services, which do not have counterparts among listed firms. These 10 industries account for 37% of all S-corporation profits. For each, we compute

[52] In 2014, S-corporations with less than $250,000 in assets reported virtually 0 book equity but accounted for 23% of S-corporation business income. Note that firms with zero reported assets do own assets, as evidenced by the fact that they reported $15.3 billion in portfolio income in 2014.

[53] According to the Federal Reserve Financial Accounts, US households owned $10.7 trillion in equity in non-pass through corporations (excluding equity held through pension funds and retirement accounts, shares in money market funds, and shares in bond funds) at the end of 2014. US taxpayers reported $206 billion in dividend income (excluding "non-qualified" dividends which mostly correspond to dividends paid by money market funds and bond funds; and adding undistributed dividends received by trusts). For one $1 of dividend paid, non-pass through corporations made on average $3.35 in pre-tax income (i.e., adding corporate income taxes paid and retained earnings). Therefore, if non-pass through corporations were treated as pass-through entities, US households would have reported around $690 billion in pre-tax equity income from these corporations, i.e., a rate of return of 6.5%.

[54] For example, with a 90% winsorization of profits and market values (neutralizing the influence of about 550 firms, corresponding roughly to the Fortune 500), the rate of return was 5.5%. Trimming the 5% listed companies with the highest profits and 5% with the highest losses, the rate of return was 5.3%.

the return on assets using publicly available tabulations of S-corporations tax returns (form 1120S). We compare this return to the return observed for listed firms in the same 3-digits industry, using SEC 10-K forms collected in Compustat. We consider a measure of income that neutralizes the differences between tax and book accounting,[55] namely operating income before interest payments and net of book depreciation. Specifically, for S-corporations, income is 25% of net income from a trade or business (following SYZZ), plus interest paid, minus net gains on noncapital assets, plus tax depreciation, minus book depreciation (estimated by multiplying assets by the within-sector ratio of book depreciation to assets observed for listed firms).[56] For listed companies, income is operating income (variable OIBDP in Compustat) minus book depreciation, and a 95% winsorization is applied to income and assets to remove the influence of large listed firms that have few counterparts among S-corporations. Winsorizing income and assets at 90%, trimming the top 5% of firms by sales, or trimming the top 5% and bottom 5% of firms by income delivers identical results.

As Figure 19 shows, in these 10 industries, the rate of return on S-corporation assets implied by the SYZZ methodology is well below the rate of return observed in comparable listed firms. Consider the largest 3-digit industry for S-corporations in terms of ordinary business income: durable goods wholesale trade (NAICS 423). The ratio of net-of-depreciation operating income to assets observed for winsorized listed firms in this industry is 8.3%, while it is 3.5% for S-corporations when classifying 25% or ordinary business income as capital income. To arrive at return on assets of 8.3% one needs to classify 70% of S-corporation business income as capital income. These findings suggest that substantially more than 25% of S-corporation profit is capital income. This is true even in sectors where the difference in returns on assets might seem small, such as real estate. In this sector, the rate of return on assets for S-corporations is 4.1% in 2014 when classifying 25% of business income as capital income, as opposed to 5.1% for winsorized listed firms. But to arrive at a rate of return of 5.1%, one needs to classify 55% of the ordinary business income of S-corporations as capital income, because for real estate S-corporations, a significant fraction of the return shown on Figure 19 derives from rental income (on top of ordinary business income) and interest payments.

[55]The main difference between book income (as reported in 10-K forms) and taxable income (as reported in business tax returns) involves depreciation, which can be more generous for tax purposes; other differences include certain deductions that are not allowed for tax purposes or book accounting, and the treatment of capital gains.

[56]For the sector "Securities, commodity contracts, other financial investments, and related activities" (NAICS 523), we include 100% of portfolio income (net of investment interest expenses) in operating income. Similarly for real estate, we include 100% of rental income, as well as all interest and depreciation expensed on form 8825.

4.1.2 Evidence from Factor Shares of Value-Added

Another way to assess the plausibility that 25% of S-corporation *profits* is capital income is to investigate what this classification implies for the capital share of *value-added* in S-corporations. The capital share of value-added is capital income divided by the sum of labor and capital income; it is the standard measure of the capital share.

We compute capital and labor shares of value-added for both S- and C-corporations using publicly available tabulations of income tax returns, harmonizing income to make the results comparable across the two types of businesses. For S-corporations, capital income is equal to 25% of ordinary business income (following SYZZ), plus interest paid, minus net gains on noncapital assets. For C-corporations (excluding regulated investment companies and real estate investment trusts), capital income is equal to income subject to tax, minus portfolio income (which is not part of ordinary business income for S-corporations but flows through to shareholders), plus charitable contributions and domestic production deduction (which also flow through to S-corporation shareholders), plus state income taxes paid (not paid by S-corporations), plus interest paid, minus net gains on noncapital assets. For both S- and C-corporations, labor income is the sum of wages and salaries, compensation of officers, employee benefit programs, and pension, profit sharing, etc., plans. We find that if 25% of S-corporation profit was capital income, then the capital share of S-corporations' value-added was 8% in 2014. By contrast, the capital share of C-corporations' value-added was 23%. The low capital share of pass-through business profit estimated by SYZZ implies an implausibly low capital share of value-added in these businesses.

To better understand this result, Figure 20 reports capital shares for C- and S-corporations by asset size, with a zoom on mid-market firms (with assets in between $1 and $100 million), which are the focus of SYZZ. As shown by Figure 20, within an asset bin, the capital share of S-corporation value-added obtained when classifying 25% of S-corporation profit as capital income is always below the capital share observed for C-corporations. The gap is small for firms with a few million in assets and grows when moving up the asset distribution. For instance, C-corporations with $50–$100 million in assets have a capital share of 20%, but if 25% of S-corporation profit is capital income, S-corporations with $50–$100 million in assets have a capital share of 9% only. In the SYZZ methodology, the capital share does not rise with assets, so that even very large S-corporations have a low capital share of about 10%. This is at odds with the patterns observed for C-corporations, for which the capital share rises with assets, to reach around 25% for the largest firms. These results suggest that the SYZZ methodology

under-estimates the capital share of mid-size and large S-corporations. To equalize the capital share of C- and S-corporations with $50–$100 million in assets, for example, one needs to assume that 65% of S-corporation profit is capital income.

These observations motivate a systematic analysis of the balance sheets and income statements of US businesses to estimate the capital share of private business income. Saez and Zucman (2020) present such an analysis exploiting public tabulations of business tax returns broken down at a fine sectoral level (3- or 4-digit level), implementing several estimation procedures (imputation of a return to capital; imputation of a wage to business owners) and model specifications. Across models and specifications, the capital share of S-corporation business income is found to be around 50% (with a mild downward trends since the 1990s), and the capital share of partnership is as high or higher.

4.1.3 Reconciliation with Estimates Based on Owner Death

SYZZ use an owner death/retirement methodology to estimate the capital share of pass-through business income. They note that pass-through business profit falls by about 75% after owner retirement or premature death, relative to control businesses. They conclude that 75% of pass-through profits correspond to human capital income. How can we reconcile our estimates of private business capital income shares with the estimates of SYZZ? Two amendments to the SYZZ methodology can close all the gap between the estimates of Saez and Zucman (2020) and those of SYZZ.

Accounting for large firms. First, we can come close to reconciling our findings with SYZZ by noting that in large firms the capital share of profits is higher than in small firms. Because SYZZ are primarily interested in the "typical" top earner, the main SYZZ estimates are person-weighted (as opposed to dollar-weighted). A medical practice that has a low capital share of profits enters with the same weight as a company with $50 million in assets that has a high capital share of profits. For the computation of factor income shares, however, the relevant statistics are dollar-weighted.

In 2014, 0.2% of all S-corporations had more than $50 million in assets and these firms accounted for 21% of total S-corporation profit. Because they are so few in number, and despite being important in terms of profit, firms with more than $50 million in assets are in effect disregarded in the equal-weighted analysis. As we have seen, the largest S-corporations are likely to have high capital shares of profits (Figure 20). Classifying as capital income 80% of the profits made by S-corporations with more than $50 million in assets (consistent with the

results in Figure 20) increases the capital share estimated using the SYZZ owner death design by 17 percentage points.

In appendix results, SYZZ also present "dollar-weighted" results. However, capturing the contribution of large firms with the owner death/retirement strategy is challenging. The sample in the SYZZ owner death/retirement analysis includes about 19,000 firms (2,436 owner-deaths, 16,548 owner-retirement), and thus no more than a few dozens firms with more than $50 million in assets. As SYZZ note (p. 1721), "the standard errors do increase with dollar-weighting." Our view is that for large firms, more robust estimates of factor shares are obtained by looking at the universe of listed firms and C-corporations of the same size in the same sector, as in Saez and Zucman (2020).

Accounting for the capital of exiting firms. A significant fraction of the large decline in business income observed by SYZZ is driven by business shutdown upon the death or retirement of an owner. When a firm shuts down following the death or retirement of an owner (and is not reorganized under a different employer identification number), SYZZ assign this firm 0 income post-shutdown.[57] The decline in income to zero is interpreted as labor income vanishing. This raises an issue. When an owner dies and a firm shuts down as a result, this does not mean that business income derived fully from labor. To see this, consider the two following examples.

Example 1: consider a medical practice organized as an S-corporation, composed of a doctor (the owner), two nurses, tangible capital (office space, medical equipment such as an X-ray machine), and intangible capital (such as electronic medical records). The doctor dies; the practice closes. The income of the practice goes to zero, but this does not mean that 100% of its income used to derive from labor. The capital survives the doctor's death or retirement. This capital will contribute to generating income elsewhere in the economy. For instance, the X-ray machine may be sold to a hospital; the electronic medical records to a neighboring practice; the office space to another business. In the estate of the wealthy owner who dies, there is positive business wealth: office space, equipment, etc. Since there is business wealth with positive market value in the estates of dead business owners, business income cannot entirely derive from labor.

Example 2: consider a hotel organized as an LLC partnership, owned and run by a couple who employs housekeeping staff. The couple retires and upon retirement sells the business to a hotel chain. The chain replaces the housekeeping staff with contractors. In SYZZ, it is assumed that 100% of the income of this partnership derived from labor. In reality, a potentially large

[57] "If a firm exits (i.e., no longer files a Form 1120S or Form 1065 income tax return), it is coded as having 0 profits and 0 sales in exited years, except for the reorganization correction defined below." SYZZ (2020, p. 1711).

fraction of income derived from capital (in this example, real estate). The owners indeed sell their business at a non-zero price.

Some reconciliation between our findings and the SYZZ estimates can be obtained as follows. In the SYZZ analysis sample, 41% of the treated firms (i.e., those for which an owner dies) exit the sample in the four years following owner death. Some of these exits do not represent firm shutdowns but firm reorganizations. In the doctor's practice example above, a new doctor might take over the practice and reorganize it under a new name, keeping more than half of the staff employed. 9% of the treated firms in the SYZZ sample are reorganized in this way following an owner's death. SYZZ account for these reorganizations by assigning to the reorganized firm the income of the old firm the year before owner death. This leaves 32% of the firms in the SYZZ treated group that are liquidated upon the death/retirement of their owners, or that keep operating but with a more than 50% change in staffing, such as in the hotel example above.[58] For these firms, income goes to zero and SYZZ consider that the labor share was 100%, no matter what capital stock the firms owned. Classifying 25% of the profit of these firms as capital increases the capital share of business income estimated using the owner death/retirement design by 8 percentage points.

Taken together, the two corrections we propose (assigning positive capital income to exiting firms; accounting for large firms specifically) increase the capital share estimated by SYZZ from 25% to 25% + 17% + 8% = 50%, thus closing all the gap with our own estimates.

4.2 Revised Estimates of Factor Income Shares at the Top

4.2.1 Methodology

We revise our estimates of factor income shares at the top of the income distribution by incorporating the following research findings and improvements.

First, the capital share of S-corporation income is less than 100%. As emphasized by SYZZ, S-corporations profits in part reflect a labor component. This is linked to the fact that doctors, dentists, and lawyers—who would typically operate as non-corporate businesses in other countries—frequently operate as S-corporations in the US. Piketty, Saez and Zucman (2018), following standard national accounts conventions, allocated 100% of S-corporation profit to

[58]SYZZ infer reorganizations by looking at whether following the exit of a business, more than 50% of its workers are subsequently employed by another firm. This excludes reorganizations in which a majority of workers are displaced (e.g., employees retiring, switching job, or being replaced by contractors) after owner death/retirement. In the SYZZ owner-death analysis, 41% of the treated firms exit, and 22% of the exiting owner-death firms correspond to reorganizations with a majority of workers retained (SYZZ 2019, p. 1712). Thus 41%× (100% - 22%) = 32% of the treated firms close or are heavily reorganized.

capital. In our revised series, we split S-corporation profit equally between labor and capital.

Second, assigning to partnerships the return seen for listed corporations within industry, excluding large firms, leads to a capital share of partnership income of 50% or more in the 2010s, with a rising trend since the 1980s (Saez and Zucman, 2020). In Piketty, Saez and Zucman (2018), it was assumed that 30% of partnership income is capital, with no trend. Therefore, in contrast to S-corporations, our new computations lead us to revise upwards the capital share of partnership income.

Third, there is a great deal of heterogeneity among pass-through firms. In small firms (e.g., medical practices), as shown by the SYZZ equal-weighted owner death/retirement estimates, a large fraction of business profit derives from labor. In large firms, a larger fraction of profit derive from capital (Saez and Zucman, 2020). This calls for applying heterogeneous capital shares to pass-through business profit. Thus in our revised estimates, at the level of each tax unit, we classify 25% of S-corporation profit below the 99.99^{th} percentile of the wage distribution (around \$4 million in 2016) as capital income, and 75% of S-corporation profit in excess of the 99.99^{th} percentile of the wage distribution as capital.[59] We also classify 75% of passive S-corporation profit as deriving from capital.[60] This averages to an overall capital share of S-corporation income of about 50%. We proceed similarly for partnerships.

Two examples illustrate this procedure. Consider first the case of a doctor operating as an S-corporation, who receives \$600,000 in wage and \$400,000 in S-corporation profit. In our revised series, as in SYZZ, this person earns \$900,000 in labor income and \$100,000 in capital income, i.e., has a capital share of income of 10%. The capital share is not zero because the practice owns marketable, non-human capital. Second, consider the case of the owner-manager of a large business (such as a retail chain) with \$800 million in assets earning \$1 million in wage and \$80 million in S-corporation income. In our computation, that person is assigned \$58 million in capital income (25% on the first \$4 million of profits, 75% on the next \$76 million of profits) and \$23 million in labor income (\$1 million from wages and 80-58=\$22 million from profits), corresponding to a pre-tax return on assets of 7.2% and pay similar to that of the CEO

[59] Conceptually, a more accurate classification can be obtained by splitting profits into labor vs. capital at the business level (rather than at the tax unit level), based on business-level balance sheets and income statements. In ongoing work, Saez and Zucman (2020) implement and contrast the two approaches. Improvements arising from the business-level approach will be incorporated in future revisions of our Distributional National Accounts.

[60] Passive business income is defined by the IRS as income derived from businesses in which the owner does not "materially participate." We allocate less than 100% of passive income to capital to take into account the fact that the frontier between passive and non-passive income is fuzzy: there can be incentives to classify income as passive or non-passive for tax purposes. Note that income classified as "non-passive" for tax purposes does not necessarily primarily derive from labor. For instance, a large real estate partnership may generate ordinary business income that is mostly capital income and yet is classified as non-passive in the tax return of its general partner.

of the listed retailer Kroger in 2019.[61] By contrast in SYZZ, this person has $20 million in capital income–a return on assets of 1.8% only–and labor income of $61 million, larger than the compensation earned by the CEOs of all Fortune 500 companies in 2019 save Google and Intel.

Last, we did additional research to estimate the wealth and capital income of sole proprietorships, using the Survey of Consumer Finances and the Survey of Small Business Finance. The evidence suggests that sole proprietorships own relatively little capital and have a low capital share of business income, around 20%.[62] Accordingly, we split income 80/20 for sole proprietorships, as opposed to 70/30 in Piketty, Saez and Zucman (2018). Since, unlike S-corporations and partnerships, there are no sole proprietorships with very large asset stocks, we apply this 80/20 split uniformly across the income distribution.

4.2.2 Results and Discussion

Updated estimates of factor income shares. Figure 21 shows the capital share of income as originally reported in Piketty, Saez and Zucman (2018, Figure VIII) and in our updated series. In both cases the same pattern emerges: a high capital share in the 1960s, gradually falling until the late 1990s, and then rebounding since 2000. In 2014, the capital share of income in the top 1% is 59% in the original Piketty, Saez and Zucman (2016) series and 56% in the revised series. The lower capital income from S-corporations is largely offset by the higher capital income from partnerships, whose ownership is highly concentrated. The trend break around 2000 originally noted in Piketty, Saez and Zucman (2018) is confirmed. The capital share of top 1% income has increased by 10 points from 2000 to 2018, although capital still plays a lower role at the top than in the 1960s and 1970s.

Overall, the available evidence thus suggests that a high (and since 2000, growing) fraction of income derives from capital at the top of the income distribution. The increasing role played by capital is driven by the growth of all forms of capital income at the top, except interest, since the turn of the 21st century: housing rents, C-corporations dividends, C-corporation retained earnings, S-corporation profit, and partnership capital income. This increase is consistent with the rise in aggregate household wealth (from around 400% of national income in 2000 to around

[61] `https://aflcio.org/paywatch/highest-paid-ceos`

[62] In the Survey of Consumer Finances, sole proprietorship and farm wealth totals $1.9 trillion in 2016 (to which should perhaps be added part of the wealth of LLCs, since single-owner LLCs file as sole proprietorships by default). We obtain a similar estimate ($1.8 trillion) by using the BEA fixed asset statistics and Federal Reserve Financial Accounts to estimate the wealth of sole proprietorships, see Section 5.1 below. Assuming a pre-tax rate of return of 7%, this suggests that around $135 billion of sole proprietorship and farm income can be considered capital income, consistent with a capital share of 15%–20% (total sole proprietorship income is around $800 billion in 2016 in the national accounts, after factoring in a large amount of unreported income).

500% in 2018), the rise in wealth concentration since 2001 (e.g., Bricker and Volz, 2020), and the rise in the capital share of national income.

Discussion. A number of remarks are in order. First, our updated estimates of capital income shares are likely to be conservative. Our update, following SYZZ, takes into account one form of tax-motivated shifting: In S-corporation with active owners, owners have an incentive to pay themselves low wages so as to avoid Medicare and Affordable Care Act taxes of 3.8% in total. Reported profits reflect a "disguised wage" component and hence attributing 100% of S-corporation profits biases capital shares upwards. However, there are other forms of shifting biasing the capital share in the opposite direction. In private C-corporations, owners had until 2018 an incentive to pay themselves high wages.[63] Taking this tax-induced shifting into account would increase the capital share, although more research is required on this issue.[64]

Second, as shown by Figure 22, the effects from reclassifying some private business income as labor (or capital) are quantitatively small. After classifying three-quarters of pass-through income as labor, SYZZ find that the capital share of income for the top 1% is slightly below 50%, vs. slightly above 50% in Piketty, Saez and Zucman (2018). After our revisions, we are back to a capital share slightly above 50%. The changes are small because pass-through income, though significant, is not a major fraction of pre-tax national income for the top 1%, where wages and (non-pass-through) corporate profits are key. Since the turn of the century, S-corporation and partnership income has accounted for 20%–25% of the pre-tax national income of the top 1%.

Third, we warn against estimating factor income shares based only on fiscal income as reported in individual income tax data.[65] These data suffer from a massive selection bias. By definition, owners of pass-through businesses tend to show up at the top of the fiscal income distribution, since all of their business's income—before any tax deduction—passes through to their individual income tax returns. This is in contrast to people who own investments other than shares in pass-through businesses, for whom only a fraction of income—sometimes a negligible fraction—passes through to their individual income tax return. A striking illustration of this bias is given by Warren Buffett, the main shareholder of Berkshire Hathaway. Since

[63] This is because the top marginal labor income tax rate (39.6% + 3.8% Medicare taxes in 2014) was (before 2018) below the top rate on distributed profits (tax rate over 50% when combining the 35% corporate income tax, the 20% tax on dividends and realized capital gains and the 3.8% investment income tax in 2014).

[64] As SYZZ show in their Appendix Figure I.10.B, their finding that a majority of income in the top 1% derives from labor is over-turned when treating private C-corporation wages as disguised capital income. When classifying 75% of pass-through business income as labor and accounting for disguised capital income in private C-corporations, 53% of the income earned by the top 1% derives from capital, vs. 47% for labor.

[65] In SYZZ, half of the results on income composition at the top are based on individual income tax data only; the other half uses the Piketty, Saez and Zucman (2018) distributional national accounts microfiles.

Berkshire Hathaway is not a pass-through business and does not pay dividends, only a small fraction of Buffett's income shows up on his tax return. In 2016 Warren Buffett disclosed he had adjusted gross income of $11.5 million. In the tax data, the owner of a mid-market pass-through business, such as an auto-dealer, has a higher income than Warren Buffet. In reality, Buffett's true income (his share of Berkshire Hathaway's profit, i.e., what would show up on his tax return if Berkshire Hatthaway was a pass-through business) is in the billions of dollars, orders of magnitude larger than his taxable income and the income of successful auto-dealers. Moreover, Buffett derives all of his income from capital: he could stop working and keep earning the same income.

This selection bias is exacerbated when (as done by SYZZ) one excludes capital gains from fiscal income. Six of the ten wealthiest Americans in September 2020—Jeff Bezos, Mark Zuckerberg, Warren Buffett, Larry Page, Sergei Brin, and Elon Musk—are major shareholders of corporations that do not pay dividends (Amazon, Facebook, Berkshire Hathaway, Alphabet, Tesla). If one excludes capital gains, their taxable capital income is negligible. A methodology founded on taxable individual income excluding capital gains is not appropriate to study the capitalists of the 21st century.

The selection bias in the US individual income tax data is large because a large fraction of capital income is missed by these data (Piketty, Saez and Zucman, 2018, Figure I). About two-thirds of economic capital income does not show up on individual income tax returns: all the profits of non-pass-through corporations that are not distributed as dividends; most housing rents; investment income earned in pensions plans; dividends and interest retained in trusts, estates, fiduciaries, etc. Since the majority of capital income does not show up on individual tax returns (while most labor income and pass-through business income shows up), the capital/labor split and the role of private business income cannot meaningfully be studied with individual income tax data only.[66] SYZZ's Figure I (left panel), Figure II, Figure VII (left panel), Figure VIII (left panel, reproduced in Figure 22 below), and Figure IX (left panel), which report statistics on the role of capital vs. labor in tax data, mostly reflect the selection bias inherent in the tax data, not the reality of capital vs. labor in the United States.

Fourth, the question of whether the rich derive most of their income from labor or capital is in our view somewhat misplaced. As shown by Figure 23, the answer entirely depends on what fractile of the distribution one looks at. For billionaires, virtually all income derives from capital:

[66]Note that a growing fraction of pass-through capital income does not show up on individual income tax returns due to the rise of bonus depreciation and the gradual move of the US tax system towards full expensing of business investment; see Section 3.1.

Warren Buffet, Bill Gates, Sergey Brin, etc. could stop working and their economic income would be unchanged.[67] Moving down the distribution, a higher and higher fraction of income derives from labor. As a result, one can always find a threshold, high in the income distribution (perhaps slightly above or slightly below the 99th percentile), above which a majority of income derives from capital. Relatedly, since the capital share rises with income, "person-level" statistics (that weigh a billionaire and a doctor equally) always show a lower role for capital than "dollar-level statistics" (in which billionaires weigh more). For classical economic questions, such as the study of capital accumulation, income and wealth distribution, and factor shares, the relevant statistics are the dollar-weighted ones.

5 Revised Estimates of Wealth and Income Inequality

This Section presents our updated estimates of income and wealth inequality. These estimates incorporate the points raised in Smith et al. (2019), Smith, Zidar and Zwick (2020) and Auten and Splinter (2019) that are well founded, as discussed in the previous sections. They also include numerous other adjustments unrelated to these papers, in particular to improve the international comparability of the series, following the publication of updated Distributional National Accounts guidelines (Alvaredo et al., 2020). Our data jointly estimates wealth and income in a single coherent framework. We discuss inn turn how our changes affect wealth and income inequality.

5.1 Updated Wealth Inequality Estimates

We revise our wealth inequality estimates comprehensively, asset class by asset class. Two key changes need to be highlighted. First, we now incorporate an interest rate premium in recent years for the wealthy when estimating interest-bearing assets. Second, we revise the distribution of business wealth by accounting separately for partnerships and sole proprietorships.

Interest bearing assets. Saez and Zucman (2016, p. 550) called for monitoring the evolution of the interest rate differential they observed in matched estates-income tax data for the period

[67] The question of whether income derives from capital vs. labor is different from the question of whether wealth is inherited vs. self-made. Warren Buffet, Bill Gates, etc. derive 100% of their income from capital. Their wealth, however, is also almost 100% self-made; they did not inherit much. Whether income derives from capital is a very different question from whether wealth is inherited. Capital income is income earned, without any current labor input, from the ownership of assets. That labor inputs may have been provided in the past is irrelevant for the computation of labor vs. capital shares of income (but it does matter for the computation of the share of wealth inherited vs. self-made).

2008–2012 and to adjust the capitalization method accordingly if need be.[68] The evidence from recent years, in particular the extension of the Saez and Zucman (2016) matched estates-income data to the period 2012–2016 by Smith, Zidar and Zwick (2020), have generally confirmed the presence of a small interest rate premium at the top. Over 2008–2016, the interest rate r of estates above \$20 million has been equal to around 1.3–1.4 times the macro interest rate r_m on average. These new data points call for a more moderate adjustment than the one proposed in the Saez and Zucman (2016) appendix series (Table B41c) that used $r/r_m = 1.6$.

We revise our estimation of interest-bearing assets by factoring in the interest rate premium observed in matched estates-income tax data. Consistent with the theory developed in Section 2.2.2, we capitalize interest at the top using the observed interest r of the wealthy. Specifically, we capitalize the interest of the top 1% wealthiest tax units using an interest r equal to 1.15 times the average interest rate between 2003 and 2007, and equal to 1.4 times the average interest rate starting in 2008. We apply these heterogeneous interest rates to tax units ranked by wealth, proceeding by iteration. That is, we first construct wealth using homogeneous returns, and then reconstruct wealth using heterogeneous returns, ranking tax units by wealth estimated in the first step.

In addition, in our revised series fixed-income claims are now decomposed into assets that generate interest for tax purposes (interest-bearing deposits and taxable bonds and loans held outside of mutual funds) and assets that generate dividends for tax purposes (taxable bonds and loans held through mutual funds, including money market funds). Both types of assets are estimated separately. Dividend-generating fixed-income claims are allocated proportionally to non-qualified dividends starting in 2003 and proportionally to all dividend income before 2003. Interest-generating assets are allocated proportionally to interest income, with the interest rate differential adjustment described above.

The main effect of this revision is to reduce the importance of fixed-income claims at the top of the wealth distribution, especially in the post-2008 period. Figure 24 shows the evolution of the revised top 0.1% with details on asset composition. Interest-bearing assets now account for 27% of the wealth of the top 0.1% in 2016.

This revision brings asset composition in line with the evidence from the Federal Reserve. As shown by Figure 25, the share of fixed income claims in the net wealth of the top 1% is

[68] See Saez and Zucman (2016, p. 550): "We retain our baseline top 0.1% wealth share estimate because only a few hundred non-married individuals die with estates above \$20 million each year. As a result, there is likely significant noise in the annual series, making it difficult to make a precise and systematic inference of the true interest premium at the top. Looking forward, should new evidence show that taxable returns rise or fall with wealth, then it would become necessary to specifically account for this fact—and similarly when applying the capitalization technique to other countries."

almost identical in our series and in the Distributional Financial Accounts since 1989. For instance, in both datasets, the top 1% held 30% of its wealth in fixed-income claims in 1995 and 22%–23% in 2018. (The Distributional Financial Accounts start in 1989 and do not report statistics for groups smaller than the top 1%). More broadly, our revised series are now fully consistent with the Distributional Financial Accounts, the most comparable official statistics. Figure 26 compares the top 1% wealth shares (among equal-split adults) in our revised series and the top 1% wealth share (among households) in the August 2020 Distributional Financial Accounts. In both level and trend, the series are very close; see Saez and Zucman (2020b) for a detailed comparisons of our updated series and the Distributional Financial Accounts.

Business wealth. We revise our estimates of business wealth to treat sole proprietorships separately from partnerships. Our original methodology assigned the same capitalization factor to sole proprietorship income and partnership income, because the Financial Accounts do not decompose equity in non-corporate businesses into a partnership component and a sole proprietorship component. We now estimate this breakdown by using the raw sources that the Financial Accounts use to estimate equity in non-corporate business assets.

The Financial Accounts estimate the assets and liabilities of non-corporate businesses using the balance sheets of partnerships reported to the IRS and the Survey of Business Finance for sole proprietorships (as sole proprietorships do not reported balance sheets for tax purposes). Sole proprietorship assets in the latest wave of the Survey of Small Business Finance are extrapolated forward based on income reported by sole proprietorships (e.g., a constant ratio of bank deposits to income is assumed).

Closely following the Federal Reserve, we estimate household equity in partnerships (excluding residential real estate, which is part of housing wealth in our series even when held through partnerships) in five steps (see Appendix Table I-S.B7). First, we start with the official estimate of partnerships' non-residential fixed assets at current cost reported by the Bureau of Economic Analysis. Second, we partially upgrade non-residential fixed assets to market values, following the methodology used by the Federal Reserve to estimate the balance sheet of non-financial non-corporate businesses in the Financial Accounts Table B.104.[69] Third, we add land (not part of fixed assets) as reported in partnership tax returns. Fourth, we estimate partnerships' financial

[69]The upgrade factor is equal to the ratio of (i) non-corporate businesses' non-residential real estate at market value, plus equipment at current cost, plus intellectual property product at current cost, plus inventories (all taken from the Financial Accounts Table B.104) minus non-corporate farm land to (ii) non-corporate businesses non-residential fixed assets at current cost (from the BEA fixed asset statistics). The ratio fluctuates around 150% over time with no trend. In practice, this correction essentially amounts to upgrading commercial real estate to market values, while other assets (equipment, intellectual property) remain at current cost.

assets and liabilities as the total amount of financial assets and liabilities of non-financial non-corporate businesses reported in the Financial Accounts Table B.104, minus the financial assets and liabilities of non-farm sole proprietorships (from the Survey of Small Business Finance) and farms (from the Financial Accounts).[70] Last we add the small amount of household equity in unincorported brokers & dealers estimated in the Financial accounts. We find that household partnership equity wealth equaled $3.8 trillion in mid-2016.

We compute sole proprietorship wealth using a similar procedure, isolating farm from non-farm sole proprietorships; see Appendix Table I-S.B7 for complete details and formulas. We find that from 2010 to 2019, partnership equity wealth averaged 21% of national income (with a rising trend) and the wealth of sole proprietorships averaged 11% of national income (with no trend), in both cases excluding residential real estate.[71]

We cross-checked these results with the Survey of Consumer Finances (see Appendix Table I-S.B8). First, sole proprietorship plus farm wealth totals $1.9 trillion in the 2016 SCF, i.e., 12% of national income, very similar to our estimate. Some of the businesses that are recorded as active LLCs in the Survey of Consumer Finances may also be sole proprietorships, since single-owner LLCs file as sole proprietorships by default. However, IRS statistics show that, in 2016, non-farm sole proprietorships registered as LLCs earned the equivalent of only 16% of all non-farm sole proprietorship net income.[72] Sole proprietorship LLCs are thus unlikely to have significant assets. Second, the wealth of partnerships is higher in the SCF (45% of national income in 2016) than in our estimate (24% in 2016). This is due to a number of reason. Our estimate excludes residential real estate partnerships (whose assets are treated as housing wealth in our series, to improve consistency with rental income in the national accounts and in income tax returns). Moreover, following the Federal Reserve, our estimate is only partially at market value: commercial real estate and other structures are at market value (based on real estate market prices) but other assets are at current cost. Last, our estimate excludes hedge funds and private equity funds, which are not part of the non-corporate business sector in the Financial Accounts, but included in the household sector.

Accounting separately for sole proprietorship and partnership wealth increase business wealth

[70]Note that partnerships often own other partnerships. Such holdings are recorded as offsetting financial assets and liabilities in the Financial Accounts Table B.104 and have no impact on households' equity in partnerships (called "net worth" in Table B.104). Corporate holdings of partnerships are a liability which reduce households' equity in partnerships.

[71]By construction, our estimate of partnership equity wealth, plus sole proprietorship wealth, plus rental residential real estate (net of mortgages) adds up to households' equity in non-corporate businesses as recorded in the Financial Accounts Table B.101. See Appendix Table I-S.B6.

[72]See "Sole Proprietorship Returns, Tax Year 2017," SOI Bulletin, available here, Figure K.

concentration, in line with what is seen in the Federal Reserve Distributional Financial Accounts. This is because partnerships have more wealth underlying any dollar of income than sole proprietorships in recent decades. Partnerships are more capital intensive: they are much larger than sole proprietorships and operate in more capital intensive sectors. A sizable amount of partnership wealth is in real estate (commercial real estate, land leasing, etc.) and oil-related sectors (e.g., pipeline transportation), highly capital intensive sectors where sole proprietorships are negligible. Our previous methodology which capitalized similarly a dollar of income earned by a sole proprietorship and a partnership over-estimated sole proprietorship wealth and under-estimated partnership wealth. Note that we keep matching the official Financial Accounts totals for household equity in non-corporate businesses, totals which are on the low end since business assets other than real estate is at current cost instead of market values.

Last, as described in Section 4.2 above, we apply heterogenous capital and labor shares to partnership income. In our revised series, and consistent with the available evidence (Figure 20 and Saez and Zucman, 2020), the capital share of business income rises with wealth: small partnerships, like sole proprietorships, mostly earn labor income; while in large partnerships, business income is closer to corporate profits, i.e., to capital income. Since labor income is disregarded when estimating business wealth, this heterogeneity leads to more business wealth concentration.

Corporate equity wealth. We improve the estimation of equity wealth. In our previous series, we used a "mixed method" to capitalize dividends and capital gains: to rank tax units only dividends were capitalized; to compute equity wealth, both dividends and capital gains were capitalized. We implement three improvements.

First, we now always put a weight of 50% on dividends and 50% on realized capital gains, i.e., we distribute half of directly-held equity wealth proportionally to dividends and half proportionally to realized capital gains (in our previous series, the weight put on capital gains was de facto higher in years with large capital gains realizations). Second, for both rankings and shares, we now capitalize dividends and a smoothed measure of capital gains. This smoothed measure of capital gains is equal to the capital gains realized on average by the tax unit and its closest 20 neighbors in terms of wealth (estimated by capitalizing equity solely with dividends). This procedure allows us to have the same measure of equity wealth (and total wealth) when ranking tax units and when computing their wealth. This greatly simplifies use while reproducing almost exactly the results from our original "mixed method." This micro-level mixed methodology is much superior to capitalizing equity using dividends and capital gains as capital

gains are too lumpy at the individual level. Last, we use qualified dividends starting in 2003 instead of all dividend income. Qualified dividends exclude the dividends generated by money market and bond funds (which we use to estimate wealth held in money markets and bond funds, see above).

These changes have relatively modest impacts, as (i) capital gains, qualified dividends, and ordinary dividends are usually distributed similarly, (ii) the "micro mixed method" gives results similar to the "macro mixed method" applied previously.[73]

Matching the Forbes 400. We now adjust equity wealth at the very top to match the amount of billionaire wealth implied by *Forbes* each year. Between 1982 and 2005, we adjust the equity wealth of the top 400 so that total top 400 wealth matches *Forbes* (reducing equity wealth proportionally in the rest of the distribution). We make no correction before 1982 (in 1982 the share of wealth owned by the top 400 is small according to Forbes, less than 1% of aggregate wealth vs. more than 3% in recent years). Starting in 2006 we implement the same correction but for a group slightly larger than the top 400, namely billionaires (estimated using the Forbes 400 and Pareto-interpolation techniques).

This adjustment is motivated by the fact that the capitalization method, which infers equity wealth based on dividends and realized capital gains, does not accurately capture the wealth of billionaires who receive no dividend and barely realize any capital gains. This problem has become more severe in recent years with the rise of giant tech companies that do not distribute dividends yet. Six of the ten wealthiest Americans in July 2020—Jeff Bezos, Mark Zuckerberg, Warren Buffett, Larry Page, Sergei Brin, and Elon Musk—collectively worth around $500 billion in July 2020 (0.5% of total US wealth wealth), are major shareholders of corporations that do not pay dividends.

S-corporations. As described in Section 4.2 above, and just like for partnerships, we apply heterogeneous capital and labor shares to S-corporation profits. In our revised series, and consistent with the available evidence (Figure 20 and Saez and Zucman, 2020), the capital share of S-corporations profits rises with wealth: small S-corporations mostly earn labor income; while in large S-corporations, S-corporation profit has a high capital component. Since labor income is disregarded when estimating S-corporation wealth, this heterogeneity leads to more concentration of S-corporation equity wealth.

[73]The only notable exception is in 2009 and 2010, when the new methodology delivers lower equity wealth at the top end. As a result the 2001–2010 and 2010–2016 dynamics of top wealth shares are now more consistent with those seen in the SCF and Distributional Financial Accounts.

Housing wealth. We revise the distribution of owner-occupied housing to better match the Federal Reserve SCF and Distributional Financial Accounts. Our original methodology aimed at matching the share of housing wealth owned by the top 10% of the wealth distribution in the SCF, but it did not attempt to match the share of housing wealth owned by the top 1%. As noted in footnote 22 of Saez and Zucman (2016), according to the SCF, property taxes are regressive at the top, with top 1% and top 0.1% households having substantially lower property tax rates than average. As a result, assuming constant property tax rates as in our benchmark methodology under-estimates housing wealth at the top relative to the SCF. We now incorporate the observed property tax rate differential seen between the top 1% and the rest of the population in the SCF.[74] This translates into a small increase in housing wealth in the top 1% and reconciles our estimate of owner-occupied housing wealth in the top 1% with the Distributional Financial Accounts.

We also fix a classification error in the estimation of aggregate mortgage debt. In our previous series, mortgages on commercial real estates were included under tenant-occupied-housing mortgage debt. In our revised series, commercial real estate mortgages are correctly subtracted from business equity wealth (not housing wealth). This translates into an increase in housing wealth net of mortgages.

Pension wealth. Last, we improve the treatment of pension wealth. Our previous methodology aimed at matching the amount of wealth found in the SCF for the top 10%, but did not specifically target the top 1%. We now match the amount of pension wealth owned by the top 1%. To do so we reduced the weight put on non-taxable pension distributions (vs. taxable pensions). Specifically, we now allocate 60% of pension wealth proportionally to taxable pension distributions, 30% proportionally to wages and 10% proportionally to non-taxable pension distributions (e.g., Roth IRA distributions). This allows us to match the amount of pension wealth seen in the SCF supplemented by the Sabelhaus and Henriques-Volz (2019) estimates of defined benefit pensions. This revision reduces the top 1% wealth share by 1–1.5 points in recent years. The share of pension wealth in the total wealth of the top 1% in now the same as in the Distributional Financial Accounts.

[74] SZZ develop a more sophisticated method to infer housing wealth with property taxes using state-level information available solely in the internal tax data, paving the way to produce state-level wealth distribution estimates. Our proposed change is a coarse way to achieve the same result for the US as a whole.

5.2 Updated Income Inequality Estimates

We revise our income inequality estimates comprehensively, income component by income component. Two key changes need to be highlighted. First, we improve the estimation of pension income going to the top 1% in recent decades. Second, we now deal with business income more granularly.

Pension Income. Our revision of pension income parallels the changes to pension wealth described just above. Just like 60% of pension wealth is now allocated proportionally to taxable pension distributions, 30% proportionally to wages and 10% proportionally to non-taxable pension distributions (e.g., Roth IRA distributions), the same weights are used to allocate private pension distributions. Our earlier treatment used a weight on non-taxable pension income that varied over years and could be higher than 10%, especially in recent years. This revision reduces the top 1% pre-tax income share by about 0.6 point in 2016 compared to the estimates reported in Piketty, Saez and Zucman (2016).

Mixed business income. Paralleling our revision of business wealth, the estimation of business income is improved by treating partnerships and sole proprietorships separately. We decompose mixed business income into a partnership and sole proprietorship component using the same raw data sources as those used by BEA to estimate mixed income (i.e., tax returns, corrections for depreciation based on the balance sheets of businesses reported to the IRS, corrections for other differences between economic income and taxable income, correction for tax evasion based on random audits, etc.). Consistent with our analysis of the wealth of sole proprietorships vs. partnerships and the results in Saez and Zucman (2020), we allocate 50% of partnership mixed income to capital (vs. 50% to labor) and 20% of sole proprietorship income to capital (vs. 80%). This averages to an overall capital share of mixed income of close to 30%, which was the assumption retained in our original series, but allows for a finer analysis of factor shares by income group.

In a similar vein, we now treat S-corporation equity as a separate asset class, distinct from other corporations. Our earlier estimates treated S- and C-corporations together, as the NIPAs do not decompose corporate profits into S-corporations vs. C-corporations profits. The NIPAs only estimate S-corporation dividends separately. We now compute a specific equity income

[75] In reality S-corporations may have slightly negative retained earnings, as corporations that make losses do not distribute negative dividends. This will be taken into account once the BEA releases official decompositions of corporate profits into S-corporation profits vs. other corporate profits.

flow for S-corporations vs. other corporations. The equity income of S-corporations is equal to dividends paid by S-corporations (as estimated in the NIPAs) plus the share of business property taxes paid by S-corporations; we assume that S-corporations have no retained earnings.[75] We allocate business property taxes to S-corporations proportionally to the share of S-corporation equity in total corporate equity. We do no allocate any corporate tax to S-corporations. Treating S-corporations as a separate asset class has small effects on the distribution of income, but it allows for a more precise analysis of income sources.

Figure 27 reports the composition of the top 1% income share. In 2018, the main income sources for the top 1% (as a fraction of the total income earned by the top 1%) are compensation of employees (26%), equity income from non-pass-through corporations (19%), partnership income (14%), pension income (10%), and S-corporation income (10%). All the rise of the top 1% income share since the late 1990s appears to be due to the rise of capital income, as found in Piketty, Saez and Zucman (2018).

Tax rates. Taxes are allocated as in Saez and Zucman (2019b) and as in the international guidelines of Alvaredo et al. (2020); see Saez and Zucman (2019c) for a conceptual discussion of this allocation. There is no methodological change compared to Saez and Zucman (2019b). Figure 28 reports the effective tax rate of the top 0.1% (including all taxes at all levels of government, and expressed as a fraction of pre-tax income) in the original Piketty, Saez and Zucman (2018) series, the Saez and Zucman (2019b) series, and the updated series presented in this paper. As the graph shows, the revisions to wealth and income made in this paper have only a trivial effect on the top tax rates reported in Saez and Zucman (2019b). The Saez and Zucman (2019b) and current series differ somewhat from the original Piketty, Saez and Zucman (2018) series for the reasons discussed in the online appendix of Saez and Zucman (2019b) and in Saez and Zucman (2019c).

6 Conclusion

Scientific knowledge advances through debates (although not all debates necessarily advance scientific knowledge). In the case of the measurement of US inequality, the recent debate, as we have shown in this paper, has undoubtedly been useful. We are grateful to Auten and Splinter (2019), Smith, Zidar and Zwick (2020), and Smith, Yagan, Zidar and Zwick (2019) for encouraging us to reassess and improve some of our estimation procedures. Three issues nonetheless deserve to be noted.

First, there is an incentive to contradict earlier work. This is partly a good thing: it is more important to know that a received wisdom is false than confirming priors. But the incentive is one sided: papers that "reverse" previous findings are more easily published (or attract more attention) than research confirming these earlier findings.[76] This imbalance risks distorting research output. It could partly be addressed by changing publication and promotion norms, to value more successful replications and rigorous extensions of existing work.

Second, working on topics of policy relevance—such as inequality and what to do about it—makes it difficult if not impossible to insulate the scientific debate from the political debate. The two debates are necessary to a well functioning democracy but they obey different rules. The scientific debate is about improving our understanding (e.g., our understanding of inequality and of policy impacts) while the political debate is about advocacy and influencing outcomes. The political process can fairly easily exploit discrepancies in scientific output for advocacy purposes and claim that researchers hopelessly disagree. In areas ranging from the health effects of tobacco to climate change, this process, facilitated by "merchants of doubt," has had dramatic consequences in the past (Oreskes and Conway, 2011).

Third, we stress the need for better and more comprehensive public statistics on inequality. Our academic career has been about improving the measurement of inequality using existing classical sources (e.g., Piketty and Saez, 2003), finding new data sources (e.g., Zucman 2013), getting access to administrative data for research and helping setting it up for systematic research (e.g., Chetty, Friedman, Saez, and Yagan, 2018), encouraging agencies to broaden data access (Card et al. 2010), and creating systematic and regularly updated databases (World Inequality Database, 2017). This work has made us well aware of the genuine difficulties involved in measuring inequality—documented at length in our work. The solution to these difficulties involves a more systematic collection of data for public statistical purposes; the creation of improved conceptual frameworks to organize these data; the collaboration of researchers across institutions and across countries to establish broadly-agreed, harmonized statistical standards. Ultimately the best data about inequality would be published by government agencies, accountable to elected representatives, discussed by the press and parties with a stake in their improvement, and based on a regularly updated, internationally-agreed conceptual framework. We have little patience for the view that "inequality is impossible to measure."

[76] See for instance the cover story by *The Economist* titled "Inequality Illusions" (November 2019), based on the three papers discussed in this article.

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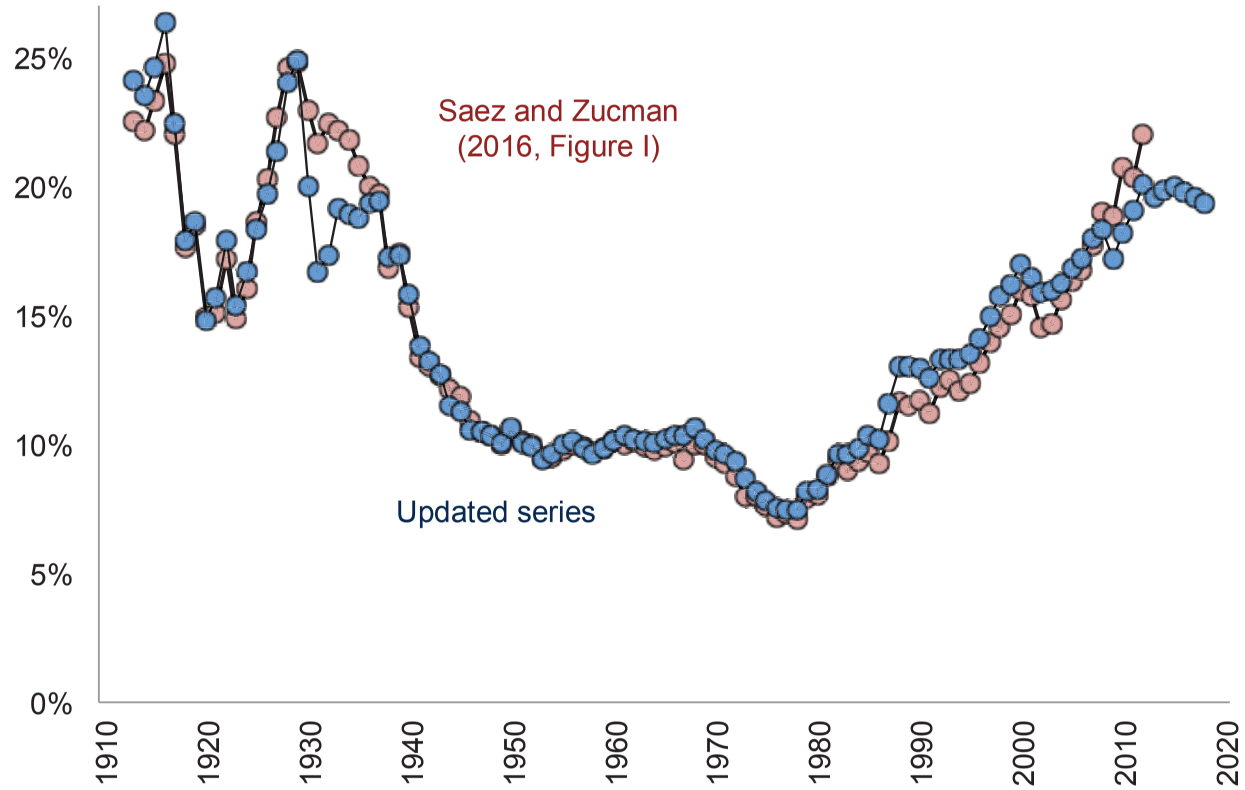
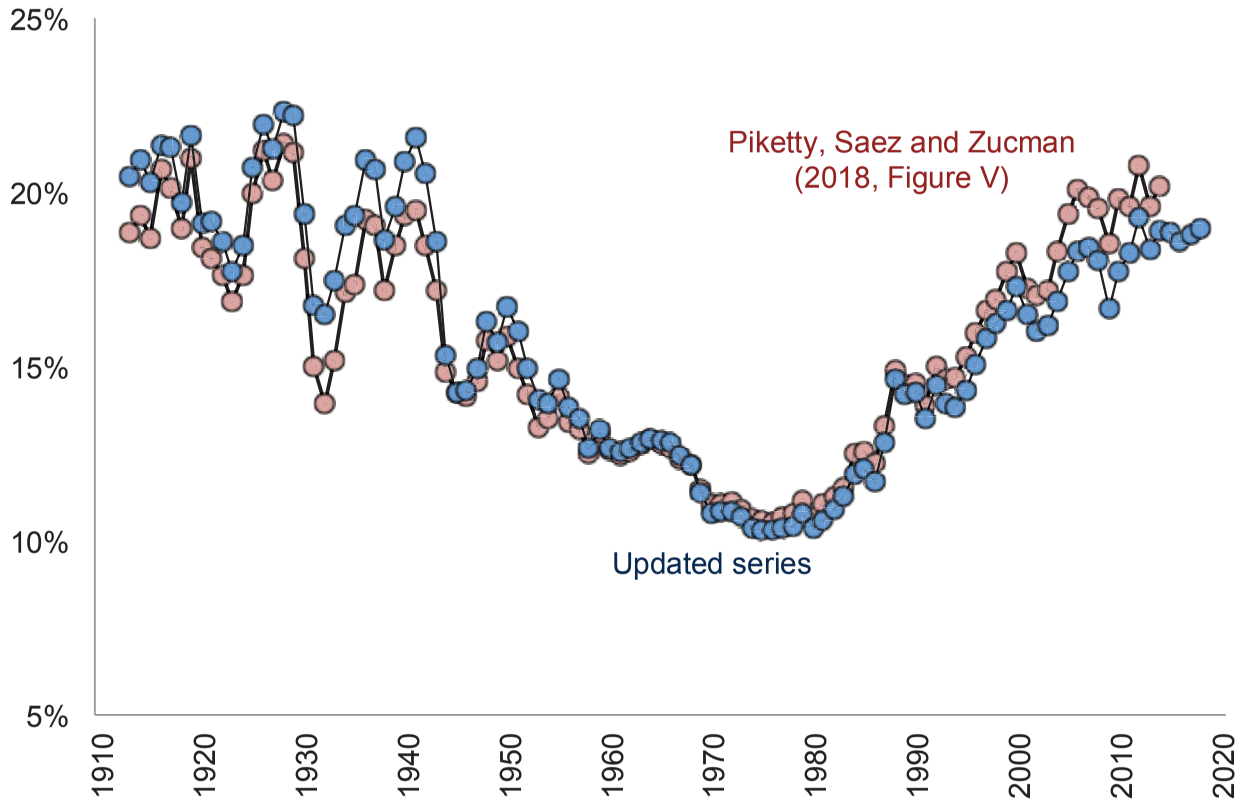
Figure 1: Top 0.1% wealth share (tax units)



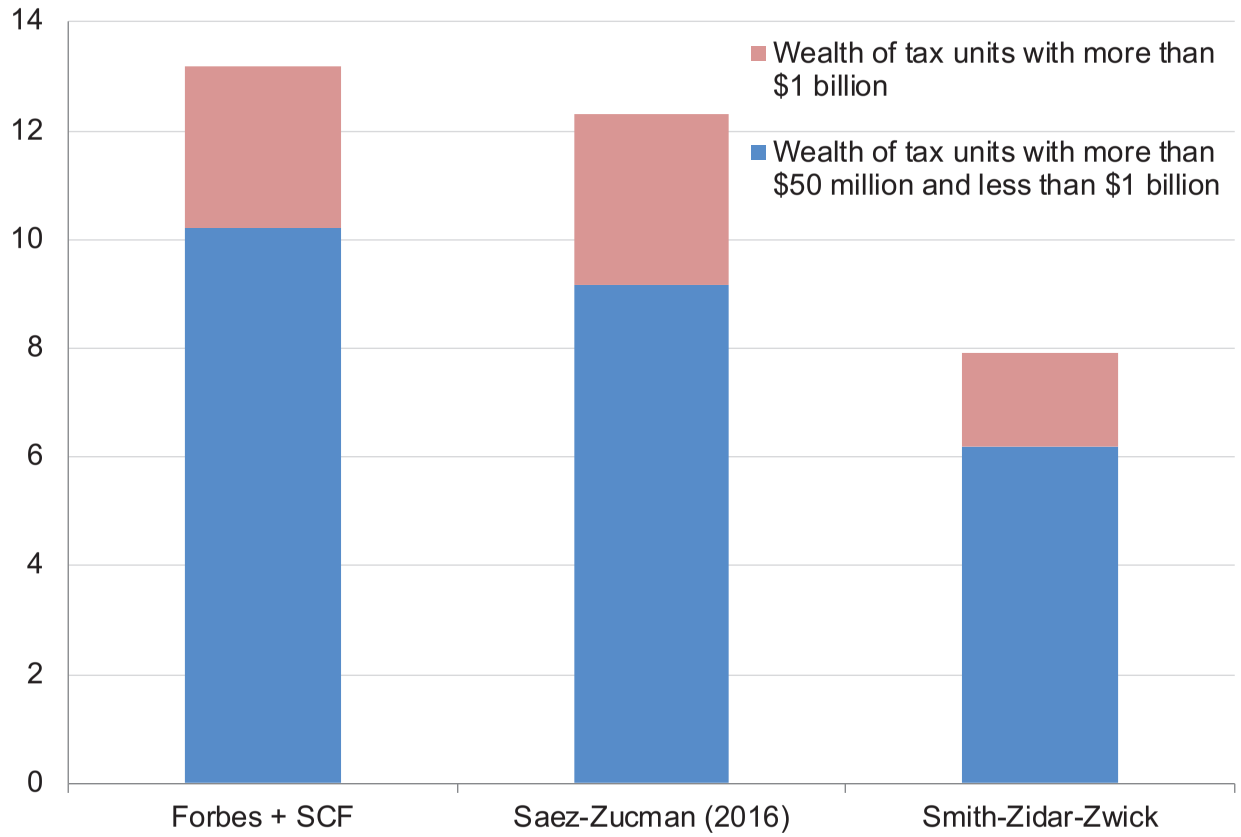
Notes: This figure compares the share of wealth owned by the top 0.1% richest tax units, as estimated and printed in Saez and Zucman (2016, Figure I) and the share of wealth owned by the top 0.1% richest tax units in the updated estimates presented in this paper. The correction for the 1930s was already done in Piketty, Saez, and Zucman (2018) and due to an error in our initial estimation. Our updated estimates track our earlier estimates closely since the 1960s, except for the Great Recession period of 2008-2012 where the updated series show less of a rise in inequality.

Figure 2: Top 1% Pre-Tax Income Share (Equal-Split Adults)



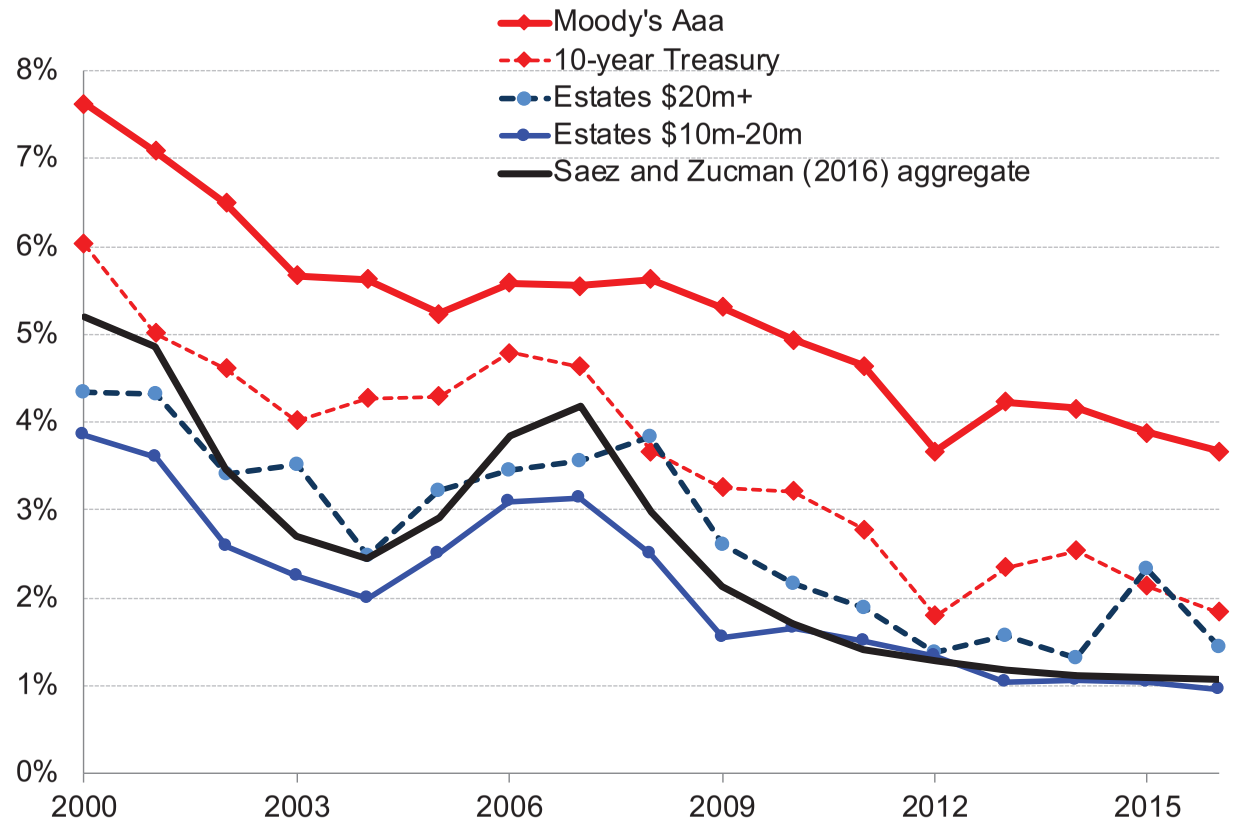
Notes: This figure compares the share of pre-tax national income earned by the top 1% adults (with income equally split among married spouses), as estimated and printed in Piketty, Saez and Zucman (2018, Figure V) and the share of pre-tax national income earned by the top 1% adults (with income equally split among married spouses) in the updated estimates presented in this paper.

Figure 3: Wealth of Tax Units With Net Wealth Above $50 Million In 2016 ($ Trillion)



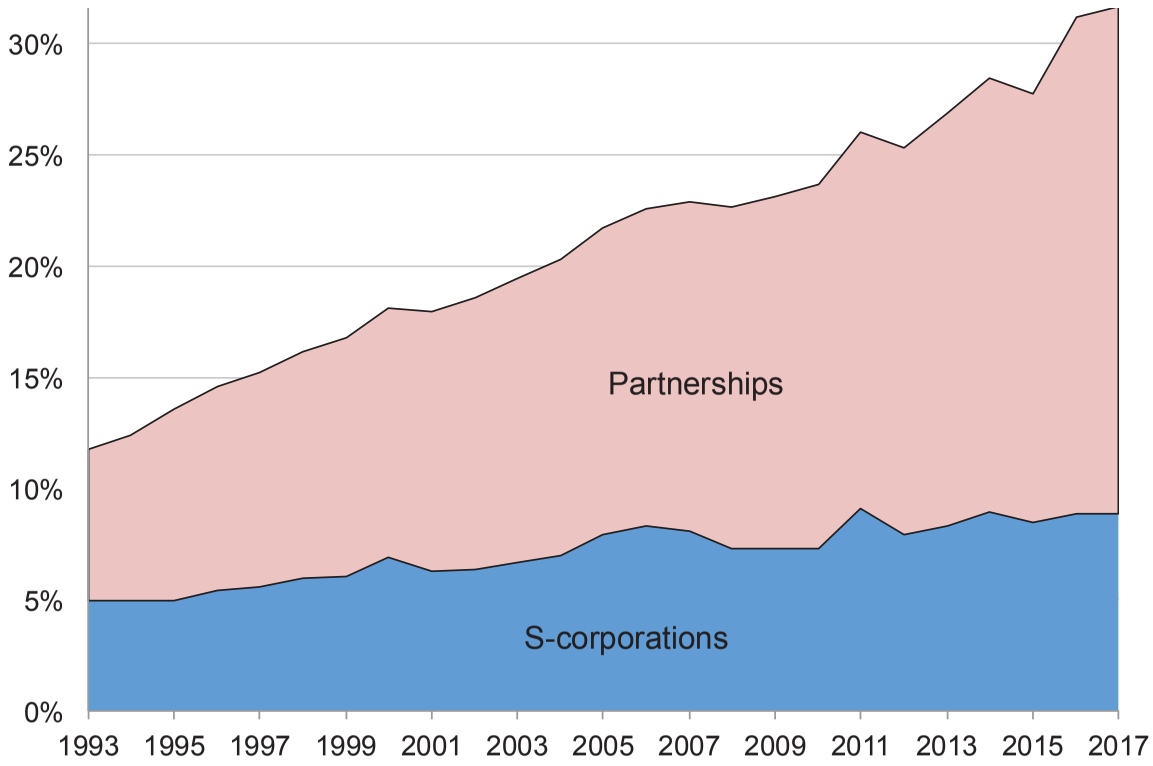
Notes: This figure compares the amount of wealth owned by tax units with more than $50 million in net wealth in 2016 according to three sources: the Survey of Consumer Finances supplemented by the *Forbes* 400, the benchmark Saez and Zucman (2016) estimates, and SZZ. Saez and Zucman (2016) capture 90% of the wealth of tax units with net wealth between $50 million and $1 billion recorded in the SCF, and 105% of the SCF + *Forbes* billionaire wealth. SZZ (2016) capture 61% of the wealth of tax units with net wealth between $50 million and $1 billion recorded in the SCF, and 57% of the SCF + *Forbes* billionaire wealth. Therefore, the SZZ estimates of top wealth are substantially lower than the classical SCF and Forbes sources.

Figure 4: Interest Rates Overall, for Top Estates, and Moody's Aaa and 10-Year Treasury Yields



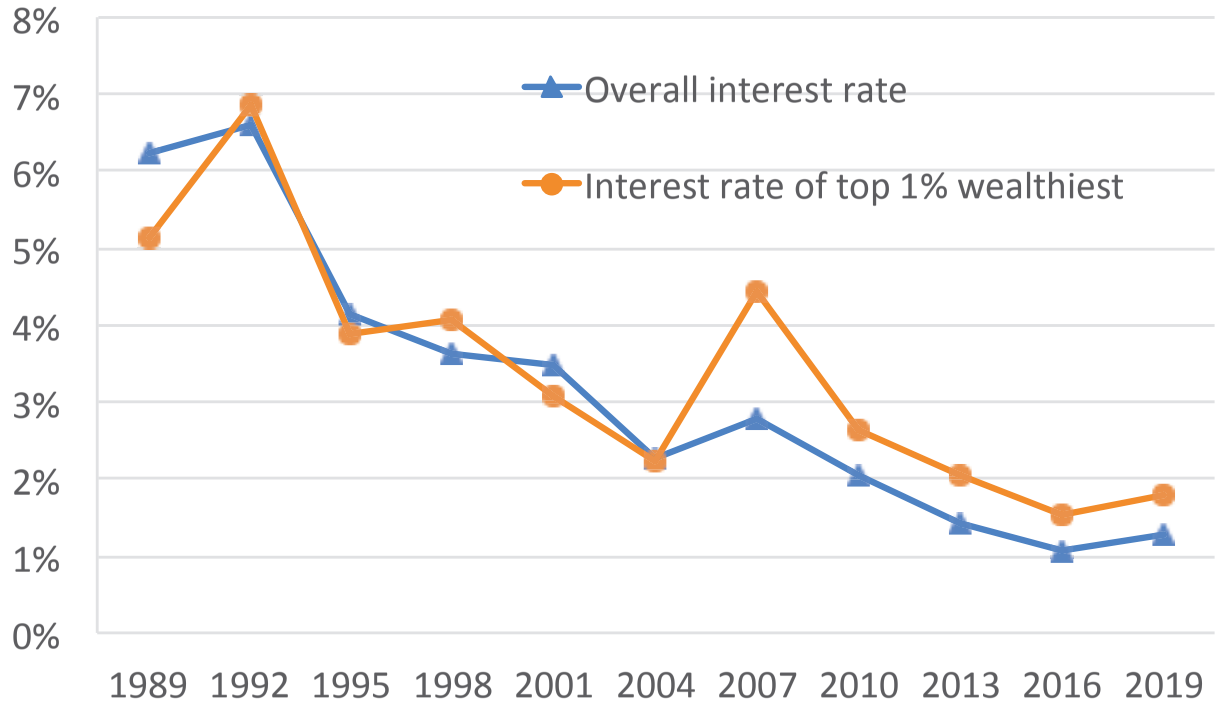
Source: Interest rates in matched estates-income tax returns taken from Saez and Zucman (2016, Appendix Table C6b) for 2000–2011 and from SZZ Appendix Figure A.15 Panel A for 2012–2016. The Saez and Zucman (2016) aggregate is revised to exclude bond mutual funds from the denominator (as such bonds pay dividends and not interest). The figure depicts Moody's Aaa (high quality corporate bonds with maturity over 20 years) and the 10-year Treasury rate. The interest rate of large estates is generally lower than the 10-year treasury rate and substantially lower than the Moody's Aaa rate.

Figure 5: Share of Taxable Interest Earned via Pass-Through Businesses



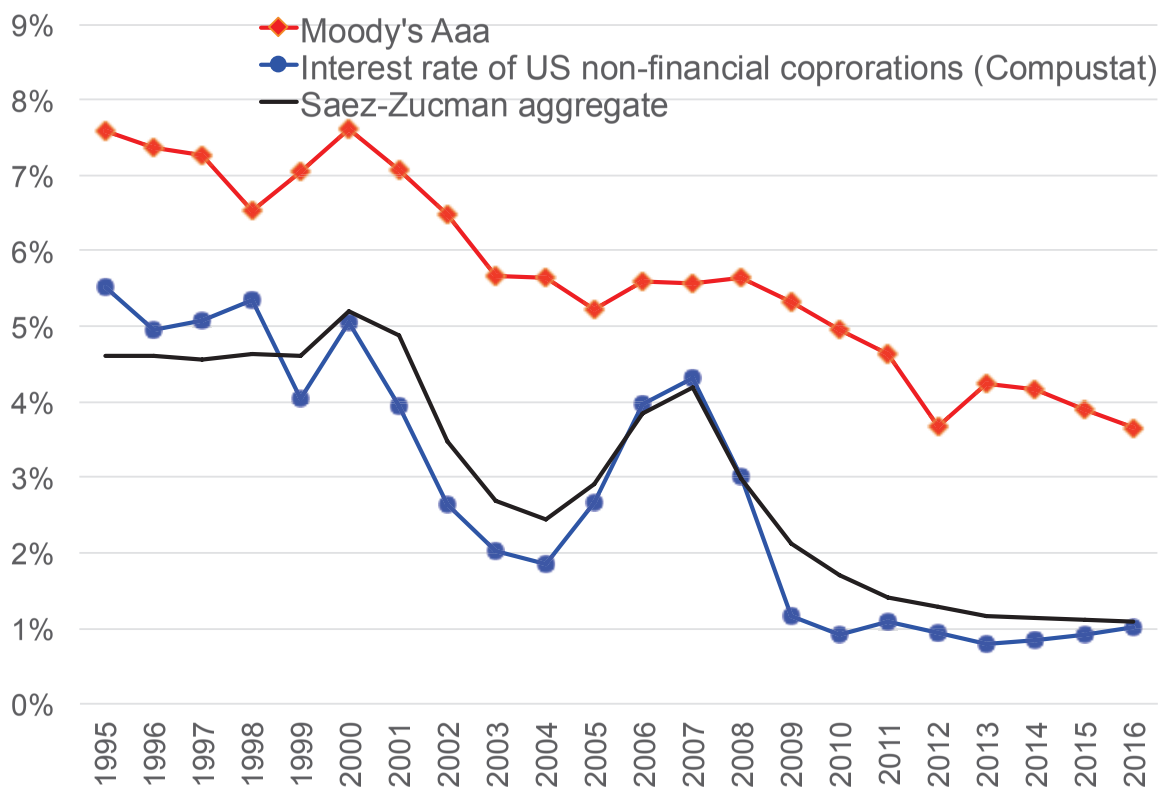
Notes: *Partnerships.* In 1993, 1994, 1995, partnership interest distributed to individuals is estimated by multiplying the amount of interest distributed by partnerships by the fraction of total partnership income distributed to individuals, within sector. This should should be seen as an upper bound for the amount of interest received by individuals in those years, as the ratio of interest to total distributed income may have been lower for individuals than for other types of partners (the pattern seen in 2011 in Cooper et al., 2016, Fig. 8B). In 2011, interest income distributed by partnerships to individuals is estimated using Cooper et al. (2016) and SOI data, as follows. Interest accounts for 6.8% of partnership income received by individuals (Cooper et al., 2016, Figure 8B), and individuals received $297b from partnerships (SOI tabulations of forms 1065), hence individuals received around 6.8% x $297 = $20.3 billion in interest. Between 1995 and 2011, the share of interest received from partnerships in total 1040 taxable interest is interpolated linearly. After 2011, interest received by individuals from partnerships is estimated by assuming that the share of interest paid by partnerships that goes to individual partners is equal to its 2011 value, 11.9%. *S-corporations.* S-corporation taxable interest flowing to individuals is taken from SOI tabulations of 1120S forms. Note that we always exclude tax-exempt interest, which is reported separately by S-corporations and partnerships.

Figure 6: Overall and Top 1% Wealthiest Interest Rates in the SCF



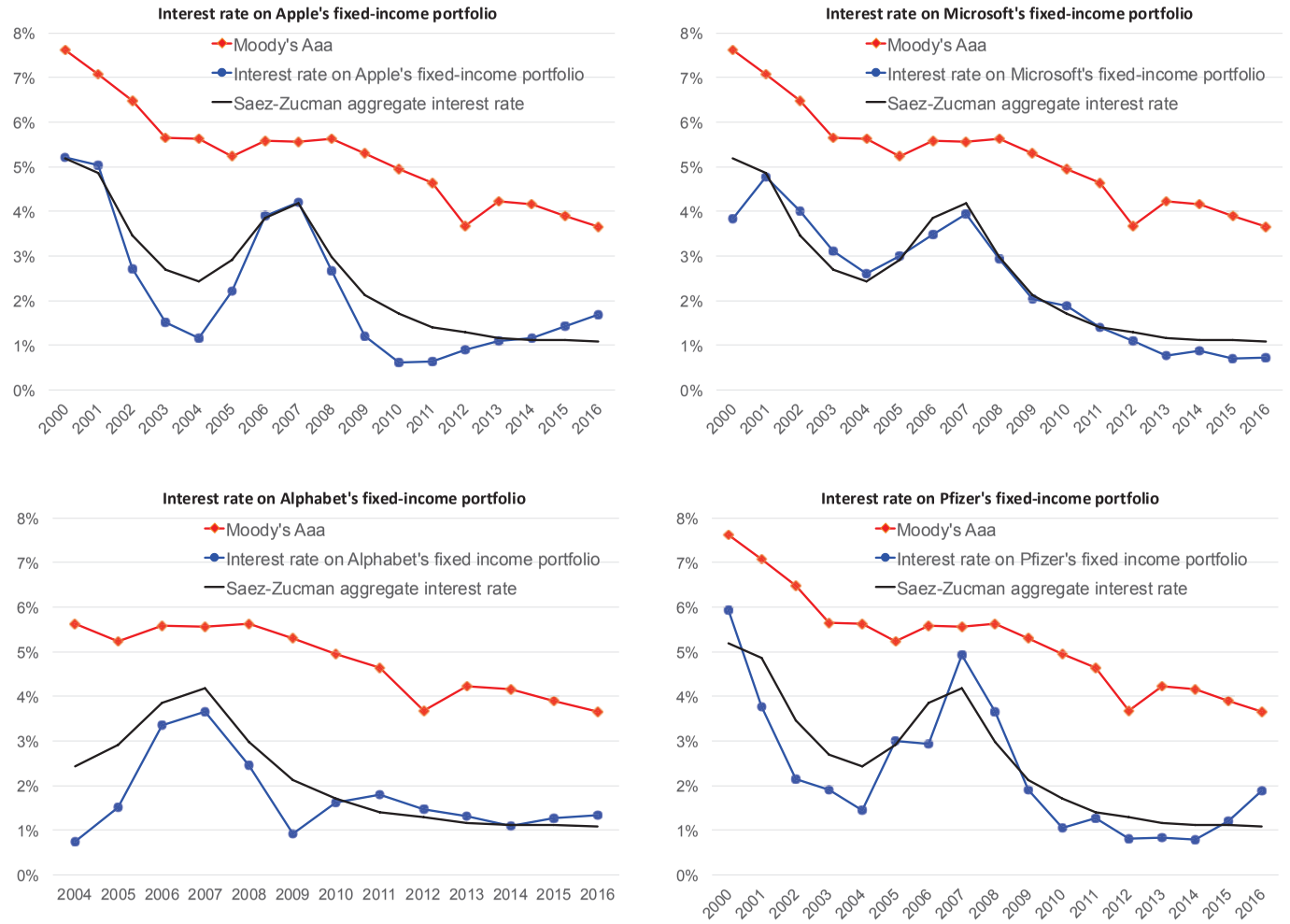
Source: This figure depicts the interest rate among all households and among the top 1% wealthiest in the Survey of Consumer Finances. This is the interest rate on assets that generate taxable interest. Such assets include saving accounts ("saving"), money market accounts ("mmda"), call accounts at brokerage firms ("call"), certificate of deposits ("cds"), saving bonds ("savbnd"), all bond directly held ("bond") that are not tax exempt ("notxbnd"), and fixed claims held through trusts. It excludes all fixed claim assets held through mutual funds as such assets pay dividends and not interest for tax purposes. Interest income in the SCF includes interest income earned through passthroughs (partnerships and S-corporations) but the corresponding fixed claim assets cannot be identified separately from business wealth. Therefore, we uniformly reduce all three depicted interest rates using the fraction of interest income earned through passthroughs from Figure 5. Interest earned through passthroughs is very likely concentrated among the wealthy and taking this into account would further narrow the gap in the overall interest rate and the interest rate of the wealthy. In the series depicted, the interest rates of the rich follow the overall interest rate except for 2007-2016 when an interest premium on the rich arises In 2010-2019, the interest premium of the top 1% is stable around 40%.

Figure 7: Interest Rate Earned by Listed Corporations



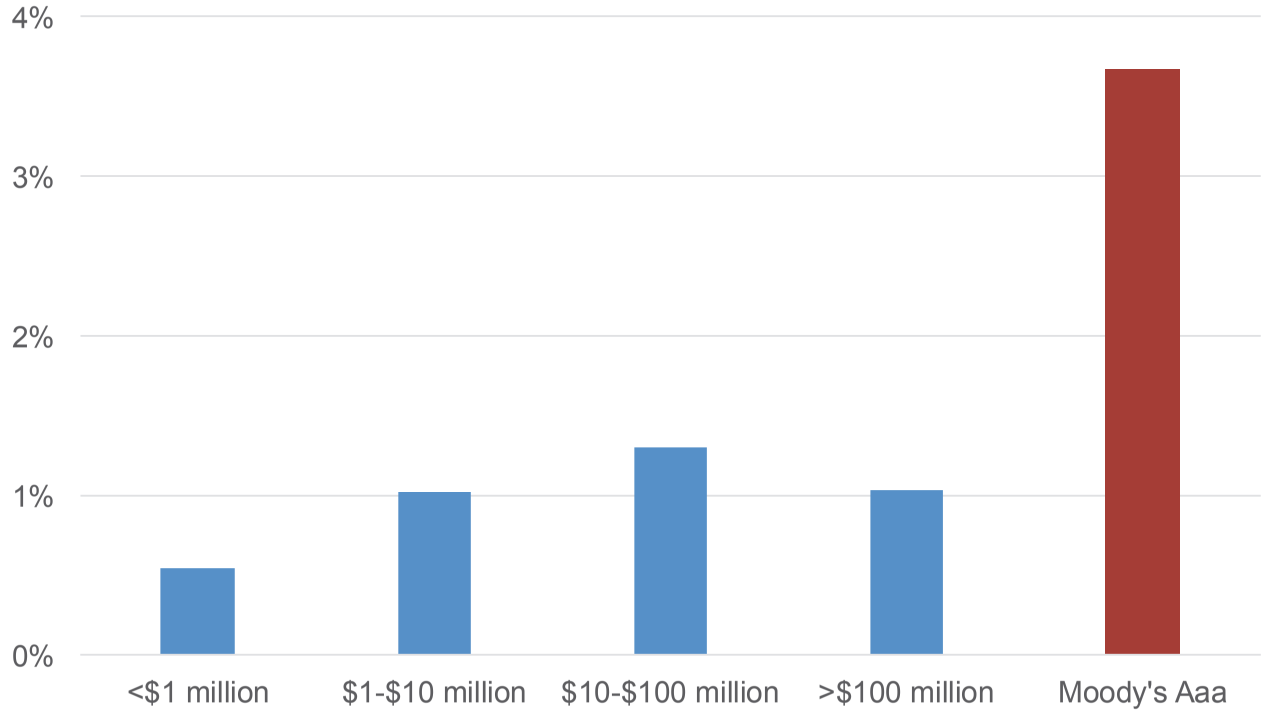
Notes: Interest rates are computed in Compustat as the ratio of interest and dividend income earned ("idit") to cash and short-term investments ("che") plus investments and other advances ("ivao"). According to 10-k reports, virtually all other investments are in fixed-income securities, and dividend income earned is negligible. The sample includes all listed US corporations (excluding financial corporations and real estate corporations) for which the variable "idit" is not missing or zero in Compustat.

Figure 8: Interest Rate Earned by Large Listed Corporations



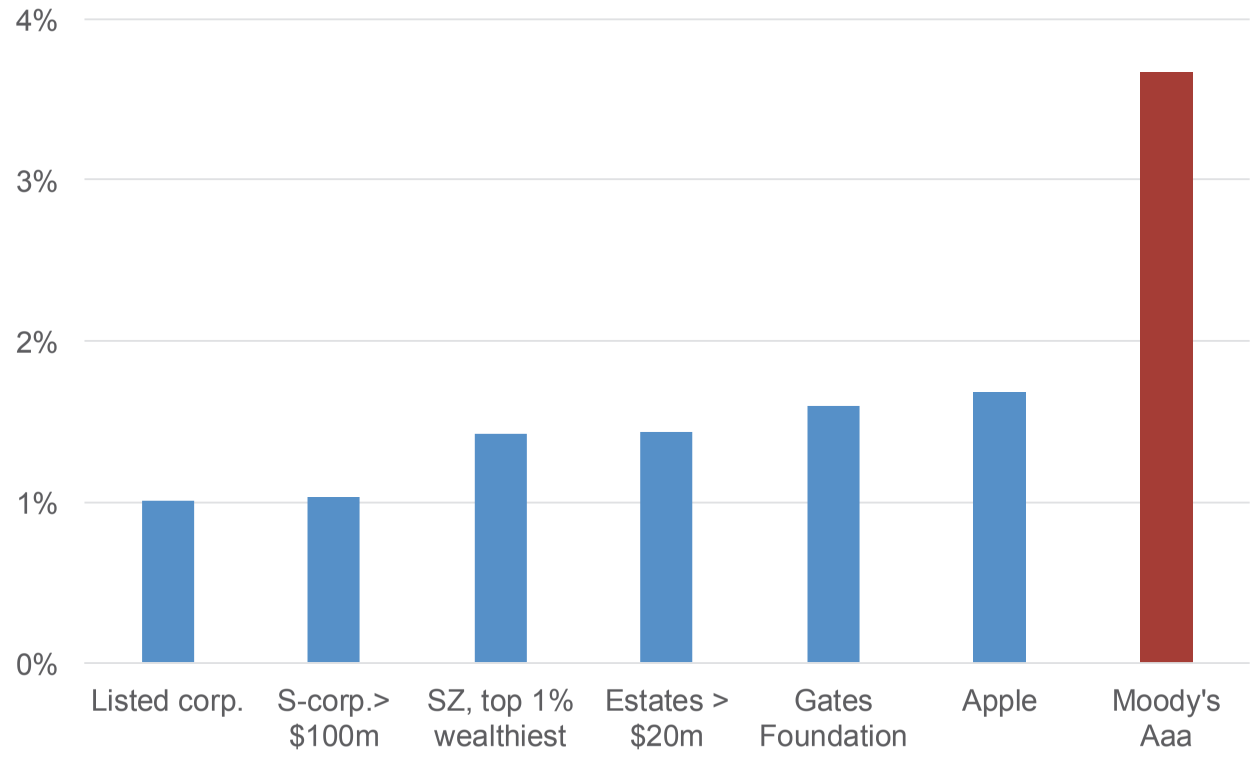
Notes: Interest rates are computed using either 10-k reports or Compustat data. They are obtained by dividing total interest income earned by total fixed-income claims (cash, interest-bearing deposits, and portfolios of fixed-income securities).

Figure 9: Interest Rate Earned by S-Corporations (2016)



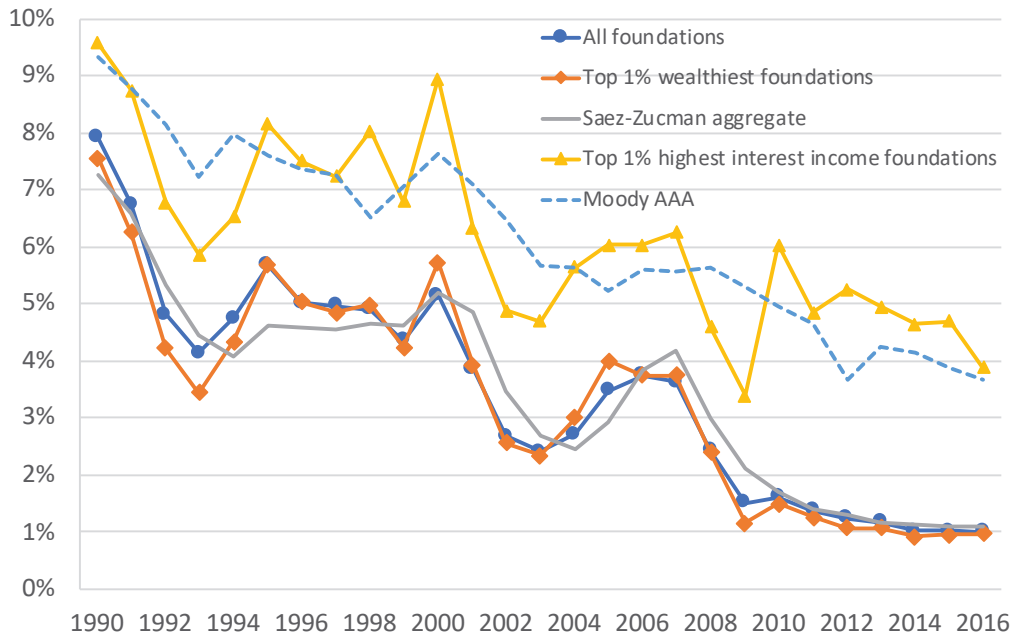
Notes: Interest rates are obtained by dividing taxable interest by the sum of cash, US government obligations, loans to shareholders, and mortgage & real estate loans. Source: SOI tabulations of 1120S tax returns.

Figure 10: Yield on Interest-Bearing Assets in 2016



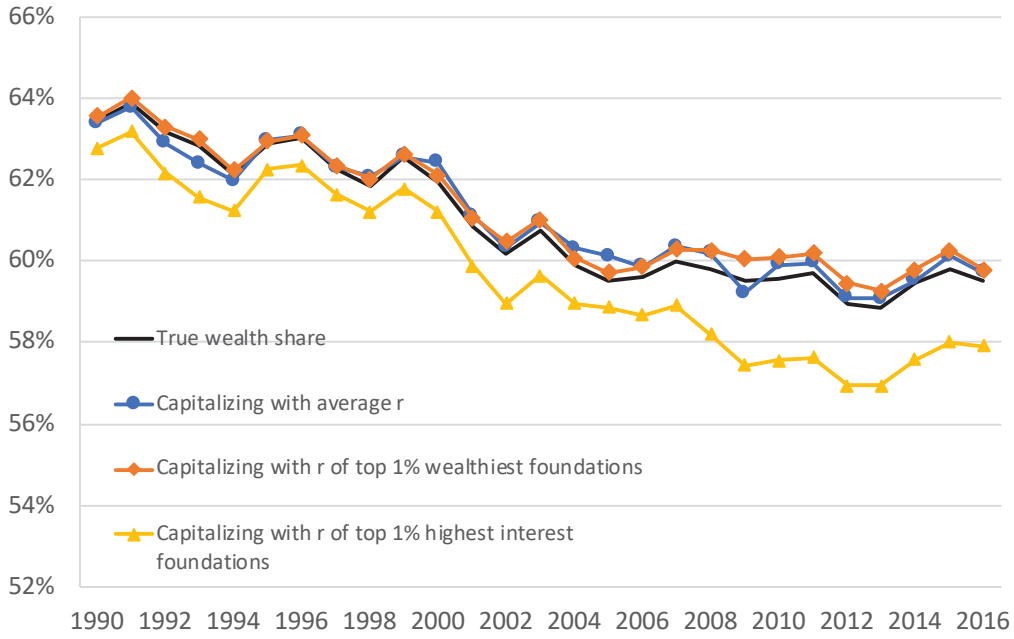
Source: *Listed corporations:* see Figure 7 above. *S-corporations:* see Figure 9 above. *Bill and Melinda Gates foundation:* publicly available tax return and Morningstar, see text. *Estates above $20 million:* SZZ Appendix Figure A.15 panel A, updating Saez and Zucman (2016, Figure V.B.).

Figure 11: Interest Rate on Savings Accounts of US Foundations



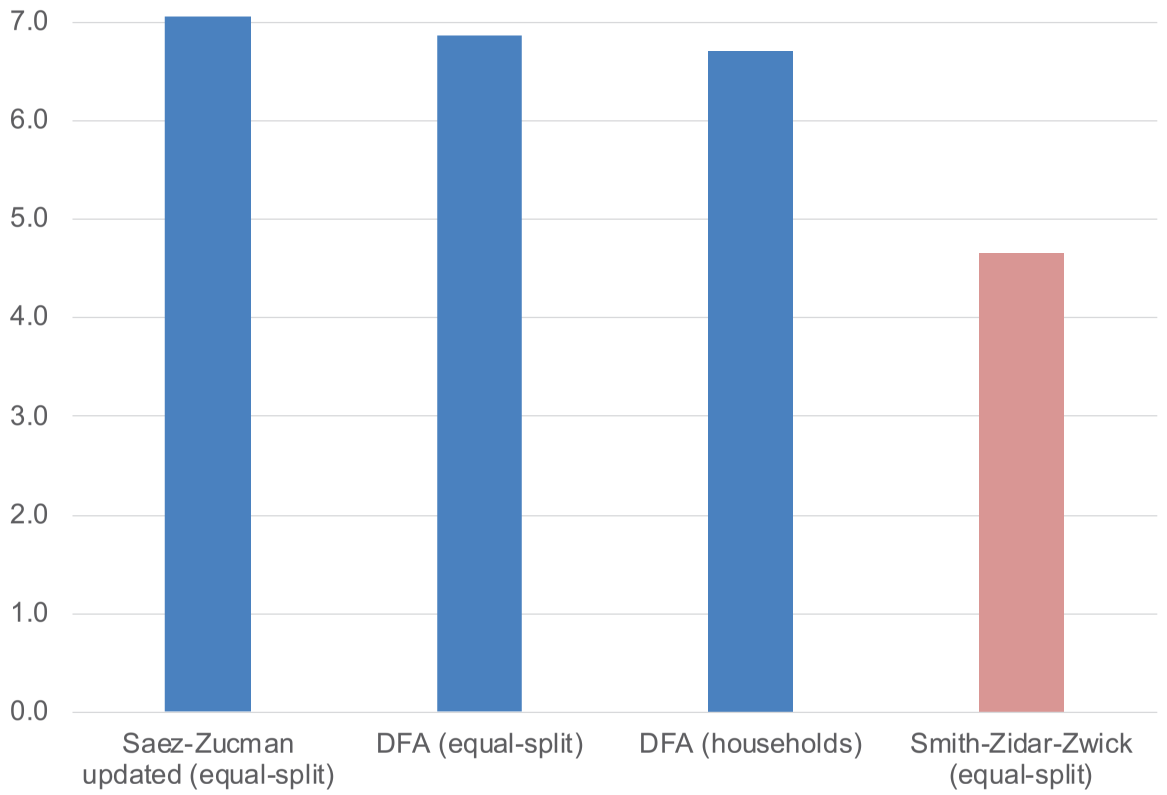
Notes: this figure depicts the interest rate on savings accounts of US foundations from 1990 to 2016 using publicly available IRS micro-data on foundations at `https://www.irs.gov/statistics/soi-tax-stats-private-foundations-harmonized-microdata-files-ascii`. The first series in dark blue circles depicts the interest rate when using all foundations (total interest earned summed across all foundations divided by total savings accounts, i.e. interest rate weighting by savings account size). The second series in orange diamonds depicts the interest rate of the top 1% wealthiest foundations. These two series track each other very closely implying that wealthy foundations do not earn a higher interest rate on savings accounts than average. The third series in grey straight line depicts the revised Saez-Zucman interest rate used to capitalize interest income on individual income tax returns. This series tracks fairly closely the interest rate earned by foundations (overall and wealthy ones) on their savings accounts. The fourth series in yellow triangles depicts the interest rate of the top 1% highest interest income earning foundations. This interest rate is much higher due to selection (as high interest income selects both on savings accounts size and interest rate). It is comparable in magnitude to the Moody AAA interest rate (depicted in dashed line as the fifth series).

Figure 12: Top 1% Foundations Wealth Shares with Various Capitalization Methods



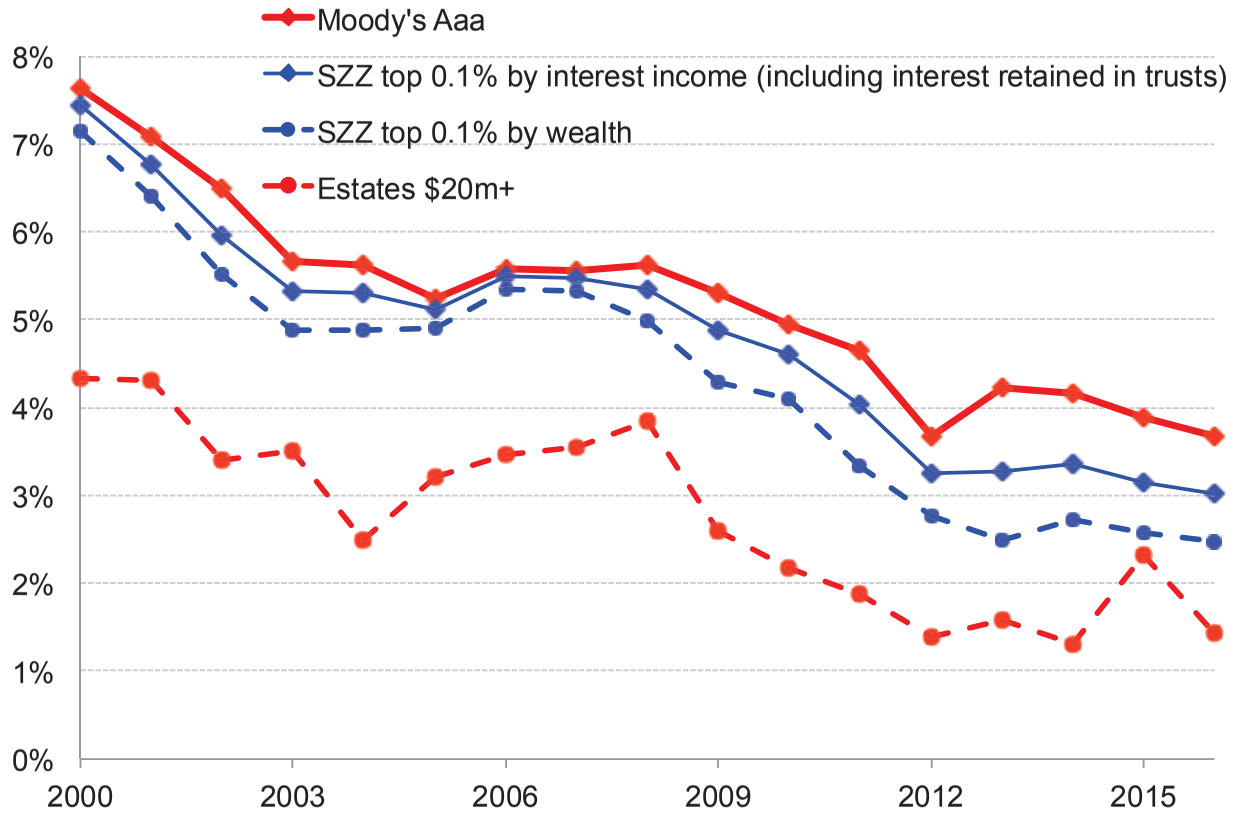
Notes: this figure depicts the share of total foundation wealth owned by the top 1% foundations (ranked by size of net wealth). The first series in solid black line is the true wealth share using wealth reported on the foundations' tax returns. The next three series estimate the top 1% wealth shares capitalizing saving accounts wealth using interest income (for this specific asset class) and using various assumptions on the interest rate from Figure 11. All other asset classes are estimated using the actual reported wealth for these asset classes. The second series in dark blue circles uses as interest rate the average interest rate across all foundations as in the basic SZ methodology. The third series in orange diamonds uses as interest rate for the top 1% wealthiest foundations (ranking by wealth excluding savings accounts) the average interest rate of the top 1% wealthiest foundations as in SZ revised methodology. The fourth series in yellow triangles uses as interest rate for the top 1% highest interest earnings foundations the average interest rate of the top 1% highest interest earnings foundations as in the SZZ methodology. In the last two series, the interest rate for other foundations is taken as constant and set to match aggregates. The graph shows clearly that the SZ and the revised SZ method provide accurate estimates while the SZZ method underestimates top wealth shares because it underestimates savings accounts at the top, exactly as predicted by the theory. The bias is more severe in recent years when the interest rate is lower. The asset class of savings accounts is about 5% of total wealth.

Figure 13: Fixed-Income Claims Owned by the Top 1% in 2016 (Trillions of $)



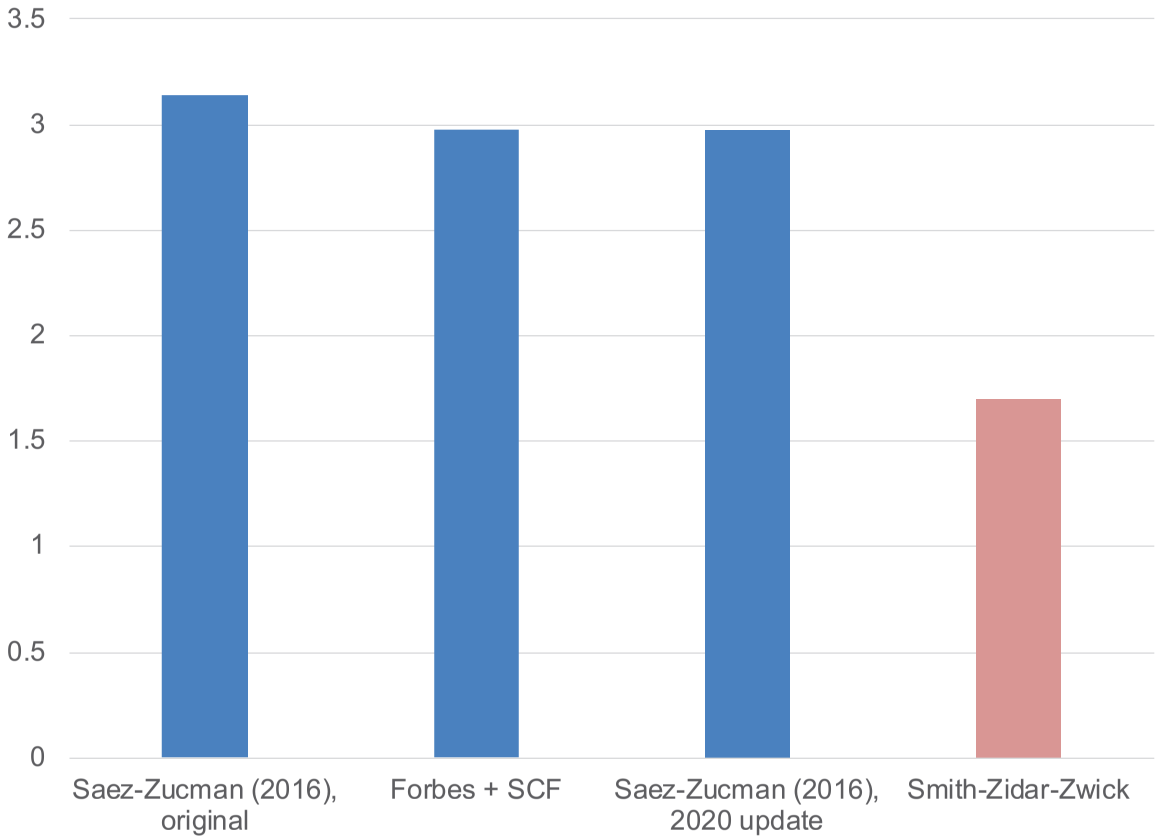
Note: fixed-income claims include checkable deposits and currency, time deposits and short-term investments, money market fund shares, debt securities, loans, and the fraction of mutual fund assets invested in bonds and loans; minus fixed-income claims held in IRAs. The aggregate for all households is $15.0 trillion in mid-2016 in all series (i.e., the Financial Accounts totals). Sources: *Federal Reserve Distributional Financial Accounts (DFA):* downloaded August 2020; 2016 Q3 estimate. Fixed-income claims held in IRAs by the top 1% are estimated as 10% of total fixed-income claims in IRAs; mutual fund assets invested in bonds and loans are estimated as 10.8% of the amount of "Corporate equities & mutual fund shares" assets owned by the top 1% (the aggregate ratio). The equal-split DFA estimate is obtained as 1.025 times the household DFA estimate (see SZZ Figure A16 Panel D). *SZZ:* Fig. 14 Panel C. *Saez-Zucman updated:* total fixed-income assets (variable hwfix, $7.44t for the top 1%) excluding miscellaneous assets (variable miscw, $0.37t).

Figure 14: Interest Rates at the Top in Smith, Zidar and Zwick (2020)



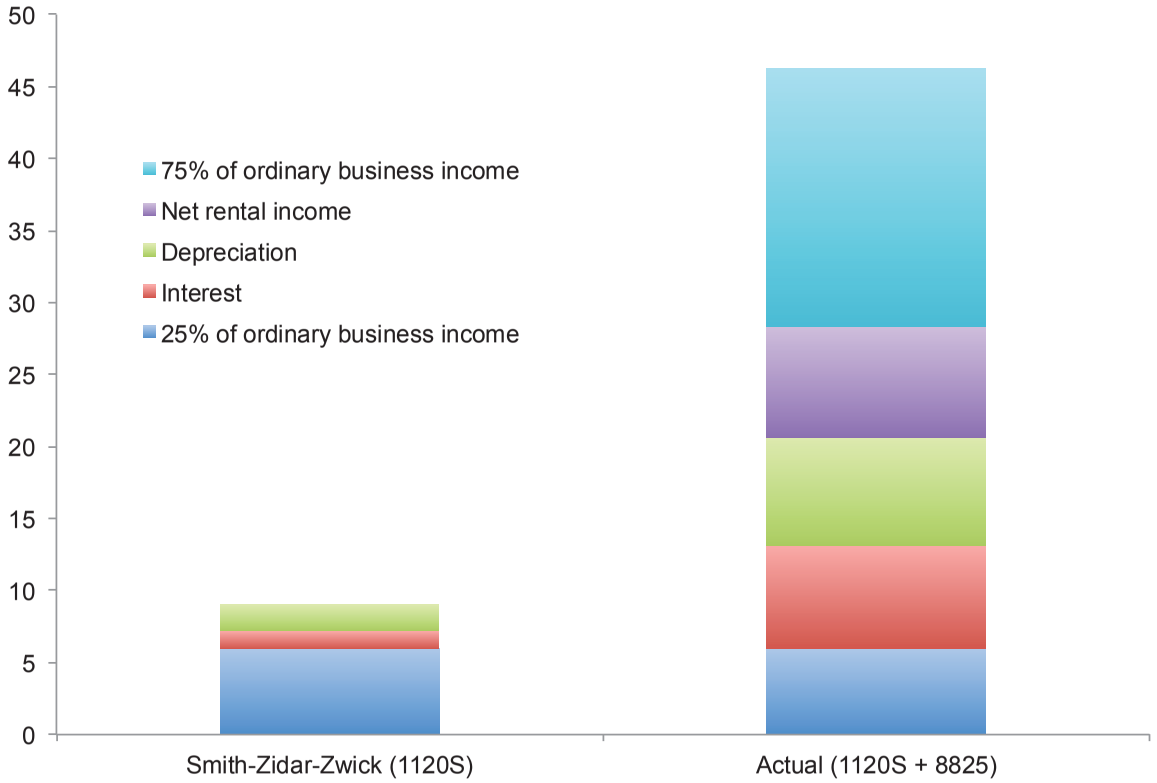
Note: Moody's Aaa is the rate used by SZZ to capitalize interest income, ranking tax units by interest excluding interest retained in trusts (including retained in trusts) computes the average interest rate of the top 0.1% when ranking by total interest (including retained in trusts). Estates above $20m: see Figure 4. SZZ Top 0.1% by wealth: see text.

Figure 15: Wealth of American billionaires in 2016 (Trillions of $)



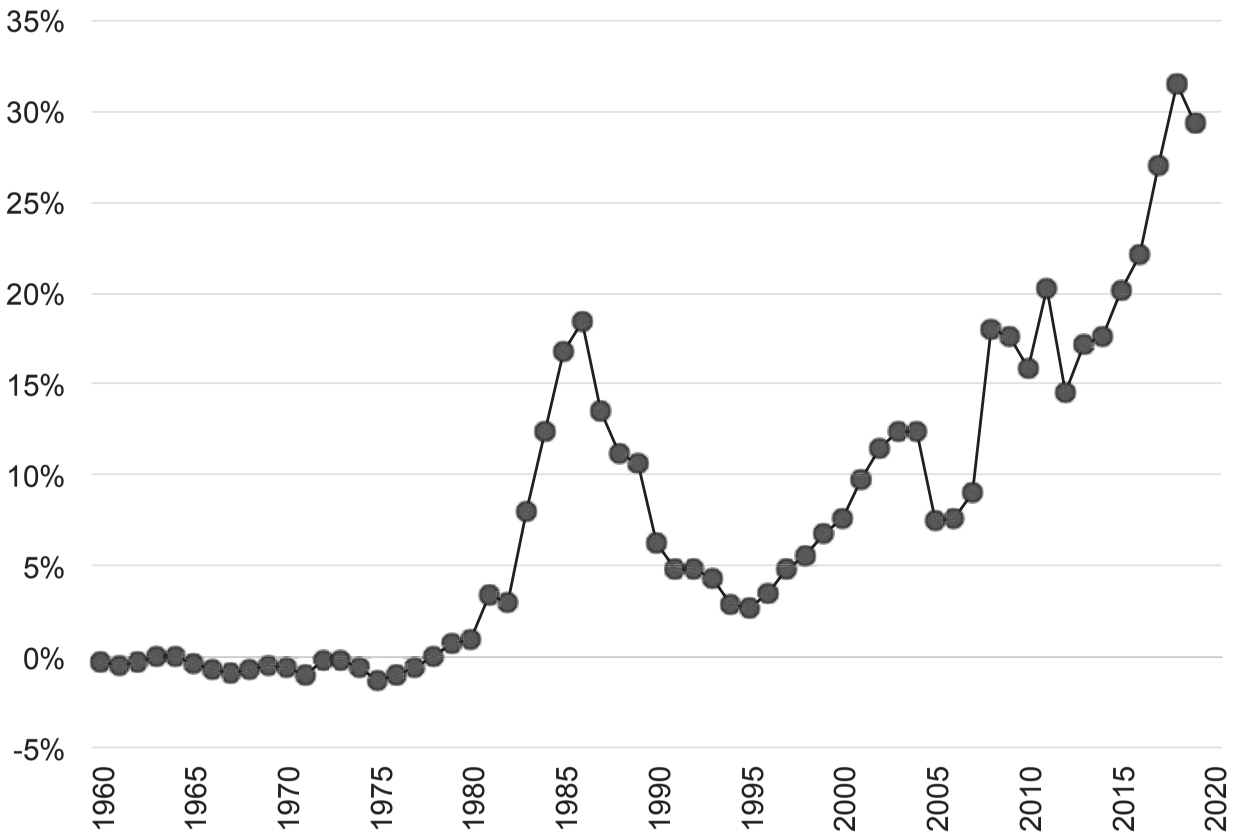
Notes: *Forbes + SCF* is the estimate of billionaire wealth obtained by appending the Forbes 400 to the SCF, which by construction excludes the Forbes 400. *Saez-Zucman (2016), original* is the estimate from the Distributional National Accounts microfiles of Piketty, Saez and Zucman (2018), which use the benchmark Saez and Zucman (2016) method to estimate wealth. *Saez-Zucman (2016), 2020 update* is from the updated series presented in this paper. Both the SZZ and the Saez and Zucman (2016) estimates reported here are at the tax unit level, conceptually comparable to the unit of observation for *Forbes* and SCF at the top.

Figure 16: Profits Before Interest, Tax, and Depreciation of Real Estate S-Corporations ($ Billion)



Notes: This figure compares earnings before interest, tax, and depreciation (EBITD) as used by SZZ to estimate the wealth of real estate S-corporations (using only form 1120S) vs. actual EBITD (using form 1120S and 8825) in 2016. Source: SOI tabulations of forms 1120S and 8825. Because SZZ do not include interest and depreciation expensed on rental income schedules (form 8825) they significantly under-estimate the true EBITD of real-estate S-corporations, and hence significantly under-estimate their wealth.

Figure 17: Excess of Tax Depreciation Over Economic Depreciation for Non-Farm Non-Corporate Businesses (% of Non-Farm Proprietor's Income)



Notes: This figure shows the ratio of the NIPA capital consumption adjustment (i.e., the excess of tax depreciation over economic depreciation) for non-farm sole proprietorships and partnerships (NIPA Table 7.13 line 14) to NIPA non-farm proprietor's income excluding capital consumption adjustment (NIPA Table 7.14, line 11). The figure shows that a high and growing fraction of the true economic income of non-corporate businesses (primarily partnerships) is exempt from taxation due to the rising generosity of tax depreciation rules. Auten and Splinter (2019) incorrectly classify the gap between tax and economic depreciation as tax evasion, which they then incorrectly allocate to the bottom 99% of the income distribution.

Figure 18: The Allocation of Underreported Income in Auten and Splinter (2019)

Table 3

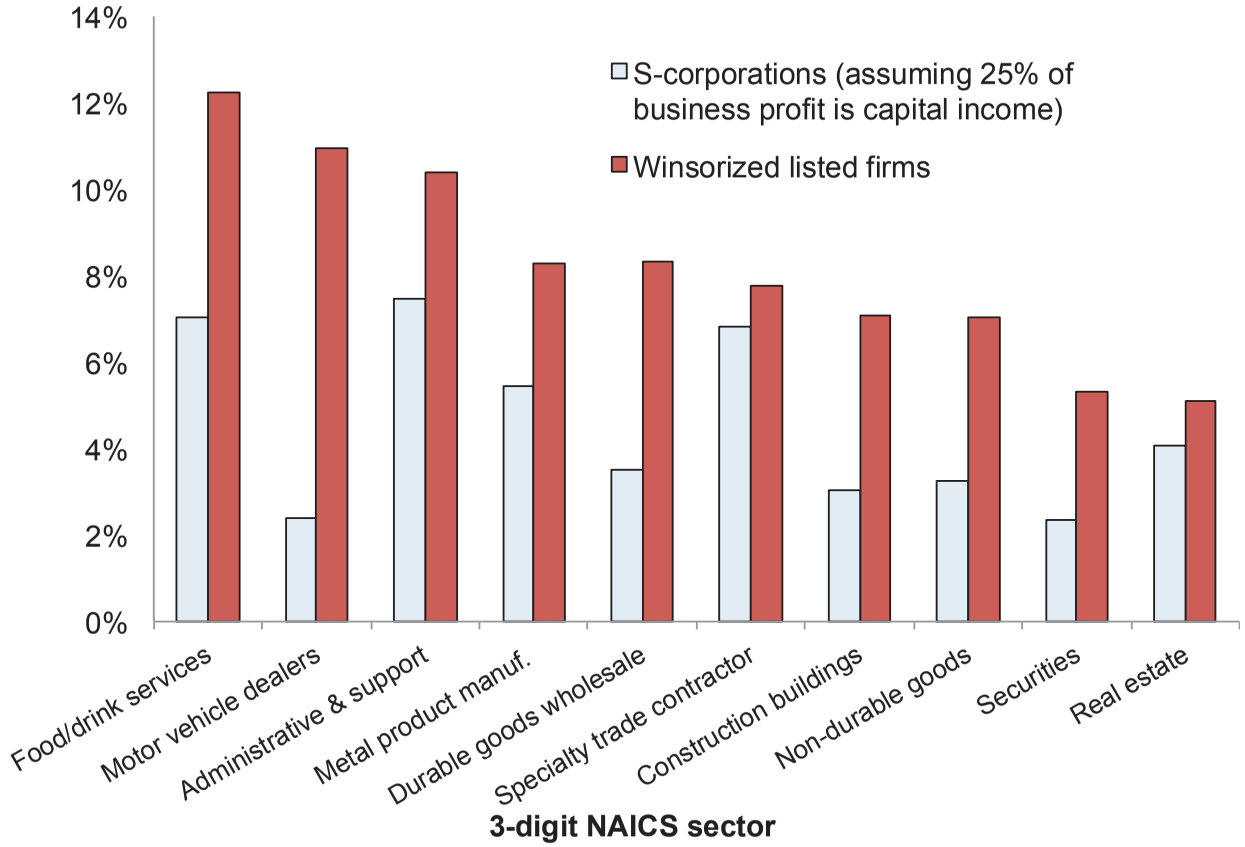
Fraction of Aggregate AGI Underreporting and Underreporting of Estimated Tax after Refundable Credits, by Estimated True and Reported AGI, Tax Year 2001

AGI	Underreporting of AGI, by Estimated True AGI	Underreporting of AGI, by Reported AGI	Underreporting of Tax after Refundable Credits, by Estimated True AGI	Underreporting of Tax after Refundable Credits, by Reported AGI
Bottom 10%	#	13	1	8
10%–20%	1	8	2	6
20%–30%	1	8	3	8
30%–40%	2	10	3	10
40%–50%	3	9	3	9
50%–60%	5	7	4	7
60%–70%	6	8	5	8
70%–80%	9	8	7	9
80%–90%	12	8	11	9
90%–95%	12	5	10	7
95%–99%	24	10	23	13
99.0%–99.5%	7	2	7	2
Top 0.5%	20	3	21	4
Total	100	100	100	100

** Less than 0.5%.

Notes: This Figure shows Table 2 from Johns and Slemrod (2010). The red column, showing the distribution of underreported income by reported pre-audit income, is the one used by Auten and Splinter (2019) to allocate underreported income. The blue column, showing the distribution of underreported income by corrected post-audit income, is the conceptually correct column to use. When ranking people by corrected post-audit income, 27% of underreported income comes from the top 1% (as opposed to 5% only when ranking by pre-audit income). The reason is that tax evaders are obviously richer once we account for their underreported income. Moreover, a number of individuals who report large business losses (and hence show up at the bottom of the pre-audit income distribution) are found in random audits to have in fact high incomes.

Figure 19: Rate of Return on Assets for S-corporations vs. Listed Firms, By Sector

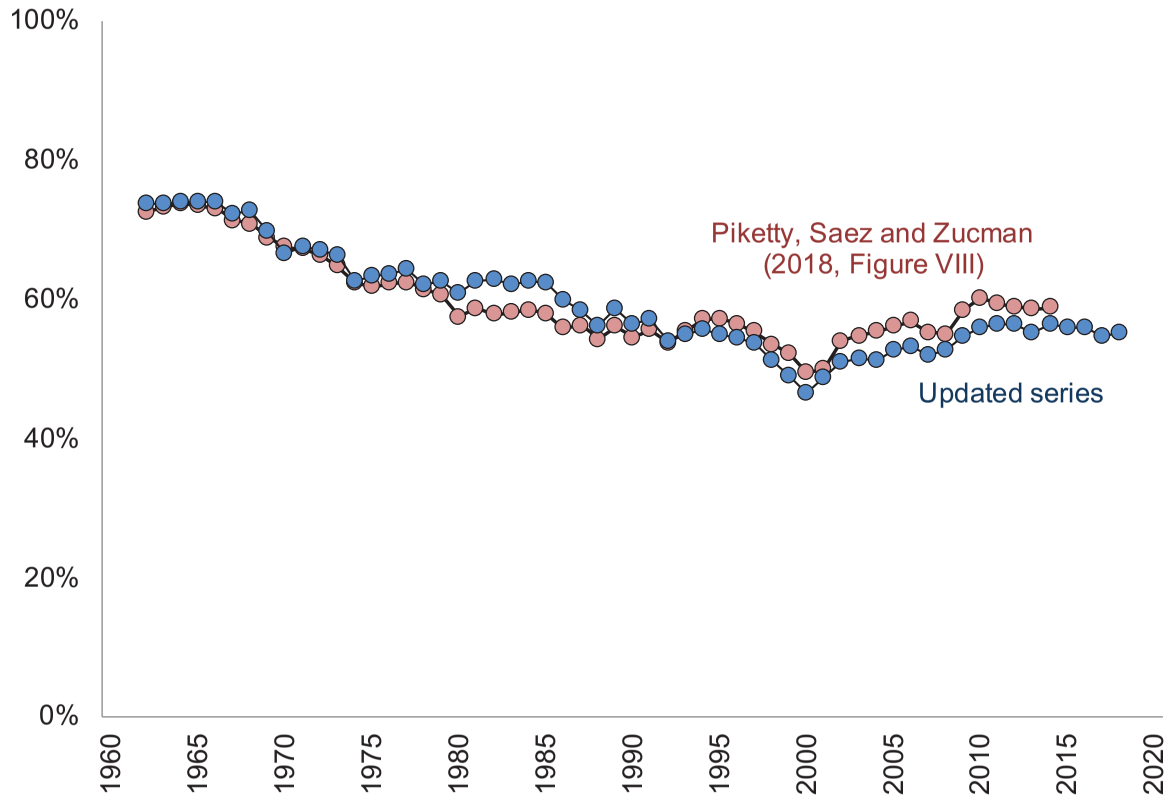


Notes: This figure reports the return on assets in the 10 largest sector for S-corporations in terms of ordinary business income (excluding offices of health practitioners and legal services). For S-corporation, income is 25% of net income from a trade or business, plus interest paid, minus net gains on noncapital assets, plus tax depreciation, minus book depreciation (estimated by multiplying assets by the within-sector ratio of book depreciation to assets observed for listed firms). For the sector "Securities, commodity contracts, other financial investments, and related activities" (NAICS 523), we include 100% of portfolio income (net of investment interest expenses) in operating income. Similarly for real estate, we include 100% of rental income, as well as all interest and depreciation expensed on form 8825. For listed companies, income is operating income (variable OIBDP in Compustat) minus book depreciation, and a 95% winsorization is applied to income and assets. Source: SOI tabulations of forms 1120S, 8825, and Compustat.

Figure 20: Capital Share of Value-Added, By Asset Size

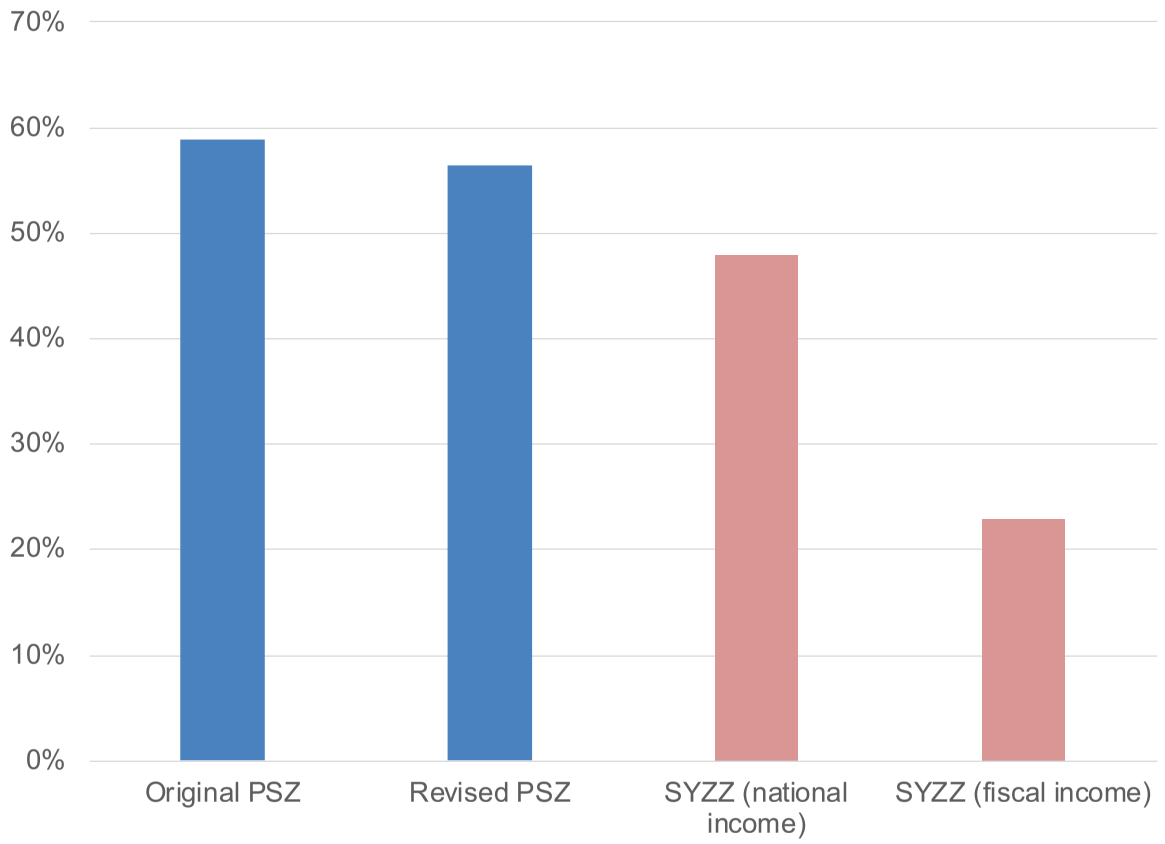
Notes: this figure shows the capital share of value-added at factor costs for C-corporations (excluding RICs and REITs) vs. S-corporations, by asset size. The capital share is computed as capital income divided by capital plus labor income, using SOI tabulations of forms 1120 and 1120S. For S-corporations, capital income is equal to 25% of ordinary business income, plus interest paid, minus net gains on noncapital assets. For C-corporations, capital income is equal to income subject to tax, minus portfolio income, plus charitable contributions and domestic production deduction, plus state income taxes paid, plus interest paid, minus net gains on noncapital assets. For both S- and C-corporations, labor income is the sum of wages and salaries, compensation of officers, employee benefit programs, and pension, profit sharing, etc., plans. C-corporations with more than $2.5 billion in assets are excluded from the >$100m bin.

Figure 21: The Capital Share of Income in the Top 1%



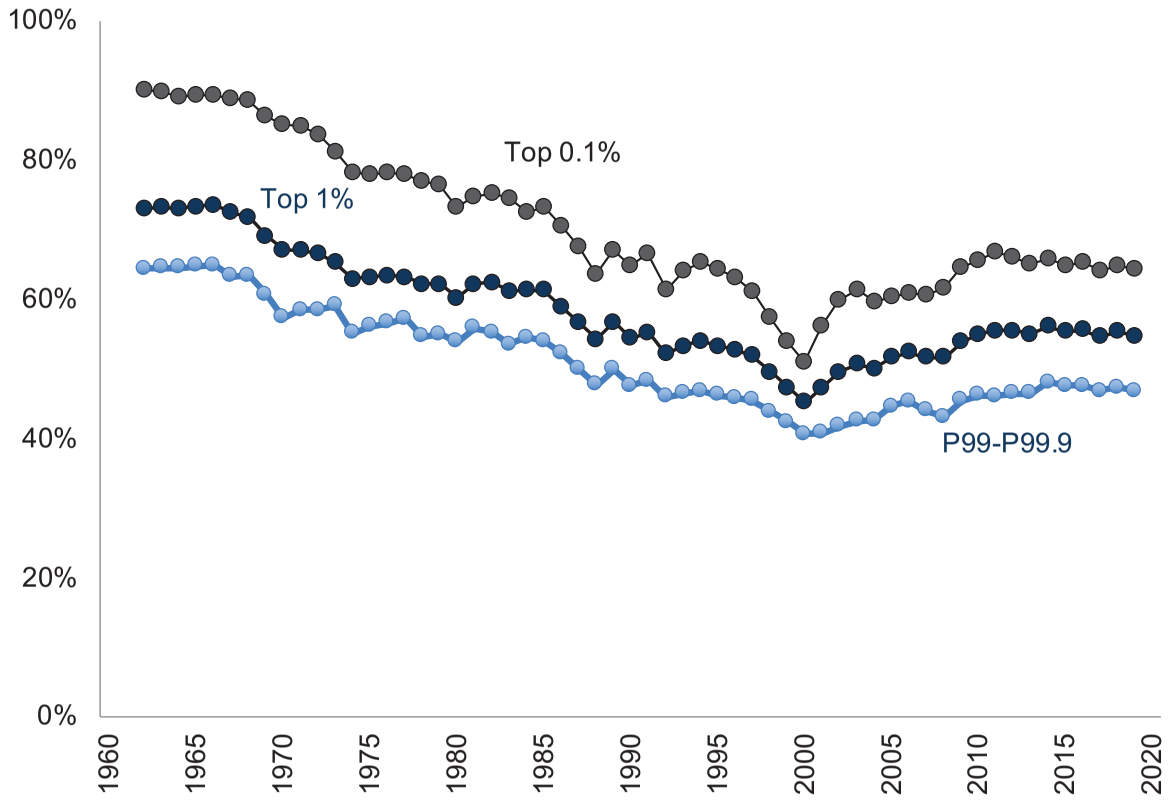
Notes: this figure shows the capital share of income in the top 1%, i.e., the total amount of capital income earned by adults in the top 1% of the pre-tax income distribution (with income equally split among married spouses) divided by the total pre-tax income of this group. The pink line is the series as reported in Piketty, Saez and Zucman (2016, Table VIII) while the blue line shows our updated series. In the updated series, capital income includes 50% of S-corporation profits, about 50% of partnerships profits in recent years, 20% of sole proprietorship income, as well as non-S-corporation equity income, interest income, housing rents, and the capital component of pension income.

Figure 22: The Capital Share of Income in the Top 1%: Comparing Estimates (2014)



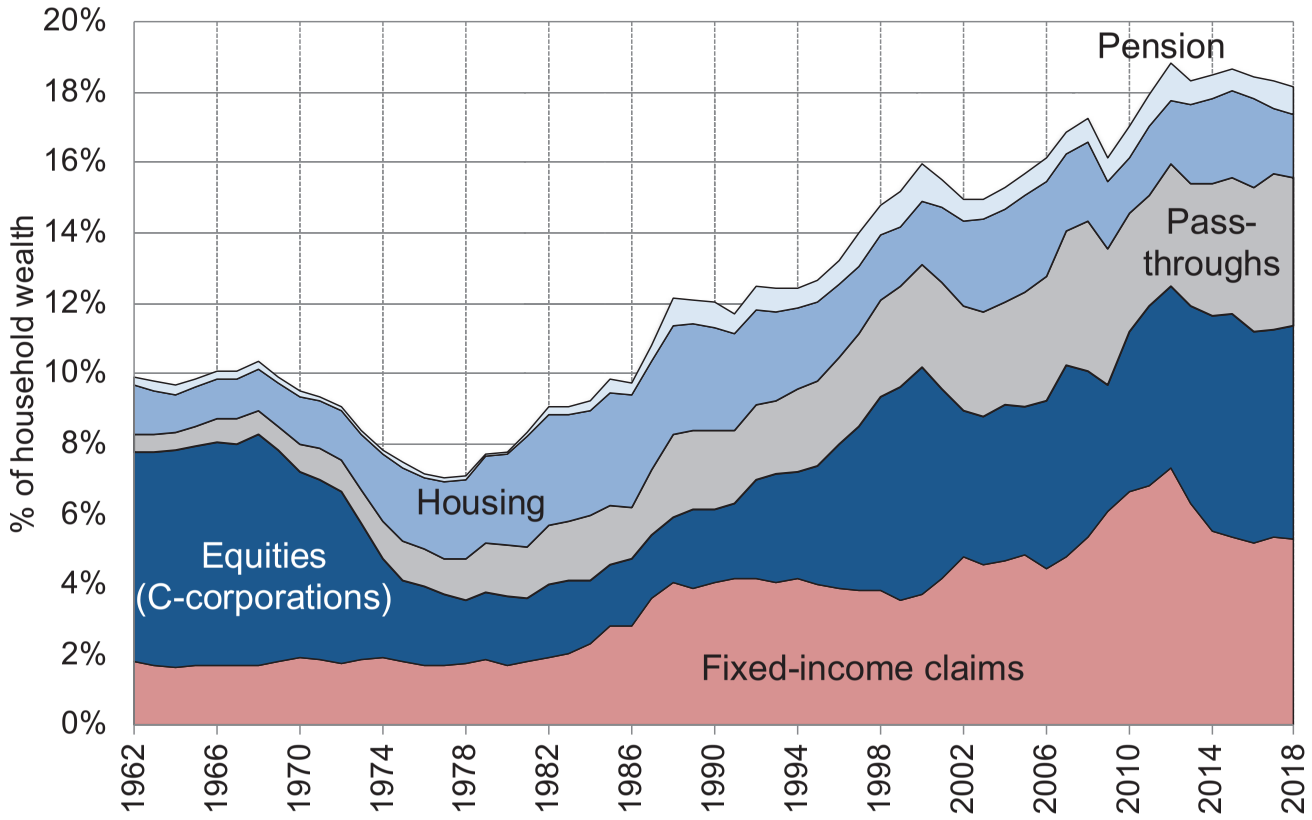
Notes: this figure shows the capital share of income in the top 1% in 2014 according to different estimates. Series labeled "PSZ" and "PSZ udpated" are taken from Figure 21 above; see notes to this figure. Series labeled "SYZZ" are taken from Smith et al. (2019), Figure VIII, Panel B. Smith et al. (2019) exclude capital gains from capital income.

Figure 23: The Capital Share of Income at the Top



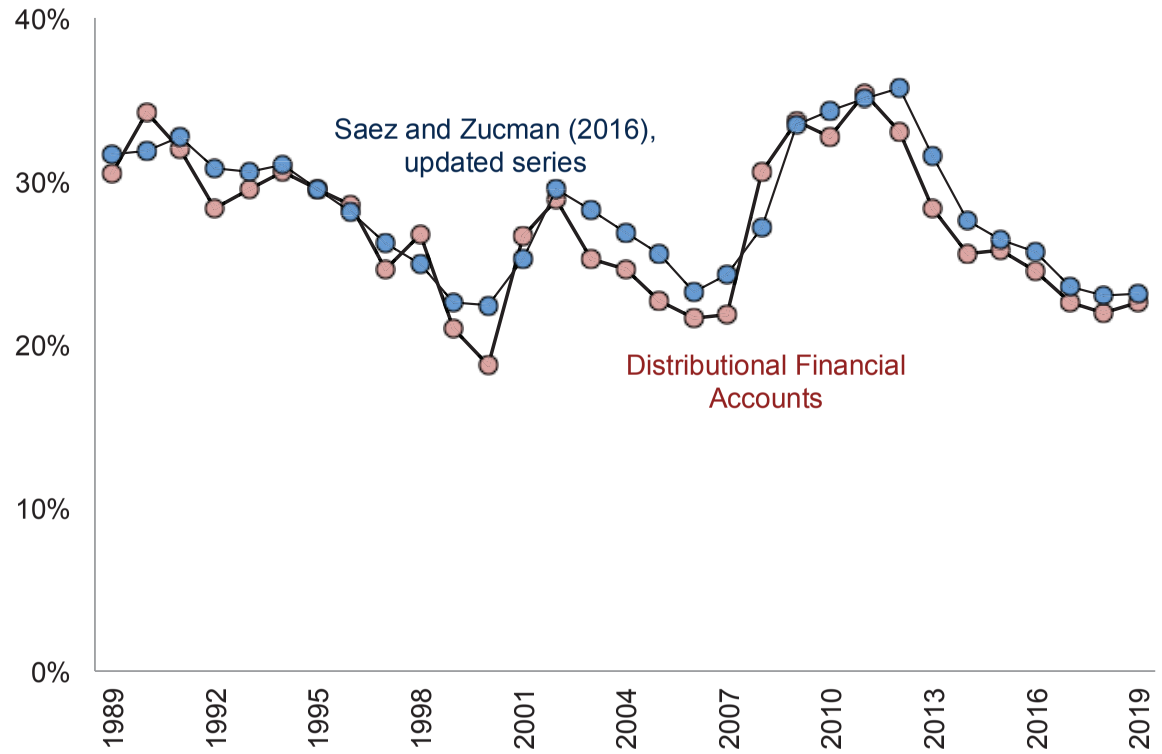
Notes: This figure shows the capital share of income in the top 1%, the next 0.9%, and the top 0.1% in our updated series. Capital income includes 50% of S-corporation profits, about 50% of partnerships profits in recent years, 20% of sole proprietorship income, as well as non-S-corporation equity income, interest income, housing rents, and the capital component of pension income.

Figure 24: The Top 0.1% Wealth Share (Among Equal-Split Adults): Composition



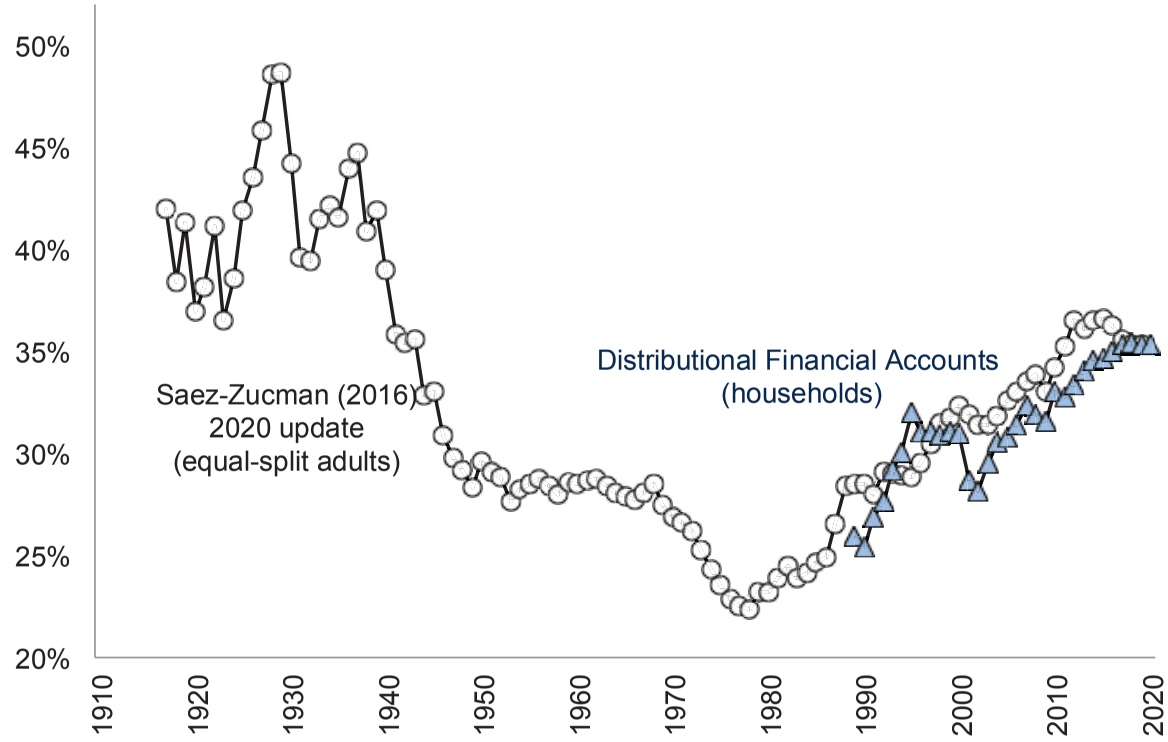
Notes: This figure shows the composition of wealth owned by the 0.1% wealthiest adults, with wealth equally-split among married spouses. Equities exclude S-corporation equity. Pass-throughs include partnerships, S-corporation equity, and sole proprietorships.

Figure 25: Share of Fixed-Income Claims in the Wealth of the Top 1%



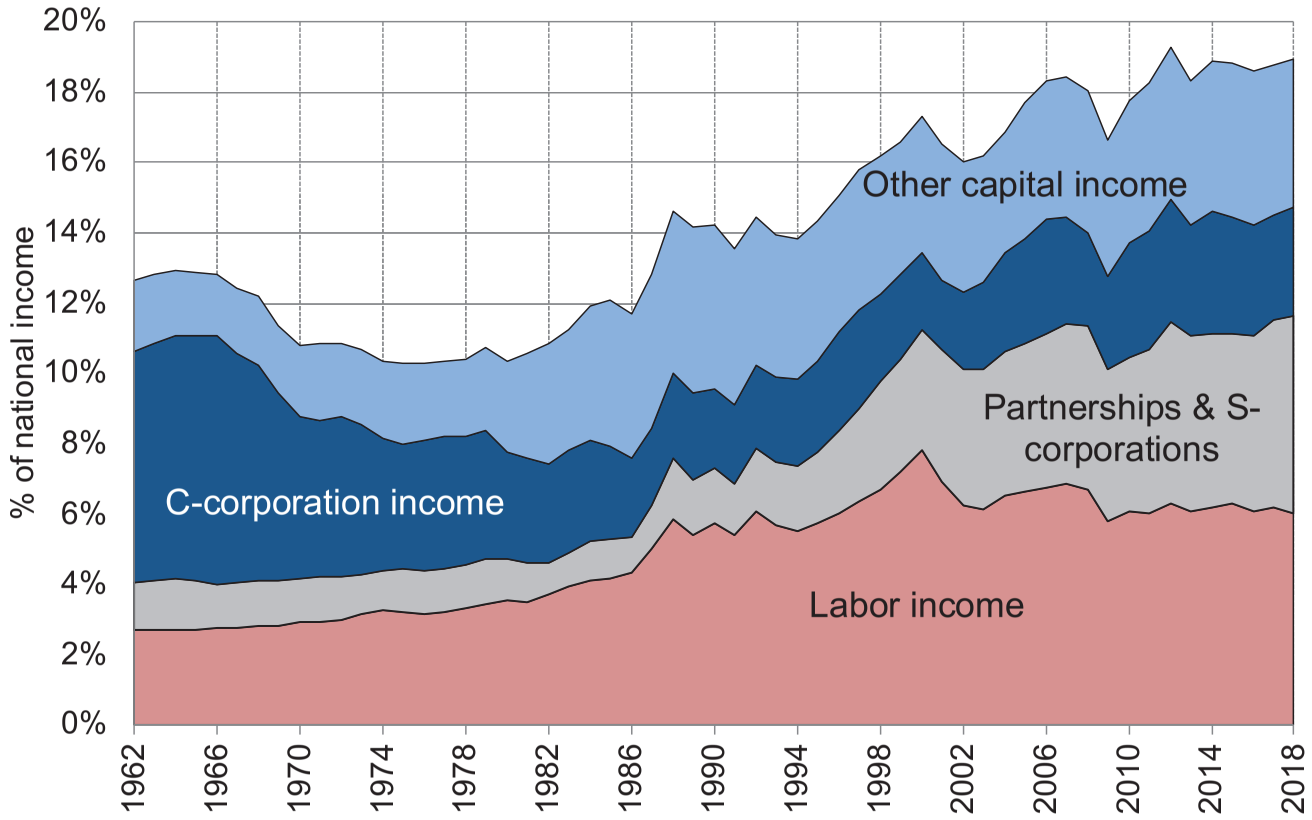
Note: fixed-income claims include checkable deposits and currency, time deposits and short-term investments, money market fund shares, debt securities, loans, and the fraction of mutual fund assets invested in bonds and loans; minus fixed-income claims held in IRAs. The aggregate for all households is identical in both series (i.e., the Financial Accounts total). Sources: *Federal Reserve Distributional Financial Accounts (DFA):* downloaded August 2020. Fixed-income claims held in IRAs by the top 1% are estimated as 10% of total fixed-income claims in IRAs; mutual fund assets invested in bonds and loans are estimated as x% of the amount of "Corporate equities & mutual fund shares" assets owned by the top 1%, where x is the time-varying aggregate ratio of mutual fund assets invested in bonds and loans to total corporate equities & mutual fund shares owned by households. *Saez-Zucman updated:* total fixed-income assets (variable hwfix) excluding miscellaneous assets (variable miscw), equal-split adults.

Figure 26: Top 1% Wealth Share: Updated Saez and Zucman (2016) vs. Distributional Financial Accounts



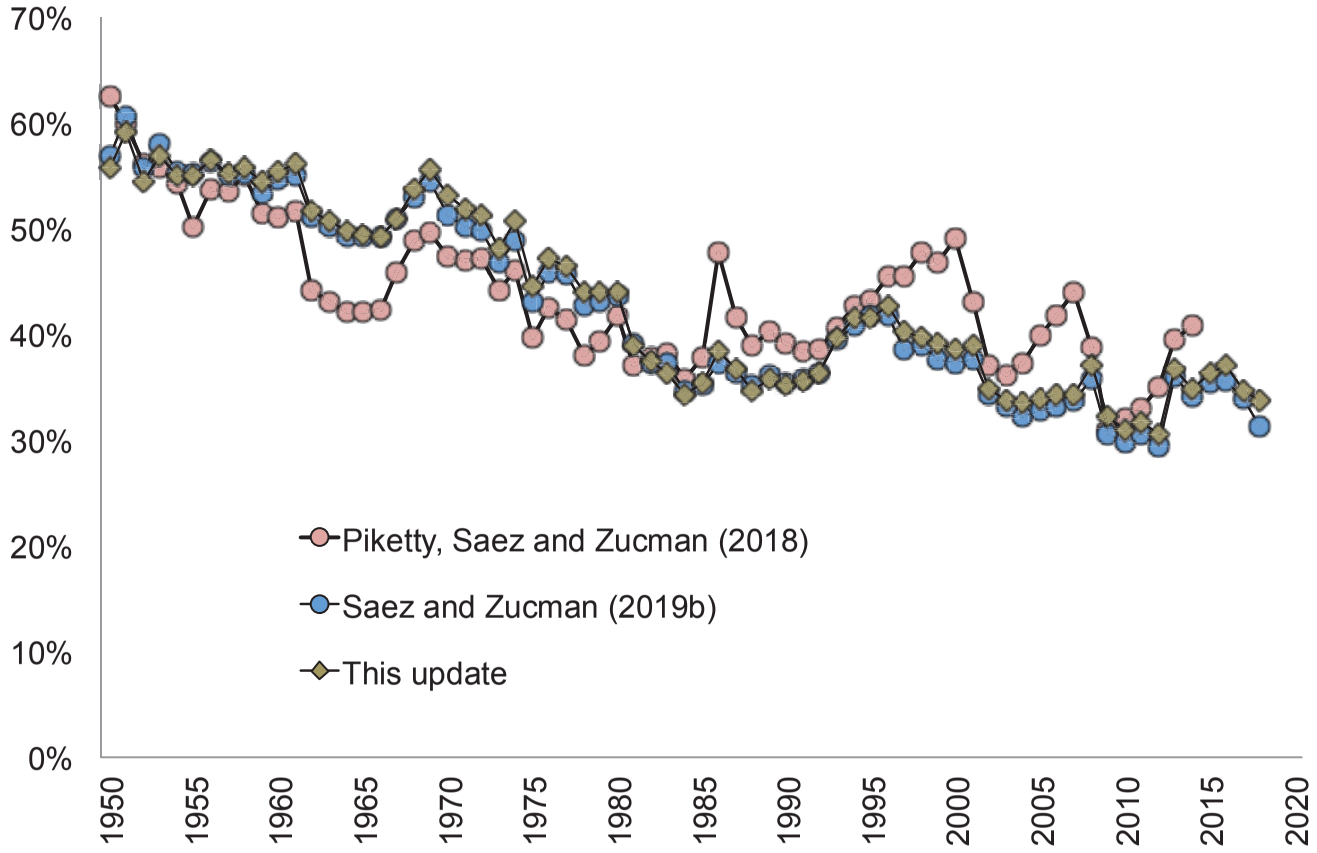
Note: Both series series use the same definition of household wealth (the market value of all non-financial and financial assets net of all debts, excluding consumer durables and unfunded pensions), have the same total wealth (the official Financial Accounts total), and the same totals asset class by asset class. In the Saez and Zucman series, the unit of observation is the adult individual with wealth equally split between married spouses; in the Distributional Financial Accounts series, the unit of observation is the household. The top 1% households includes 1.26 million households in 2016; since about 90% of top 1% households are married, this represents about 2.27 million adults. The top 1% adults includes 2.38 million adults in 2016, making the level of the two series broadly comparable. A fully accurate comparison would convert the Distributional Financial Accounts series to equal-split adults, and would show a slightly higher top 1% wealth share in the Distributional Financial Accounts compared to what is reported in the figure, with negligible impact on trends. Sources: Federal Reserve, and Saez and Zucman (2016), September 2020 update.

Figure 27: The Top 1% Income Share (Among Equal-Split Adults): Composition



Notes: this figure shows the composition of pre-tax income earned by the top 1% over time. Income is split equally among married spouses. Labor income includes compensation of employees, the labor component of sole proprietorship income (80%), and the labor component of pension income. Other capital income includes housing rents, interest, the capital component of sole proprietorship income, and the capital component of pension income. Partnerships & S-corporations splits 50/50 into a labor income and a capital income component (so that the line dividing labor and capital on the figure runs in the middle of the Partnerships & S-corporations component).

Figure 28: Top 0.1% Effective Tax Rate (Percent of Pre-Tax Income)



Notes: Taxes include all taxes at all levels of government. Tax rates are computed by dividing taxes paid by pre-tax income. Original Piketty, Saez and Zucman (2018) series do not include pure capital gains at the denominator. Saez and Zucman (2019b) series and this update include pure capital gains at the denominator (to smooth the effect of capital gains realizations). Saez and Zucman (2019b) series restrict the population to people earning more than 1/2 the minimum wage in pre-tax income (which has negligible impact on top tax rates).