# How Much Do Unrealized Gains and Borrowing Reduce the Rich's Income Taxes?

Edward Fox & Zachary Liscow*

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Abstract: We study how unrealized gains and borrowing impact Americans' tax liability and have four main findings. First, after adding unrealized gains as income, the income tax base captures about 60% of the total income of the top 1% of wealth holders and the vast majority for lower wealth groups. Second, looking at average tax rates benchmarked to income including unrealized gains, the income tax system is still progressive, though less so than when using AGI as the measure of income. Third, we quantify for the first time the amount of borrowing across the wealth or income distribution: new borrowing each year is fairly small (1-2% of income including unrealized gains) for the top 1% compared to new unrealized gains, suggesting that "buy, borrow, die" is not a dominant tax avoidance strategy for them. Fourth, consumption is less than AGI for rich Americans, partly because the rich have a fairly high amount of liquid income, and partly because savings are high, suggesting that the main tax avoidance strategy the super-rich use is "buy, *save*, die."

* Fox – Professor, University of Michigan Law School (edfox@umich.edu). Liscow - Professor, Yale Law School (zachary.liscow@yale.edu). Thanks to Jim Hines, Brian Galle, Jacob Goldin, and participants at the AMT and ALEA conferences for helpful comments. Thanks to Raj Bhargava, Safia Sayed, and Nick Whitaker for helpful research assistance. We are grateful to Danny Yagan for sharing data with us.

## I. Introduction

The realization rule requires owners to sell assets like stock or land before increases in their value are taxed (I.R.C. §1001). The rule drives an important wedge between the income tax base and "economic income" under the commonly used Haig-Simons definition, which includes unrealized gains as income. In this paper—in the spirit of Haig-Simons—we measure the "economic income" of a taxpayer as adjusted gross income ("AGI") plus changes in the value of her unsold assets over the year.[1] Anecdotally, the wedge between the taxed income tax base, which we measure with AGI,[2] and economic income is often appears very large at the top of the wealth distribution. From 2014-2018, Elon Musk, Jeff Bezos, and Warren Buffett saw the value of their combined assets increase by more than $137 billion. All of that is economic income under our definition. Their combined AGI, however, was only $5.7 billion over that period (Eisinger et al. 2021), or about 4% of economic income. The realization rule has advantages, including solving liquidity and valuation issues. Nevertheless, partly due to stories like this—proposals to alter the realization rule have been at the center of recent tax debates. For example, the White House has proposed a withholding tax on unsold gains for centi-millionaires (Department of the Treasury 2023), which Vice-President Harris' campaign has endorsed. Perhaps motivated by proposals of this sort, the Supreme Court agreed to take a case on the constitutionality of taxing "unrealized" income in *U.S. v. Moore* (2024), though ultimately the majority declined to answer that question.

Borrowing can help delay realization. In particular, it can drive a further wedge between economic income and the income tax base by substituting for what would otherwise be sales of appreciated assets. If owners of appreciated assets want to consume, they can borrow against these gains instead of selling and thereby avoid tax. And, indeed, there are anecdotes of wealthy Americans borrowing extensively: Musk, for example, in the years after 2018 borrowed $1 billion from Space-X and $500 million from banks secured by appreciated stock (Maidenberg and Higgins 2023). Moreover, due to the "step-up" in basis at death (IRC §1014), no one ever has to pay income tax on gains built into unsold assets held at death. In concert, this allows rich

[1] Our "economic income" is then a subset of Haig-Simons income, which would also include sources of untaxed consumption like the imputed value of owner-occupied housing, non-taxable employer or government provided health insurance, non-taxable government transfers, etc.

[2] Adjusted gross income is of course larger than taxable income due to taxpayers deducting either the standard amount or their itemized deductions below the line. The effect of these below the line deductions as well as any credits will be incorporated in our measures of income tax liability rather than in "base."

Americans to *buy* assets, *borrow* against those assets when they appreciate and to consume those gains, and when they *die*, use the stepped-up basis to avoid any income tax on the asset.[4] Tax scholars have thus worried that "buy, borrow, die" therefore allows the rich to "live luxuriously… [and still] avoid all income taxation," all while reducing estate tax burdens as well (McCaffery 2017 at 306).

In this paper, we measure how much economic income is missed by the tax system due to the realization rule across the wealth distribution. In addition, we assess for the first time how much borrowing is done by rich Americans, and estimate to what degree "buy, borrow, die" is narrowing the federal income tax base. We complete these analyses primarily using data from the Federal Reserve's Survey of Consumer Finances (SCF), which oversamples the rich and reports comprehensive measures of wealth and borrowing as well as much tax data, allowing us to estimate the relevant parameters for a representative sample of households with up to $1 billion of wealth and beyond. We supplement the SCF with estimates from the Forbes 400 to provide a complete view of the wealth distribution.

We believe this analysis is important because in spite of frequent critiques of the realization rule (e.g., Andrews 1983) and the raft of new policy proposals aimed at altering the rule for high wealth Americans, important questions about the realization rule remain unanswered. This is in part because few data sources contain data on income, taxes, and unrealized gains (and or wealth). Moreover, we are not aware of any systematic work attempting to quantify the role of borrowing and "buy, borrow, die" among the wealthy, despite concern over the practice in both the academic and popular press including in the *N.Y. Times, Wall Street Journal*, *Financial Times*, *Economist, Forbes*, among others (e.g., Ensign and Rubin 2021; Hyatt 2021; Leonhardt 2021; Foley 2022 *The Economist* 2024). We have the following four main findings:

*Tax Base vs. Economic Income.* Below the top 0.1% of wealth-holders ($62 million in wealth in 2022), the tax base—as represented by AGI—captures a substantial majority of economic income. For example, on average, the tax base captured 75% of the economic income of those in the 90-99% over 2004-2022 and 67% for those in the 99.0-99.9%. Unrealized gains continued to be important for these groups, however. The aggregate total of unrealized gains in

[4] The loan will be repaid by having the heirs sell some of the asset, but because of the basis step-up, this will trigger no income tax.

2022 for those groups were $23 trillion and $12 trillion, respectively. Above the 99.9%, the tax base captured roughly half of economic income in the 2004-2022 period. Aggregate unrealized gains for this group represent another $13.7 trillion in 2022. Overall, for the top 1% of wealth-holders (above $14 million in 2022), 60% of economic income is in the tax base. This is true, despite very large estimated increases in their unrealized gains each year, because that group receives large amounts of taxable salary (16% of economic income); business income (20% of economic income); and interest, dividends and realized capital gains (23% of economic income).[5]

*Average Tax Rates Accounting for Unrealized Gains*. Second, calculating average tax rates using economic income in the denominator instead of AGI makes the income tax system look less progressive because unrealized gains are concentrated at the top of the wealth distribution.[6] Still, average tax rates as a share of economic income rise across the wealth groups until we reach the 99.9%+. Average tax rates then fall somewhat for both the 99.9%+ and the Forbes 400. As discussed below, our definition of "economic income" likely yields less progressivity in our average tax rates than if we used real Haig-Simons income as the benchmark. In particular, because we are focused on the realization rule, our definition does not attempt to include various other non-taxable forms of Haig-Simons income—like imputed income from owner-occupied housing, employer or government provided health care, government transfer payments. These items are less important at the top of the wealth distribution than elsewhere.

*Borrowing*. Third, while we document considerable borrowing by rich Americans, new borrowing is small in comparison to economic income and unrealized gains. Aggregate borrowing by top 1% wealth holders in 2022 was nearly $1.02 trillion (excluding the Forbes 400 for data reasons), potentially unlocking as much as about $450 billion in unrealized gains.[7] But, for the top 99-99.9% (99.9%+) of wealth holders, new borrowing each year is only about 2.4% (1.0%) of economic income in 2022, while new unrealized gains each year are about 33% (50%) of economic income, suggesting that wealthy Americans do not use borrowing to unlock and

[5] The figures on the sources of taxable income exclude the Forbes 400 for data reasons.

[6] Because our primary analyses are broken out by wealth group, by "progressive" we mean that average income tax rates rise as wealth rises rather than the usual definition, with average income tax rates rising with income.

[7] Unrealized gains comprise about 45% of wealth of the top 1% of wealth holders and thus sales of average assets worth $1.02 trillion would produce about $450 billion in gains.

consume a large fraction of unrealized gains. Indeed, in aggregate, borrowing large amounts while simultaneously having large unrealized gains is arguably more of an upper middle-class phenomenon: Americans in the 50th-90th percentile of wealth had $18 trillion in unrealized gains in 2022, and had borrowed $7.7 trillion (43% of unrealized gains), while those in the top 1% had unrealized gains of $23 trillion and borrowed $1.0 trillion (4% of unrealized gains).

*Consumption.* Fourth, we estimate that consumption by high wealth-holders is smaller than their taxed income, which is usually liquid, explaining why borrowing rates are low: they don't need to borrow. Partly this occurs because, as described earlier, liquid income is most of economic income for the top 1%. This is all income rich Americans can spend without any further income tax consequences. In terms of consumption, using a synthetic panel method, we estimate that high wealth groups save a considerable fraction of AGI, similar to Dynan et al. (2004) among others. The allure of buy, borrow, die is in large part that it permits taxpayers to consume unrealized gains without having to sell appreciated assets and thus avoid income tax. If, however, the taxpayer's AGI exceeds her consumption, she can fund her consumption from AGI without any additional tax issues, and she does not need to borrow to avoid tax on unrealized gains. All she has to do to minimize taxes on unrealized gains is not sell the assets. This simpler tax avoidance strategy is more like "buy, *save*, die."

These results may be informative as policymakers consider changes to the realization rule as well as fixes for "buy, borrow, die." For example, the large drop in the fraction of economic income that the tax base captures for Americans with wealth in the top 0.1% (exceeding $62 million in 2022) dovetails with Treasury proposals to alter the realization rule for centi-millionaires. That said, the results also highlight that there are very large amounts of unrealized gains below that threshold, even if such gains makes up a smaller fraction of those groups' economic income. Vis-à-vis borrowing, the important amount of borrowing done by the very rich suggests it could be worthwhile for policymakers to treat some borrowing as a partial realization of unsold gains (Fox and Liscow 2024). That said, the data also indicate that "buy, borrow, die" is likely not a primary tax avoidance strategy of the very rich. This means that tax changes focused on borrowing will affect only a fairly small fraction of the unsold gains of the very rich.

Our work contributes to several literatures. A variety of papers attempt measure average income tax rates using broader concepts of income than that used by the income tax system (e.g.

Auten and Splinter 2024; Piketty, Saez, and Zucman 2018). Yagan (2023) measures average tax rates for the Forbes 400, including unrealized gains as part of a broader income definition. Going just a bit down the wealth distribution, the Treasury likewise has scored the budgetary impact of creating a withholding tax on unsold gains of centi-millionaires (Department of Treasury 2023). Bricker et al. (2020) also estimates average tax rates using an expanded income concept in the denominator, including an estimate of unrealized gains based on two assumed rates of return across the wealth distribution. Larrimore et al. (2021) estimate the effect of including unrealized gains and other forms of untaxed Haig-Simons income on measures of income inequality over time. In using the SCF, we are building off other recent papers that use that survey to estimate tax-relevant characteristics that do not appear on tax returns (e.g., Gale et al. 2022a, 2022b). Our paper is the first to measure the effect of unrealized gains across the wealth distribution on the *tax base* (as distinct from tax rates). It is also the first to measure the impacts of unrealized gains on the tax base and tax rates using a direct measure of the key variable: data on changes in actual unrealized gains, rather than assumed and uniform rates of growth.[9]

Our work on borrowing draws on McCaffery (2017 and 2020), who described the existence of "buy, borrow die." Underwood and Yost (2023) examine CEO's pledging shares to support loans and find CEOs are more likely to pledge shares if they have a larger share of unrealized gains in the stock. In our work on the consumption and savings behavior of the rich using SCF data to explain the amount of borrowing, we build on work by Mian, Straub, and Sufi (2021) and Feiveson and Sabelhaus (2019). We also connect to a longstanding literature on the differences between income tax bases and consumption tax bases (e.g., Shaviro 2007; Gordon et al. 2004; Fox 2020). Our work quantifies total borrowing by the rich and examines its tax implications for the first time. We show that the existing income tax base of the rich remains larger than current consumption, though a consumption tax will also eventually reach the present value of future consumption out of income saved today.

## II. Data and Methodology

We combine several data sources to make our estimates. We review each in turn.

[9] In addition, we measure these variables going back to 1989, rather than for just 2016.

*Survey of Consumer Finances*

Our most important data source is the Survey of Consumer Finances. The Federal Reserve has conducted the SCF in roughly its current form every three years since 1989. The SCF heavily oversamples high-income and high-wealth households based on administrative tax records. As a result, among the 4,595 families in the 2022 Survey of Consumer Finance, for example, 256 have a wealth that exceeds $62 million—the cutoff to be in the top 0.1% of wealth holders. A random sample with 4,595 observations would have only 5 families exceeding this cutoff. This oversampling provides granular coverage essentially all the way up the wealth (and income) distribution up to Forbes 400 billionaires, who are excluded from the SCF sampling regime.[10]

The SCF contains comprehensive questions concerning respondents' assets, with questions about well over thirty types of assets, including among other things, data on the unrealized capital gains accrued on different types of assets. The SCF data on wealth largely match the estimates of wealth in the Financial Accounts of the United States constructed by the Federal Reserve using entirely different sources. Feiveson and Sabelhaus (2019), for example, report that for financial assets the ratio of SCF to Financial Accounts data is about 97%. For private businesses, however, the SCF figure is roughly twice as big as in the Financial Accounts, likely due to methodological differences.[11] In particular, the SCF figures are based the owner's view of the market value of the firm. By contrast, the Financial Accounts figures are based on adjustments to book value. Prior to adjustment at least, book value is often far less than market value. For example, book value has recently been about half of market value for small publicly traded U.S. firms.[12] Therefore, although the owner's view is likely to be at least a bit upwardly

[10] The SCF excludes these individuals because their data could not be anonymized without "without rendering their data virtually useless" (Federal Reserve 2010). Notably, the top of the SCF distribution has a similar level of wealth to the bottom of the Forbes 400 list in wealth which Bricker, Hansen, and Volz (2019) argue means that the SCF is *not* missing a section of the wealth distribution whose wealth is below those of the Forbes 400 list but above the top of the SCF respondents. (Bricker, Hansen, and Volz, 2019).

[11] The ratio of SCF private business net worth compared to the Financial Accounts as reported by Feiveson and Sabelhaus (2019) is about 1.85 in 2016 and in 2022 is about 1.92.

[12] The price to book ratio of small capitalization publicly traded US firms in the Russell 2000 as of August 31, 2024 is 2.15 (FTSE Russell, 2024). This large gap arises in part because firms actually have many intangible assets valued by the market which do not appear on their balance sheet at all, such as customer goodwill and technical knowledge among others, e.g., Corrado and Hulten (2010). The Financial Accounts estimate of the value of private businesses takes book value and attempts to adjust to current cost of assets (Feiveson and Sabelhaus 2019), though it cannot adjust for those assets not actually on the balance sheet.

biased, we think there are good reasons to prefer the SCF figures and follow Feiveson and Sabelahus in using it.

The SCF-based estimates of the share of wealth owned by different wealth groups and trends at the top of the wealth distribution are also largely similar to the baseline estimates of Smith, Zidar, and Zwick (SZZ) (2023). Those authors' estimates of wealth are based on capitalizing income streams from administrative access to tax returns, while allowing for heterogeneous rates of return. For example, the SCF-based estimate for the share of wealth held by the top 0.1% differs from SZZ's estimate for that group by 0.18 ppts on average from 1989-2016.[13]

Paralleling assets, the SCF contains data about the universe of respondents' debts, broken out into a variety of categories. Aggregating SCF respondents' debts matches fairly closely the Federal Reserve's estimates of household debt in the Financial Accounts of the United States, which do not rely on the SCF and instead are estimates using "aggregate data on loans made by other sectors" (Ahn et al. 2018). For example, in Q2 2022, the Financial Accounts showed total household debt of $18.14 trillion, while the 2022 SCF conducted during this period implied household debt of $17.23 trillion, or 95% of the amount shown in the Financial Accounts. We discuss a variety of additional sensitivity checks to ensure that we are adequately covering borrowing by the wealthy in our robustness section, including analyses of securities margin borrowing, life insurance borrowing, and taxpayers borrowing through privately owned pass-through businesses to finance consumption.

Finally, the SCF solicits a variety of information corresponding to the income reported on respondents' tax returns, and respondents are encouraged to reference their tax forms when responding to such questions (although many households, especially lower income households, do not do so) (Moore and Johnson 2005). The SCF data generally match public tax data from the Statistics of Income (SOI) produced by the IRS (Gale et al. 2022a). The SCF does not contain data on tax liability itself and we use the NBER TAXSIM model to calculate taxes using the SCF income data. SCF data require some manipulation to be used with TAXSIM. SCF data

[13] The SCF tracks Smith, Zidar and Zwick's baseline somewhat less closely for the top 1%. Over 1989-2016, the baseline series average is that 29.94% of wealth is owned by that group, and the average gap with the SCF is 3.26 percentage points. Still, the SCF series tracks the baseline fairly closely in both levels and trends with a correlation of 0.753.

are representative of households rather tax units and while these frequently overlap, they do not always do so.[14] This issue requires a series of steps to assign SCF income responses to the relevant tax unit. In addition, the SCF collects data on a variety of types of economic income which are not taxable, such as interest from municipal bonds, (most) Social Security payments, government transfer programs like SNAP (a.k.a. food stamps) and TANF etc., which must be separated from income that is part of AGI. We follow Gale et al. (2022a) in adjusting the SCF data to feed into TAXSIM. As discussed in the Appendix, however, to ensure our total AGI and federal income tax owed after all deductions and credits match the SOI exactly, we scale our SCF-and-TAXSIM-based calculation of AGI and income tax owed to the SOI figures for the six income groups examined in Gale et al. (2022a). For the 2022 SCF for example, the average scaling factor across the five groups is 1.00 for AGI, but ranges from 1.30 for those with AGI $1-$25,000 (because too little AGI is reported in the SCF for that group) to 0.80 for those with AGI over $1 million (because too much AGI is reported in the SCF for that group). The equivalent figures for taxes after all deductions and credits are 1.66 and 0.73 for those groups.

We do not include state and local taxes because our focus is on the individual federal income tax's realization rule and borrowing.[15] For the same reason, we do not pass through a share of federal corporate income taxes to shareholders, workers, or consumers. We include refundable credits like the earned income tax credit, child tax credit, and various economic stimulus payments during the Financial Crisis and COVID-19 Pandemic as negative tax liability.

There is increasing concern about non-response biasing even high-quality government surveys,[16] but the SCF takes a variety of steps to reduce non-response bias, particularly using administrative tax data in constructing the initial sample of rich Americans and using that data to adjust sampling weights to account for non-response in this group (see e.g., Kennickell 2008). Moreover, as just noted, SCF estimates for borrowing match the Fed's estimates derived from business balance sheets, and likewise the SCF estimates of wealth shares match Smith, Zidar and

[14] For example, two long-term cohabiting adults might form a single household, but will always be two separate tax units.

[15] Moreover, the SCF does not include geographic identifiers in its public version making accounting for these taxes more difficult.

[16] For example, see Bradley et al. (2021) on the Census Department's Household Pulse survey.

Zwick (2023) derived from income tax returns. Such matching would be unlikely if non-response were substantially impacting the SCF results.

*Forbes 400*

We also include wealth data on *Forbes 400* billionaires (the 400 wealthiest individuals), who are not covered in the SCF. Data on the *Forbes 400* is much more limited than that available for the SCF. The magazine estimates families' wealth from surveys, as well as publicly available sources like SEC filings, court filings, and probate records (Peterson-Withorn 2023). As discussed in the Appendix, we follow Yagan's (2023) assumptions to assign federal income tax paid, AGI, and capital gains to Forbes 400 individuals using publicly available SOI data on the highest income filers.

*Estimating Unrealized Gains and New Borrowing*

A core goal of the paper is to estimate new unrealized gains and losses accruing to different wealth and income groups of Americans each period: $\Delta UR_t = UR_t - UR_{t-1}$, where $UR_t$ is unrealized gains at time $t$. Because the SCF is not a panel in which the same households appear repeatedly over time, we cannot directly observe $\Delta UR$ on a household-by-household basis. Instead, we use data on unrealized gains from the SCF to estimate the rate at which such gains grow over the study period for different wealth groups. The SCF data on unrealized gains do not cover retirement assets and trusts and, as explained further in the Appendix, we assume that the fraction of gains in assets not covered by the SCF is the same as for assets that are covered. In Appendix Table 1, we find that on average, unrealized gains increase at roughly the same annual rate (6.0% ) as nominal wealth (6.3% ) from 1989 to 2022, with unrealized gains thus composing a similar fraction of wealth at the start and end of our periods. High-wealth groups saw their wealth grow the fastest over this period. That relationship also appears to be present for unrealized gains, although it's less clear than in the wealth data. For each period, we assume that the rate by which $\Delta UR$ increases for a given wealth group matches the historical average given in Appendix Table 1. So for a given year $t$, and wealth group $\theta$, $\Delta UR_{t,\theta} = UR_{t-1,\theta} * R_\theta$, where $R_\theta$ is the average growth rate of unrealized gains for that group.

We believe our method for estimating changes in unrealized gains has important advantages compared to other estimation methods. Bricker et al. (2020) is the only other paper

we're aware of to look at the effect of adding unrealized gains on average tax rates across the wealth or income distribution. That paper relies on two assumed rates of returns at which unrealized gains accrues for *all* households: either 6% of wealth or 3% (to account for inflation). Our method by contrast attempts to measure changes in unrealized gains using data on such gains, rather than an assumed rate of return. In addition, our method allows a different rate of increase in unrealized gains depending on household wealth. This will automatically adjust for the fact that wealthier households have earned higher rates of return within some asset classes (see Smith, Zidar, and Zwick (2023) emphasizing the importance of this fact to properly capitalizing wealth). These assumptions matter; partly because of them, we find significantly lower tax rates than Bricker et al. do using assumed rates of return. Likewise, as we discuss next, we show the robustness of our primary results using two other methods of estimating unrealized gains.

In robustness analyses described below, we also use two other methodologies to estimate $\Delta UR$ and find qualitatively similar results. In one method, we largely follow Mian et al. (2021a, 2021b) to estimate the growth rate of asset prices for seven different asset classes using market transaction data. We take the average return on each asset class over 1989-2022 and treat each household as accruing that rate of return on each asset held within that class. We then subtract the household's realized capital gains in year t to reach the household's $\Delta UR_t$.

In another method, we use the Federal Reserve's Financial Accounts to decompose nominal increases in wealth into new savings (net investment) and increases in the market price of assets (net holding gains). From 1989 to 2022, according to the Financial Accounts increases in the market price of assets accounted for 69% of increases in wealth. We then assume all households' wealth grows at the average rate in each period. Thus we calculate $\Delta UR_t = XX * 69\% * W_{t-1} - realized\ cap.gains_t$. Appendix Table 7 shows total the main results using unrealized gains using the baseline and alternative methodologies. The Appendix discusses these methodologies in more detail.

With respect to new borrowing, we estimate it in a manner very similar to our baseline estimates of unrealized gains. We look across the wealth distribution at how fast debt within each wealth group grew from 1989 to 2022 and then estimate a group-specific rate of change of borrowing such that $Borrowing_{t,\theta} = Borrowing_{t-1,\theta} * \beta_\theta$ where $\beta_\theta$ is the average rate of

increase of borrowing for that group. In our primary analyses we define borrowing as equal to the Debt variable from the Federal Reserve's SCF Summary Extract. This variable excludes two forms of borrowing the SCF asks about: non-residential real estate borrowing and borrowing from household owned businesses. As discussed in more detail in the Appendix, we follow the Summary Extract in defining debt because the non-residential real estate variable appears to be subject to significant sampling variation.

*Psuedo-Panels*

The SCF has been used to estimate consumption and savings behavior in recent work (e.g., Feiveson and Sabelhaus 2019 and Mian et al. 2021a). If the same households were repeatedly sampled in the SCF, this would be fairly straightforward. The SCF contains comprehensive measures of both income and wealth, and from this, consumption and savings behavior could be imputed over time using various accounting identities.[17] This method raises some issues in terms of measurement error, though Baker et al. (2022) finds that with good data, the measurement error is usually small and centered around 0. As noted, however, the SCF surveys a different group of households in each survey year. Thus, we follow Feiveson and Sabelhaus (2019) and Mian et al. (2021) in using "pseudo-panels," that is, treating a given wealth or income *group* as being repeatedly observed over time, even though the same individuals within the group are not repeatedly sampled. We follow Mian et al. (2021) in calculating the implied consumption and savings for different wealth groups (within a given age cohort). See the Appendix for more detail on methodology. Notably, the implied savings and consumption behavior from using this method largely aligns with savings and consumption estimates derived from other methods which do not rely on the pseudo-panel assumptions (see Mian et al. 2021b at 56).

## III. Main Results

We present our four main results here. First, we show that, while unrealized gains are large at the top of the wealth distribution, the tax base contains most economic income for the top 1% and decompose the elements of AGI that produce this result. Second, we show that

[17] For example, if a researcher can observe both a household's Haig-Simons income in a year and the change in its wealth over the year, imputing consumption is straightforward from the definition $Haig\ Simons\ Income = Consumption + \Delta Wealth$

though taxes are less progressive as a share of economic income than as a share of AGI, they are still progressive (rising with wealth) up to the 99.9%+. Third, we show that borrowing is a small share of economic income and AGI for the top 1%. Fourth, we estimate that consumption is considerably less than AGI for the top 1%, helping explain this group's limited borrowing.

For most analyses, we collapse down to group-level aggregates estimated from the SCF and Forbes 400. In each survey year, we group households in the SCF into one of five wealth categories depending on the wealth distribution for that year. We also include the Forbes 400 as an additional group in the top 1% when data are available. Appendix Table 2 provides the wealth cutoffs, average wealth, and total wealth for each group in 2022.[18]

*A. Income Tax Base as a Share of Economic Income*

First, we examine how much of economic income is covered by the current tax system. As noted above, economic income is a more comprehensive measure of changes in economic well-being than AGI because it also includes unrealized capital gains and losses. Unlike AGI, it more accurately measures how much more the taxpayer *could* consume this period, in addition to starting period wealth.

Figure 1 estimates of the ratio of AGI to economic income, averaged over 2004-2022, across our wealth groups. As one would expect, wealthier Americans tend to have more unrealized income and the tax base captures a smaller share of their economic income under our definition. AGI is 98% of economic income for the bottom half of the wealth distribution and 87% for the 50-90$^{th}$ percentiles. Below the top 0.1% of wealth, however, the tax base captures a substantial majority of economic income. The tax base captures 75% of economic income for the 90-99$^{th}$ percentiles and 67% for the 99-99.9$^{th}$ percentiles. Although the tax base captures a substantial majority of economic income for the 90-99.9%, there is a lot of economic income that currently goes untaxed: the group had unrealized gains of about $35 trillion as of 2022.

Within the top 0.1%, the tax base still captures about half of economic income: 50.2% for the top 0.1% minus the Forbes 400 and 48.1% for the Forbes 400.

[18] Note that the SCF asks about income in the previous calendar year, rather than current income. For example, the 2022 SCF reports income from calendar year 2021. When we refer to a "year," we are generally referring to the survey year, not the tax year. We have constructed the Forbes 400 measures in an analogous way; income is determined by the previous calendar year.

Holding fixed behavior—and without changes to the realization rule—changing tax rates on ordinary income and capital gains therefore will therefore reach a large majority of economic income of those in the 90-99% of wealth, 60% of the economic income the top 1% as a whole, and half the economic income of the top 0.1% on average from 2004-2022. Within the top 1%, it is important to keep in mind that most wealth is in the top nine-tenths of the top 1%: in 2022, the 99-99.9$^{th}$ percentiles had $29 trillion of wealth, compared to $20 trillion for the top 0.1% excluding the Forbes 400 and $4 trillion for the Forbes 400 (Appendix Table 2).So, for top-1% wealth-holders, the 67% of the tax base captured by AGI for the 99-99.9$^{th}$ percentile is quite influential.

For all wealth subgroups, there is little change over time, as shown in Figure 2. It bears emphasizing that this is partly a result of our modeling choices, which (to reduce year-to-year volatility) by design estimate change in unrealized gains in each period based on a time-invariant rate of change derived from the wealth group's average nominal change in unrealized gains over 1989-2022, rather than varying that rate year to year. (But that return is still off of a base that varies year-to-year.) It is also worth noting that an important fraction of capital gains realized (and thus included in AGI) in year t, may have accrued many years before, thus lowering the real tax rate somewhat on such gains through deferral.

To understand what drives AGI for the rich, Figure 7 shows the components of economic income for the top 1%. This group has a lot of business income (20%), salary (16%), and realized capital gains (16%) as a share of economic income, along with an important amount of taxable interest and dividends (7%).

Figure 3 shows the sources of unrealized gains by wealth group. In the bottom 50% of wealth, the vast majority of unrealized gains come from increases in the market value of their home. In the 50-90$^{th}$ percentiles, homes remain an important contributor, but are joined by tax-preferred savings vehicles (i.e., retirement assets). In the top 90-99%, tax preferred savings are the largest contributor, but unrealized gains in the value of private businesses become important too. Within the top 1%, private businesses dominate, especially in the top 0.1%. This result reflects the finding in Smith et al. (2019) on the importance of business income at the top.

*B.* Average *Tax Rates as a Share of Economic Income*

We turn next to tax rates as a share of economic income. Figure 1 shows federal income taxes (after all credits and deductions and not including FICA taxes) as a share of AGI and economic income, along with the share of economic income captured by the tax base on average from 2004-2022. These results flow from the fact that $\frac{Tax}{Economic\ Income} = \frac{Tax}{AGI} * \frac{AGI}{Economic\ Income}$. So, the bottom line is the product of the top two lines. As taxpayers' wealth increases, the average tax rate as a share of economic income diverges increasingly from that using AGI. This blunts the progressivity of the income tax: the line for taxes as a share of income is considerably flatter than the line for taxes as a share of AGI. That said, the individual income tax is still progressive up to the 99.9%: average tax rates for the bottom 50% are about 1.7%, while for the 99-99.9% they are 15.8%. Average rates fall, however, in the 99.9%+ (12.1%) and the Forbes 400 (9.6%), with the Forbes 400's average tax rate close to that paid by the 50$^{th}$-90$^{th}$ percentile (9.9%). Our estimate of the Forbes 400's average tax rate from 2004-2022 is the same as Yagan (2023)'s estimate for that group from 1992-2020. In Appendix Figures 1 and 2, we show Tax/AGI and Tax/Economic Income over time, but neither shows time trends except a small decrease in the tax rates of the bottom 50% of wealth holders.

Mechanically then, even for the top 0.1%, low taxes on already-taxed income (24% for the non-Forbes-400 top 0.1%-wealth-holders) does much more to lower the tax rate as a share of economic income than does AGI as a share of economic income (50% for that group).

Table 1 shows how our results change if we exclude unrealized gains embodied in tax-preferred savings vehicles and primary residences. For example, with respect to assets in traditional IRAs and 401Ks, Congress has explicitly chosen to exempt unrealized and even realized returns from current income taxation. As a result, even if the unrealized returns in those assets would also be protected from current taxation by the realization rule absent the special rules just described, arguably they should not be included in our definition of unrealized gains given our focus on the realization rule. Likewise, IRC §121 exempts the first $500,000 of gains on the sale of a primary residence for married couples. This also arguably implies that we should not include unrealized gains embodied in primary-residences given that most of these gains upon realization will be exempt (though less so among the very rich). As one would expect given

Figure 3, excluding these items tends to increase the share of $\frac{AGI}{AGI + Modified\ Unrealized\ Gains}$ for the bottom 99% of the wealth distribution. For example, even for the 90-99$^{th}$ percentile, taxes/economic income when excluding housing and tax-preferred unrealized gains (16.1%) is closer to taxes/AGI (18.4%) than to taxes/unmodified economic income (13.7%). It makes relatively little difference in the top 1%, however, because the primary source of their unrealized gains are businesses and to a lesser extent stock.[20]

### *C. How Much Borrowing Is There?*

We now turn to how much the wealthy borrow, taking advantage of the borrowing data in the SCF, which is rare among datasets on the wealthy. Borrowing is important to measure because it lets taxpayers engage in the "buy, borrow, die" tax strategy of consuming out of unsold gains without paying tax, and then dying and taking advantage of step-up in basis, thus never paying any tax on the consumption. We are the first to quantify this phenomenon. Unfortunately, we do not have data on borrowing for the Forbes 400, so we omit this group in our analysis of borrowing. Fox and Liscow (2024), however, using public disclosures of borrowing against publicly traded stock and other back-of-the-envelope calculations, estimate that billionaire's new borrowing is under 2% of economic income, which is largely consistent with our estimates for rich SCF-respondents below.

For high-wealth Americans, the existing amount of borrowing as of 2022 is substantial. Those in the top 1% had borrowed $1.02 trillion and those in the next 9% another $3.6 trillion. Given that about 45% of their assets are unrealized gains, such borrowing may have unlocked as much as $450 billion in otherwise unrealized gains. Nevertheless, when we estimate new borrowing for these groups, it is small in comparison to economic income or unrealized gains. Figure 4 shows estimates of new borrowing each year across the wealth distribution as a share of economic income in 2022. For the top 1% as a whole, new borrowing as a share of economic income is about 2% of economic income, while unrealized gains are about 40% of economic income in the most recent SCF. For this group, if all new borrowing were replaced by sales of

[20] IRC §1202 provides for an exclusion for some gains on the sale of stock in private businesses structured as C-corporations, but this appears to cover a relatively small fraction of gains. Treasury estimates—holding fixed behavior—§1202 costs the fisc $1.8 billion in 2024 compared to $58 billion for §121 or $238 billion for exclusions of defined benefit, defined contribution and IRAs for current taxation.

average assets, it would increase the percentage of economic income captured by the tax base only marginally: about 1 ppt. That in turn would raise the average tax rate of the group by about 0.2 ppts.

This low average amount of new borrowing, however, conceals that there are rich households who borrow a significant amount as a fraction of wealth. In particular, as shown in Appendix 4, 54% of households in the top 1% borrow less than 0.1% of their wealth, but about 15% borrow more than 5% of their wealth.

By contrast, new borrowing by lower wealth Americans is much larger as a share of their economic income than for higher wealth groups, as high as 8% for the bottom group in Figure 4.

Appendix Figure 3 tracks new borrowing/economic income by wealth group over time. It shows no major time trends for rich Americans, though for the bottom wealth group borrowing has grown as a percent of economic income from about 4% from 1989 to 2001 to 8% in 2022.

In Figure 5, we outline the sources of borrowing by the top 1%. Most of their borrowing (66%) is mortgages on first or second homes. Margin borrowing, which we examine in greater detail in the robustness section, is about 12% of total debt. Appendix Figure 5 shows that there is not an increase in borrowing/wealth as taxpayers age. One might have expected that, under "buy, borrow, die," taxpayers would accumulate debt over time as they consumed more of their gains and rolled over their previous loans.

Figure 6 shows aggregate unrealized gains and borrowing in 2022 by wealth group. In total, borrowing significant sums while also having large unrealized gains appears to be more of a upper middle-class phenomenon: Americans in the 50th-90th percentile of wealth had $18 trillion in unrealized gains in 2022, and had borrowed $7.7 trillion (43% of unrealized gains), while those in the top 1% had unrealized gains $23 trillion and borrowed $1.0 trillion (4% of unrealized gains). For those in the 50-90$^{th}$ percentile, this often takes the form of borrowing to buy a home followed by significant appreciation in housing and retirement assets during the long period of a 30-year mortgage, but in some cases it will on net result in the borrowing being repaid after the taxpayer's death using the stepped up basis on assets as under "buy, borrow, die."

Borrowing by the wealthy is still substantial. For example, Fox and Liscow (2024) estimate that taxing the existing and future borrowing of centi-millionaires as a partial realization of their appreciated assets could raise about $100 billion over a decade (under the Biden administration's proposed top tax rate on capital gains of 44.6%). That said, the results here suggest that borrowing is far from the dominant tax avoidance strategy used by the very wealthy.

*D. Explaining Borrowing: Consumption and Savings*

To explain why the rich do not borrow more to unlock their unrealized gains, we turn to estimates of their consumption versus their liquid income, which determine how much they would need to borrow.

We first examine consumption habits for our different wealth groups and compare these to liquid income. We divide AGI (which is essentially equivalent to liquid income) into two parts. The first we call AGI-. AGI- consists of the components of AGI for which it is difficult to defer realization. AGI- is computed as AGI less realized capital gains. We separately include realized gains. To estimate consumption, we first estimate savings rates out of AGI- following the pseudo-panel methodology of Mian et al. (2021), which is discussed in the Data and Methodology section. For purposes of this analysis, we also follow Mian et al.'s calculation of unrealized gains discussed above, which is different than in primary analyses. (As shown in Appendix Table 7, and discussed below, however, this method produces similar results to the primary method of calculating unrealized gains.)

With the savings rates derived from the pseudo-panels, we can then back out aggregate levels of consumption. Figure 8 displays these aggregate levels of consumption, AGI-, and realized capital gains as a share of economic income, by wealth group in 2022, and Figure 9 compares consumption and AGI. The bottom wealth group in this figure consumes more than its economic income by converting existing wealth and or borrowing. For each wealth group in the top 10%, consumption is less than AGI. For the 99-99.9$^{th}$ percentile, AGI- alone exceeds consumption. Thus, on average the ultra-wealthy don't need to rely on "buy, borrow, die" to finance their consumption.

To explain why liquid income exceeds consumption, there are two parts: Why is liquid income "high"? And why is consumption "low"?

Turning first to liquid income: Recall that 60% of economic income is AGI for the top 1%. As Figure 7 showed above, the top 1% have a lot of salary and business income. In total, these households have enough income that they are "forced" to realize that it is large enough to cover their consumption. In addition, they do not have direct control over the timing of capital gains realizations for a significant portion of assets in their portfolio like hedge fund, venture capital, and private equity investments, among others (Sarin et. al 2021). This also holds when we look at household-level estimates rather than aggregate estimates by wealth group. Using the 2022 SCF, we find that most households in the top 1% have AGI greater than average implied consumption as a fraction of economic income. Only about 15% of households have AGI less than their implied consumption. When we add 10% of liquid assets to AGI, this number drops to 11.91%.

These results raise the question of why consumption is so "low" relative to Haig-Simons income or even AGI. One possibility is a bequest motive. Another is a declining return to consumption. There are only so many beds that one can sleep in each year. Ingrained habits could also play a role. As could the idea that wealth itself (contra Veblen) is itself the ultimate status good. In any case, "buy, save, die" appears to describe a much larger share of behavior than does "buy borrow die."

## IV. **Robustness**

In this section, we conduct several robustness checks.

### *A. Other Ways of Measuring of Unrealized Gains and Losses*

Appendix Tables 7 and 8 show the portion of economic income captured by the tax base and average tax rates after accounting for unrealized gains using the two other methods of calculating unrealized gains noted in the Methodology section. In general, the other two methods produce results that are similar to the baseline. The two robustness methods produce unrealized gains that are somewhat bigger for everyone but the top 0.1%, but the differences are not large. For example, using one of the robustness methods would drop the average tax rate on economic income for the 99-99.9% from 15.8% in the baseline to 14%.

### *B. Adjusting for Inflation*

In Appendix Figure 7, we reexamine the percent of economic income captured by the tax base and average tax rates in Figure 1, except we adjust realized and unrealized gains for

inflation. This figure then shows the portion of real economic income captured by a real version of the tax base. The analysis captures the intuition that economic income due to inflation is not really economic income. This analysis does not shift the qualitative story for taxes: average rates still peak in the 99-99.9%. The analysis does accentuate the result that most of economic income is captured in the tax base: 78% for the 99-99.9$^{th}$ percentile, 61% for the 99.9$^{th}$ percentile excluding the Forbes 400, and 57% for the Forbes 400.

*C. Other Kinds of Haig-Simons Income*

The types of Haig-Simons income that our definition of economic income misses—like imputed rental income from owner-occupied housing, employer and government provided health insurance, non-taxable government transfer payments—make up a larger share of the Haig Simons income of middle and lower wealth groups than the top wealth groups. Thus using Haig-Simons income instead of our definition would likely make the average tax rate structure look more progressive by driving down rates in the middle and bottom. Future drafts will incorporate these other kinds of Haig Simons income as included in Larrimore et al. (2021) to examine the effect on the main results.

*D. Comparing SCF Borrowing Data to the Financial Accounts; Margin Borrowing and Borrowing against Life Insurance*

As noted above, the SCF data on household debt fairly closely matches the Federal Reserve's estimates of household debt from Financial Accounts of the United States (formerly known as the Flow of Funds accounts). The correlation between the SCF and Financial Accounts data over the 1989 to 2022 period is 99.5%. In general the SCF tends to produce estimates of household debt which are about 5% smaller than the Financial Accounts in recent years. A large fraction of this discrepancy—$1.5 trillion—is composed of larger Financial Accounts figures for educational loans, auto loans, and credit cards.[21] Even if the Financial Accounts figures are preferred for these kinds of loans, the "excess" over the SCF in these categories is unlikely to be concentrated among high income Americans.[22] By contrast, however, the Financial Accounts

[21] As Batty et al. (2020) point out this is due in part to the Financial Accounts using a broader definition of credit card debt.

[22] Such loans make up about 2% of debt for the top 1% of wealth holders in 2022. By contrast these kinds of debt were 13% of the debt of the bottom 50%.

estimates for household borrowing via margin loans ($466 billion) and loans against insurance policies ($132 billion) are substantially higher than the SCF ($173 billion and $66 billion, respectively). The Financial Accounts margin loans are estimated using data reported by securities brokers and dealers on all "receivables due from customers (margin loans and other receivables)," which includes margin loans made to non-household customers like hedge funds.[23] This is likely to explain most of the discrepancy because other Financial Accounts data shows that the bulk of this margin borrowing is done by hedge funds.[24]

Nevertheless, as a robustness check, we distribute the additional borrowing shown in the Financial Accounts for margin loans and loans against insurance in Appendix Table 12. Distributing the excess margin and insurance loans makes a marginal difference up to the 99.9$^{th}$ percentile, but substantially increases the borrowing of the top 0.1% because, in the SCF, that group reports roughly 60% of total margin loans. This increases the share of borrowing/unrealized gains from 2.4% to 4.1% for this group.

*E. Personal Borrowing via Entities*

The SCF does not attempt to capture borrowing by business entities owned by households. This is a potential limitation if taxpayers use entities to facilitate "personal" borrowing. A rich taxpayer might contribute appreciated assets to an LLC—which is taxed as a pass-through (i.e. partnership)—and have the LLC borrow against the assets, instead of borrowing directly. The LLC would then pay out the loaned funds to the taxpayer without triggering taxes.[25] We are not aware of any tax reason to use this more complex form of borrowing, but there could be non-tax reasons to do so.[26] Similarly, a taxpayer who owns an operating partnership which already has appreciated assets might have the partnership borrow against that appreciation and pay out the proceeds, instead of borrowing against her appreciated

[23] The authors confirmed this interpretation of the data series with a Federal Reserve employee.

[24] Financial Accounts series on hedge fund margin borrowing—FL663067003A—is often over 90% of the figure for households although the hedge fund margin series covers some loans not overlapping with the household margin loans series.

[25] Borrowing by a partnership increases the taxpayer's "outside" basis in the partnership. This means that the payout will not trigger tax as a result of exceeding the taxpayer's outside basis.

[26] For example, the taxpayer could use this strategy to effectively turn the loan into a non-recourse obligation, albeit at a cost of higher interest rates from the lender. Or simply they might use an entity for privacy reasons so it is not clear who the purchaser of an asset is.

shares in the partnership itself. Such borrowing would not show up in the SCF if the entity is the borrower.

By contrast, a taxpayer with an S-corporation, which is also taxed as a pass-through, would often have a difficult time taking the steps outlined above without triggering tax.[27] As a result, we might hypothesize that if taxpayers often use businesses as vehicles to facilitate personal borrowing, then entities taxed as partnerships should have more debt than similar entities organized as S-corporations.

Using data from the Statistics of Income, we generally do not see this pattern in the (limited) data. Looking at the most recent year for which there is data for both types of entities (2017), Appendix Table 4 shows Debt/Equity and Debt/Assets of Partnerships and S-corporation. Among all industries, partnerships have much less leverage measured by Debt/Equity or Debt/Assets. But outside of finance, partnerships do in fact have a higher debt/assets ratio. Nevertheless, when we look more closely, this pattern disappears. Even outside of finance, if we compare entity types *within* other major industries, on average partnerships have slightly lower Debt/Assets. In particular, regressing Debt/Assets or Debt/Equity with an industry fixed effect (hence comparing S-corps and partnerships within the same industry) shows in Appendix Table 14 that partnerships have less borrowing, not more.

It is of course true that there could be unobserved reasons why S-corporations would have more leverage than entities taxed as partnerships, which could then obscure how personal borrowing against appreciation increases leverage at partnerships. Still, these results that personal borrowing facilitated by entities is likely to be relatively limited. As a sensitivity check, however, we assume that the additional Debt/Assets shown for non-financial partnerships compared to non-financial S-corps is attributable to excess personal borrowing as shown in Appendix Table 15. While again this increases the amount of borrowing at the top, borrowing remains a fairly small fraction (5%) of unrealized gains.

[27] In general, borrowing by an S-corporation from a 3rd party does not increase a shareholder's basis in it. Thus a shareholder who caused the S-corporation to borrow against appreciated assets and pay out the proceeds might exceed her basis in the shares, triggering tax. See Eustice, Kuntz & Bogdanski (2024) (¶8.04; 9.01 etc.).

Finally, Appendix Figure 6 shows borrowing/wealth as a function of pass-through assets divided by wealth. If some high wealth households used pass throughs to do their personal borrowing, while others did not, we might expect that those households would have a lower level of measured borrowing in the SCF (since their true borrowing was being done through the pass through). Appendix 6 however shows no relationship on average between the percentage of the household's assets held in pass throughs and borrowing as a fraction of wealth. This is suggestive again that entity borrowing is not substantially biasing the results.

## V. Conclusion

Our analysis yields four main results.

First, for the top 1% of wealth-holders, we estimate that AGI is on average 60% of economic income from 2004-2022 and thus that—holding fixed behavior—raising ordinary and capital gains rates would reach a majority of our definition of economic income. Of course, at the same time, missing 40% of economic income is a large share by any measure.

Second, using economic income as a benchmark, the tax system is still progressive, though less so than when using AGI as our measure of income. The average tax rates peak in the 99-99.9% who end up paying significantly higher average tax rates than those above them in wealth (roughly 50% higher rates than billionaires for example).

Third, existing borrowing by the rich is substantial, but new borrowing each year is fairly small (under 2% of economic income) for the top 1%. "Buy, borrow, die" does not appear to be a dominant tax avoidance strategy for them.

Fourth, we estimate that consumption is less than AGI for the top 1%. The wealthy have fairly high liquid income, partly from business income, salary, and realized gains. And there are a variety of reasons why they may not consume much of their income, include steeply declining returns at such a high level of wealth. In the end, then, it appears that the main tax avoidance strategy of the super-rich is "buy, save, die."

Overall, for the top 1%, the story is quite different for unrealized gains and for borrowing than is suggested by anecdotes on billionaires in the media. At the same time that innovative

ways of taxing unrealized gains and borrowing would raise large amounts of money, our results show how much of the economic tax base can be targeted by simply raising rates.

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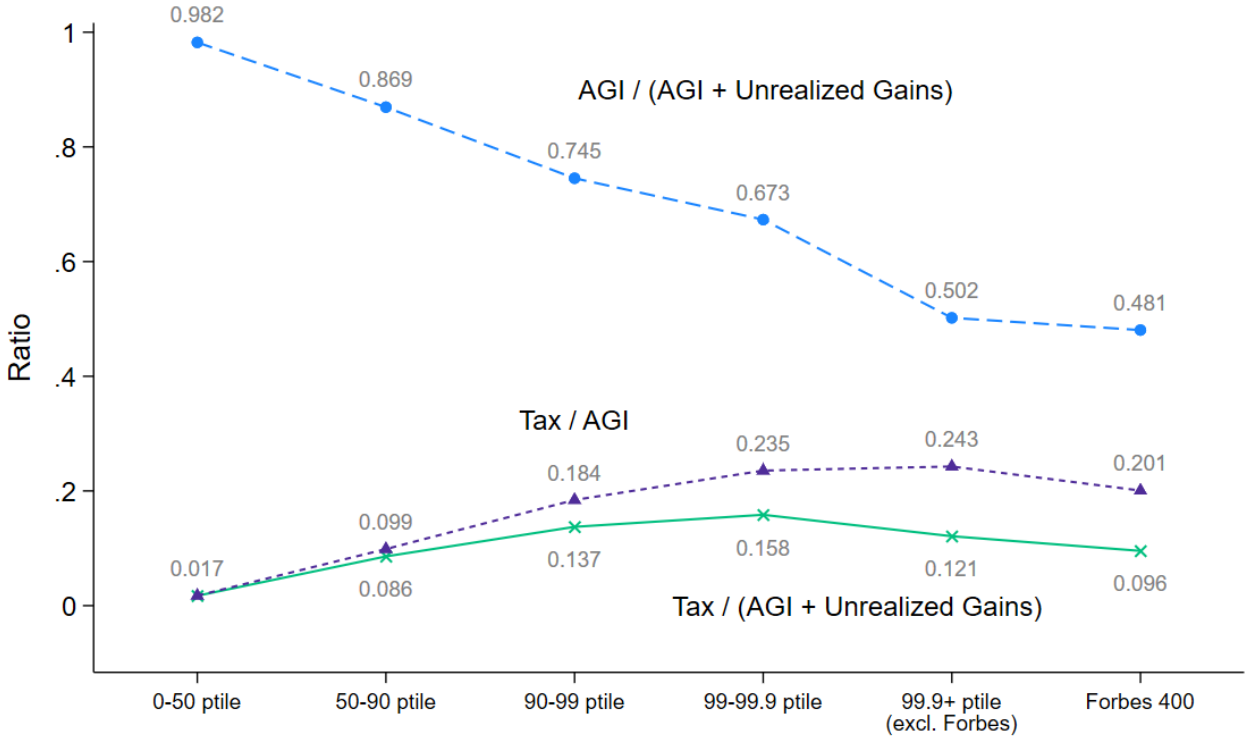
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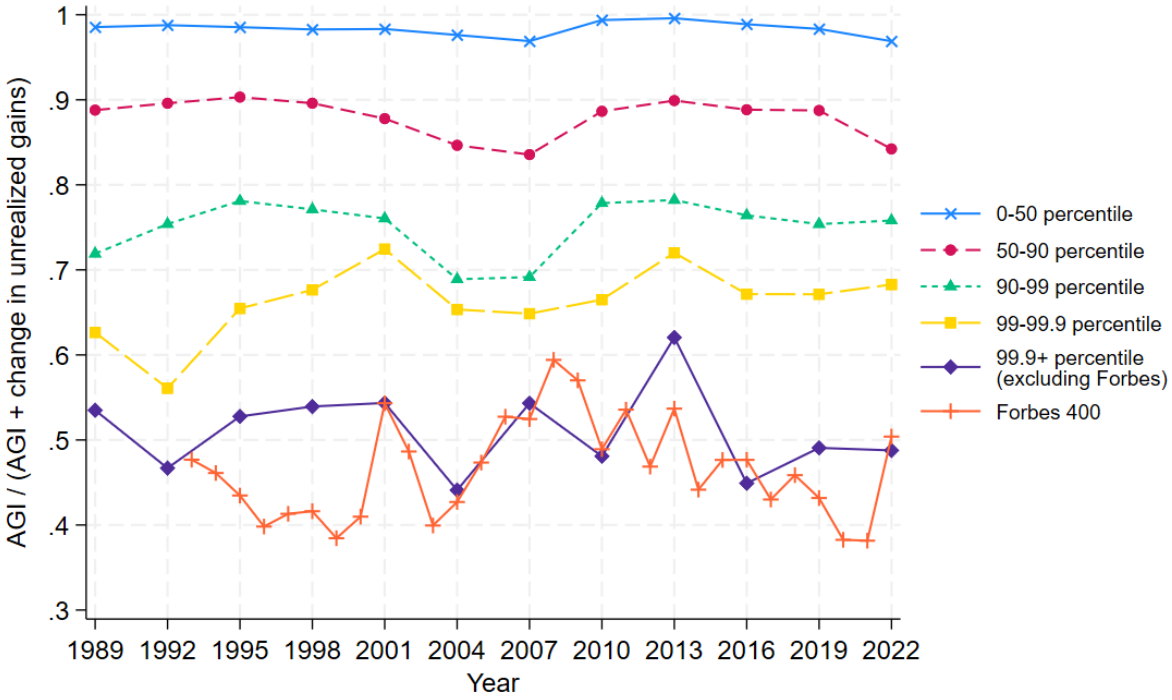
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Figure 1. How Much Unrealized Gains Reduce the Tax Base and Tax Rates, 2004-2022 Averages



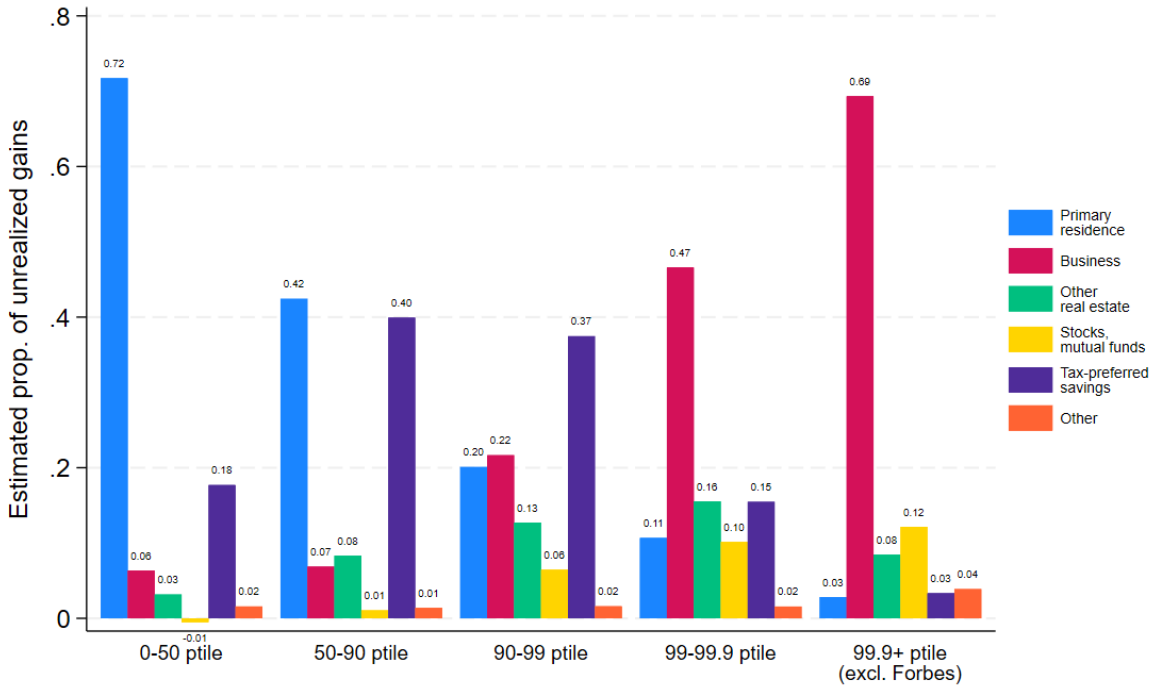

Notes: Ratios are average of ratios over the period 2004-2022. Tax refers to federal income tax liability. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data and Methodology section for more information. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Tax and AGI for the Forbes 400 are estimated following Yagan (2023). See Data Appendix for more details.

Figure 2. AGI to AGI + Change in Unrealized Gains



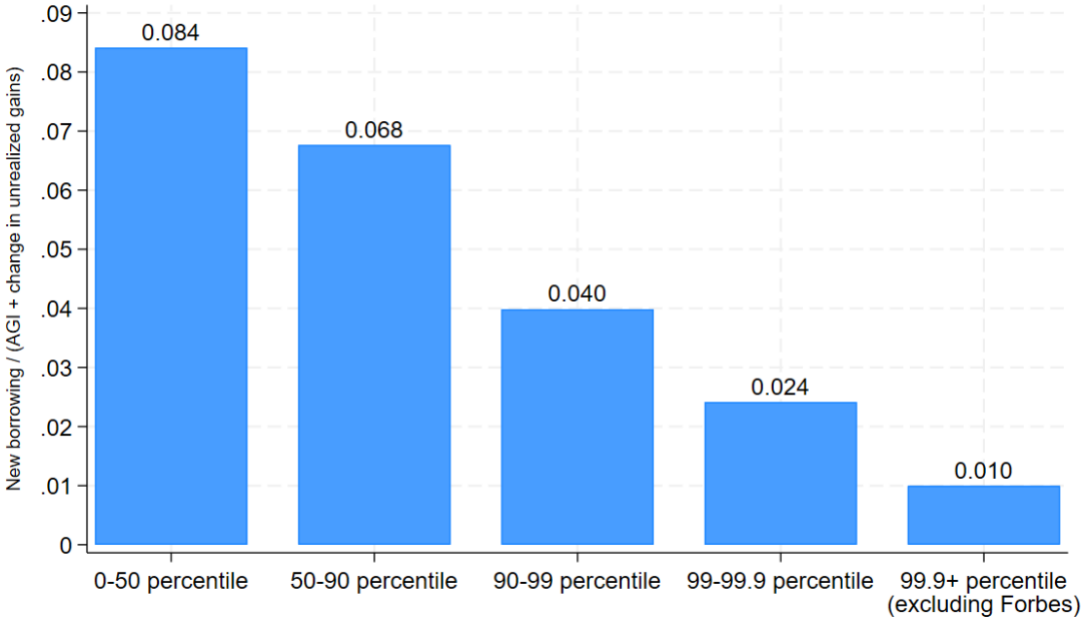

Notes: Year is SCF survey year, AGI is measured over calendar year prior. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data and Methodology section for more information. For wealth groups other than the Forbes 400, AGI is estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. AGI for the Forbes 400 is estimated following Yagan (2023). See Data Appendix for more information.

Figure 3. Unrealized Gains by Asset Type, 2004-2022 Averages



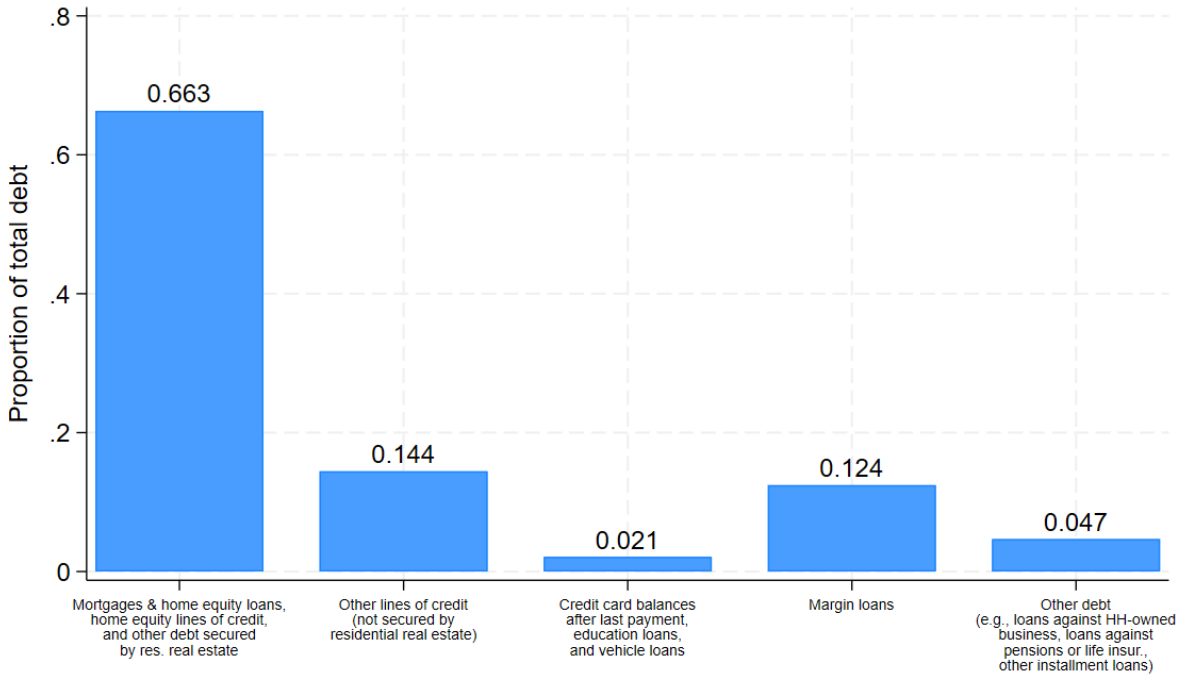

Notes: Estimates are averages of 2004-2022 ratios. Tax-preferred savings includes annuities, life insurance, retirement accounts, and DB pension plans. Other includes trusts and other unrealized gains not covered by the SCF unrealized gains variable and not included in tax-preferred savings. Our measure of total unrealized gains is estimated by upweighting the SCF unrealized gains variable to account for assets not covered by this variable (annuities, life insurance, retirement accounts, DB pension plans, trusts, and other). Primary residence; business; other real estate; and stocks, mutual funds are observed in the SCF. The tax-preferred savings category and other category are not directly observed in the SCF, we are estimating these categories. See Data Appendix for more details. Forbes is not included because we do not have sufficient data on Forbes 400 members' composition of unrealized gains.

Figure 4. New Borrowing/(AGI + Change in Unrealized Gains) by Wealth Group, 2022 SCF



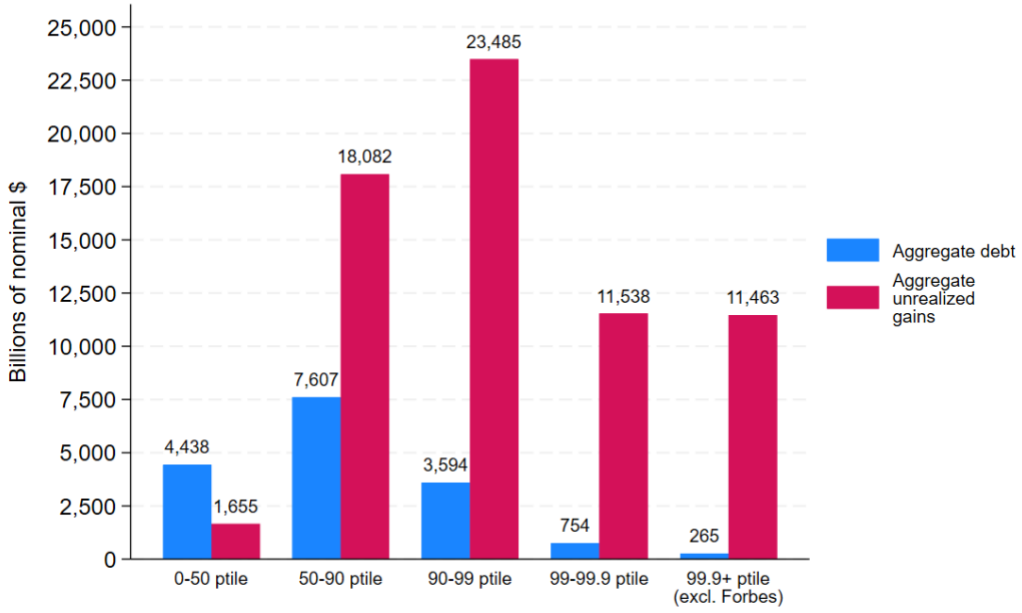

Notes: Borrowing concept does not include non-residential property debt and loans against HH-owned business. New borrowing is not directly observed in the SCF. We estimate new borrowing using observed borrowing in the SCF and the wealth-group specific annual growth rate of borrowing, 1989-2022 (see Data Appendix for more details). Change in unrealized gains is estimated using the SCF. See Data and Methodology section for more information. AGI is estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. See Data Appendix for more details. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Figure 5. Sources of Debt, Top 1% of Wealth Distribution, 2022 SCF



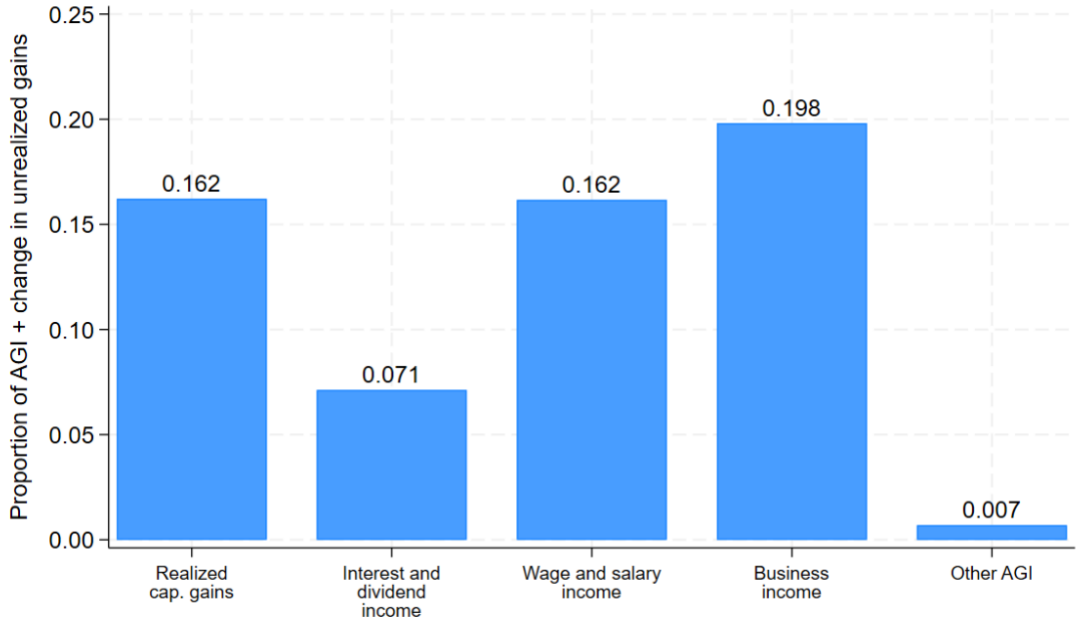

Notes: Sample restricted to the top 1% of net worth in the 2022 SCF. Borrowing concept does not include non-residential property debt and loans against HH-owned business. Proportions are computed using aggregate category / aggregated total debt. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Figure 6. Aggregate Unrealized Gains and Aggregate Borrowing by Wealth Group, 2022 SCF



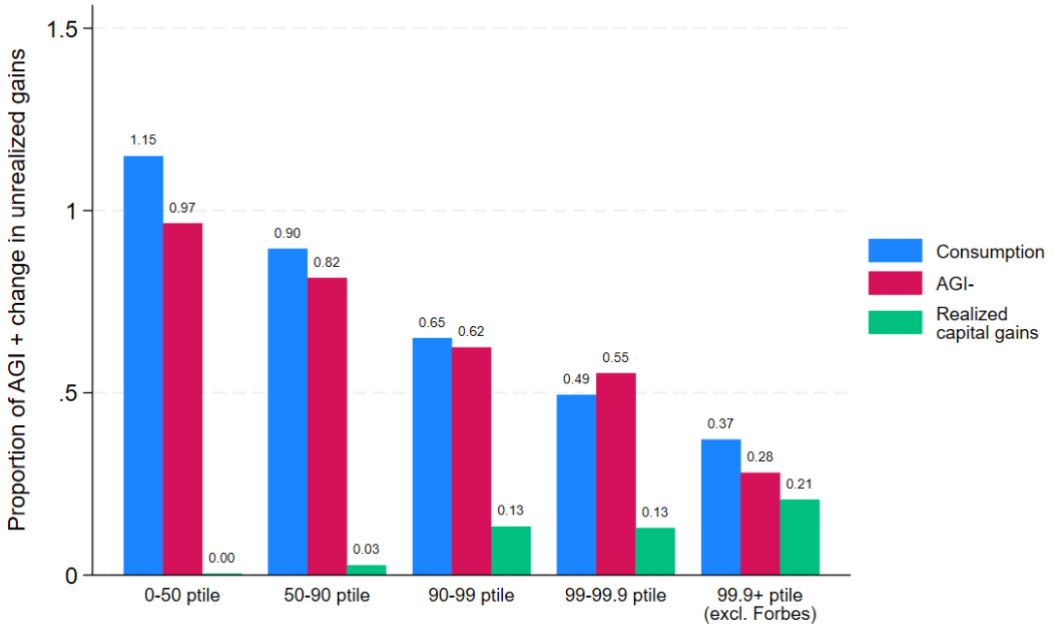

Notes: Borrowing concept does not include non-residential property debt and loans against HH-owned business. Proportions are computed using aggregate category / aggregated total debt. Our measure of total unrealized gains is estimated by upweighting the SCF unrealized gains variable to account for assets not covered by this variable (annuities, life insurance, retirement accounts, DB pension plans, trusts, and other). See Data Appendix for more details. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Figure 7. Components of AGI as Share of AGI + Change in Unrealized Gains, Top 1% of Wealth Distribution, 2022 SCF



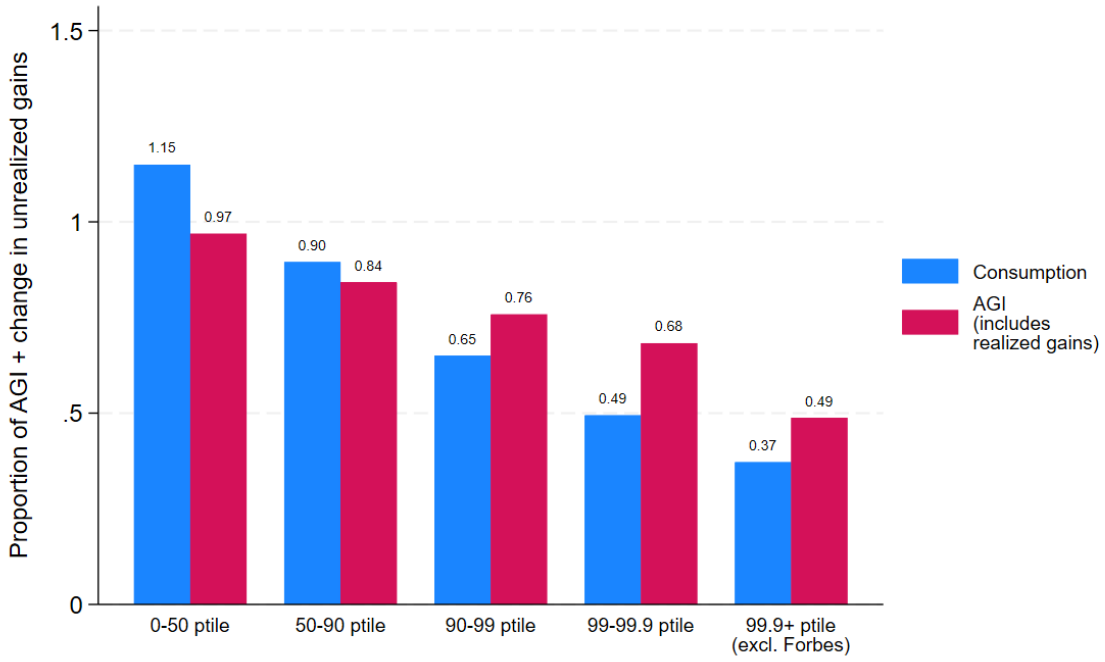

Notes: Sample restricted to the top 1% of net worth in the 2022 SCF. Change in unrealized gains is estimated using the SCF. See Data and Methodology section for more information. AGI is estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Realized cap. gains, interest and dividend income, wage and salary income, and business income are determined using SCF variables, then scaling these variables by the AGI scaling factors. Other AGI is estimated as a residual. See Data Appendix for more details. Forbes is not included because we do not have sufficient data on Forbes 400 members' composition of AGI.

Figure 8. Aggregate Consumption, AGI-, and Realized Gains, 2022 SCF




Notes: Consumption includes tax payments. Consumption is estimated using scaled SCF income variables and wealth group-specific savings rates. Savings rates vary by wealth group but are time invariant. AGI is estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. See Data Appendix for more information. AGI- is AGI less realized capital gains. Consumption is greater than 1 for the 0-50 percentile because the estimated savings rate is negative (consumption is greater than income). Forbes is not included because we do not have sufficient data on Forbes 400 members' savings rates.

Figure 9. Aggregate Consumption and AGI, 2022 SCF



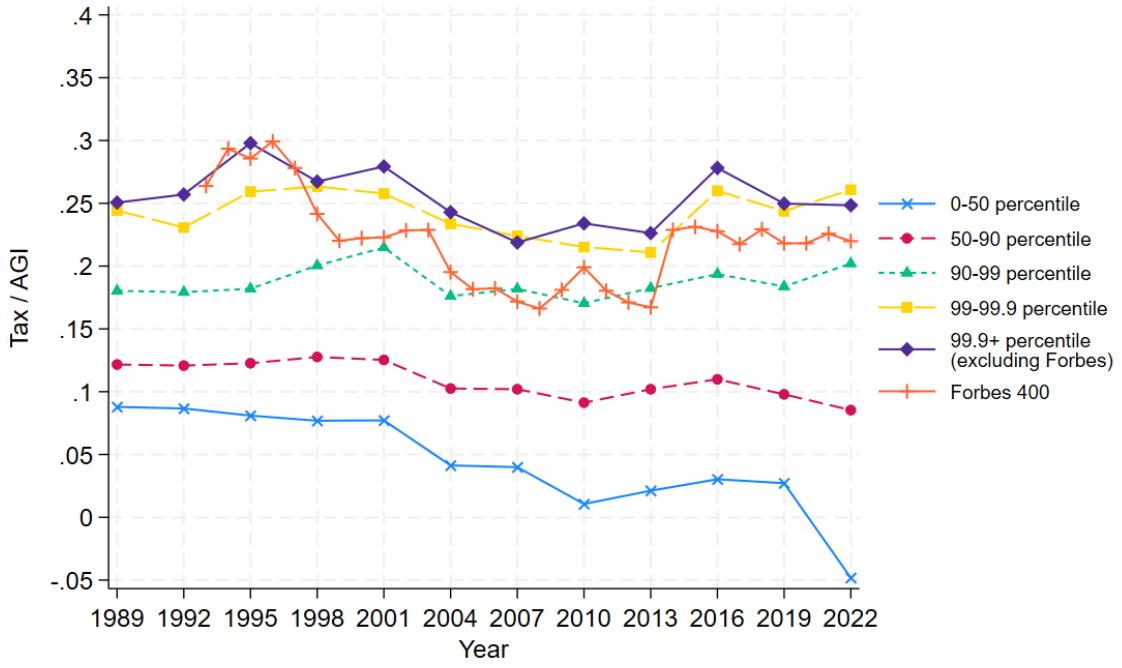

Notes: Consumption is estimated using scaled SCF income variables and wealth group-specific savings rates. Savings rates vary by wealth group but are time invariant. AGI is estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. See Data Appendix for more information. Consumption is greater than 1 for the 0-50 percentile because the estimated savings rate is negative (consumption is greater than income). Forbes is not included because we do not have sufficient data on Forbes 400 members' savings rates.

Table 1. Tax / AGI Variants

| | Tax / AGI | | Tax / (AGI + change in unrealized gains) | | Tax / (AGI + change in unrealized gains - change in unrealized tax-pref. savings gains) | | Tax / (AGI + change in unrealized gains - change in unrealized tax-pref. savings gains - change in unrealized housing gains) | |
|---|---|---|---|---|---|---|---|---|
| | Average, 2004-2022 | 2022 Only | Average, 2004-2022 | 2022 Only | Average, 2004-2022 | 2022 Only | Average, 2004-2022 | 2022 Only |
| 0-50 percentile | 0.017 | -0.048 | 0.017 | -0.047 | 0.017 | -0.047 | 0.017 | -0.048 |
| 50-90 percentile | 0.099 | 0.085 | 0.086 | 0.072 | 0.09 | 0.077 | 0.096 | 0.083 |
| 90-99 percentile | 0.184 | 0.202 | 0.137 | 0.153 | 0.152 | 0.167 | 0.161 | 0.176 |
| 99-99.9 percentile | 0.235 | 0.261 | 0.158 | 0.178 | 0.167 | 0.187 | 0.173 | 0.193 |
| 99.9+ percentile | 0.243 | 0.248 | 0.121 | 0.121 | 0.123 | 0.123 | 0.125 | 0.124 |
| Forbes 400 | 0.201 | 0.220 | 0.096 | 0.111 | | | | |

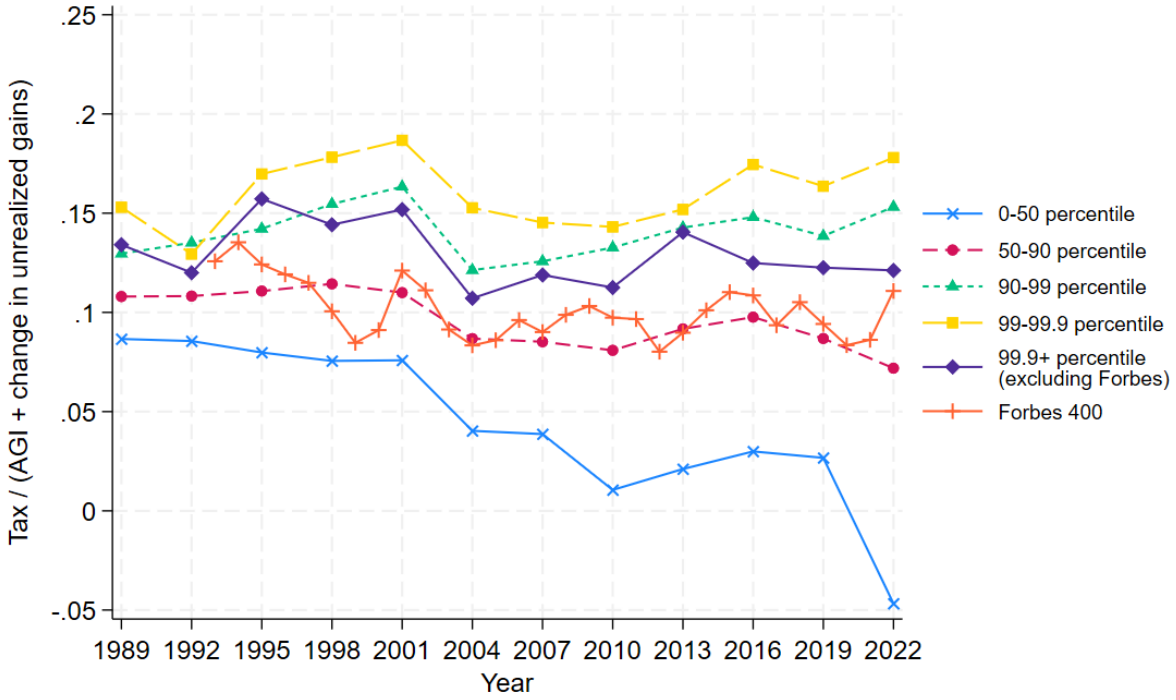
Notes: Tax refers to federal income tax liability. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data and Methodology section for more information. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Tax and AGI for the Forbes 400 are estimated following Yagan (2023). See Data Appendix for more information. Tax-preferred savings includes annuities, life insurance, retirement accounts, and DB pension plans. Other includes trusts and other unrealized gains not covered by the SCF unrealized gains variable and not included in tax-preferred savings. Change in unrealized tax-preferred savings gains and change in unrealized housing gains are estimated using the estimated composition of unrealized gains. See Data Appendix for more details. Forbes is excluded from some results because we do not have sufficient data on Forbes 400 members' composition of unrealized gains.

Appendix Figure 1. Federal Income Tax to AGI



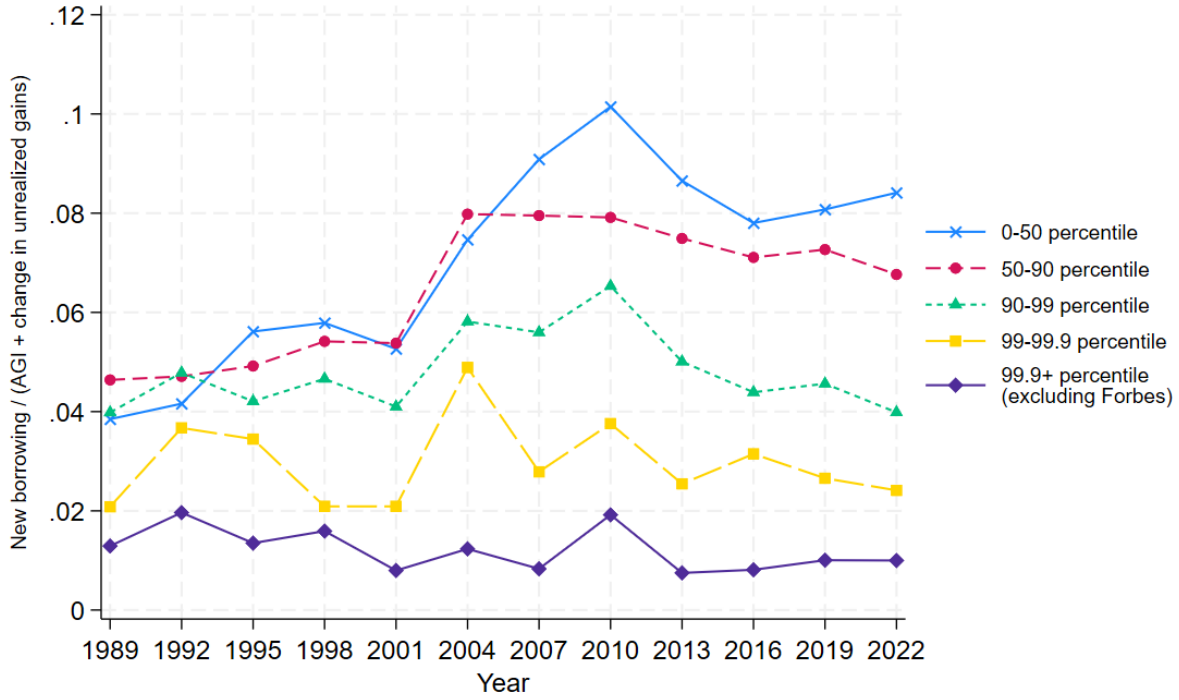

Notes: Year is SCF survey year, AGI and federal income tax are measured over calendar year prior. Tax refers to federal income tax liability. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Tax and AGI for the Forbes 400 are estimated following Yagan (2023). See Data Appendix for more information.

Appendix Figure 2. Federal Income Tax to AGI + Change in Unrealized Gains



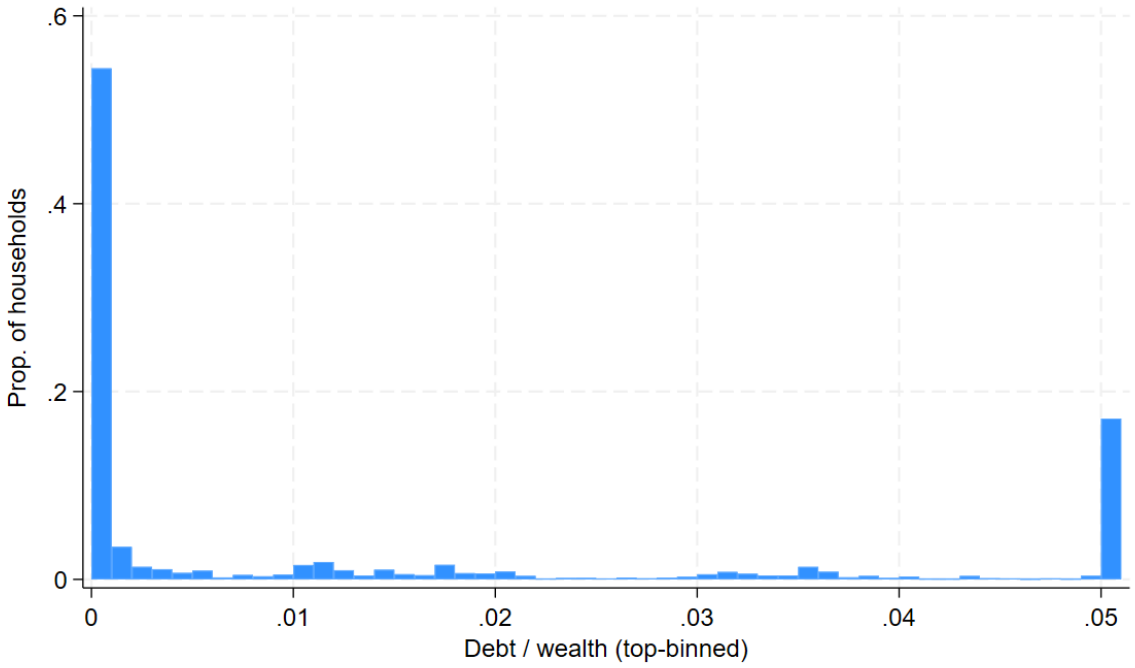

Notes: Year is SCF survey year, AGI and federal income tax are measured over calendar year prior. Tax refers to federal income tax liability. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data and Methodology section for more information. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Tax and AGI for the Forbes 400 are estimated following Yagan (2023). See Data Appendix for more details.

Appendix Figure 3. New Borrowing / (AGI + Change in Unrealized Gains)



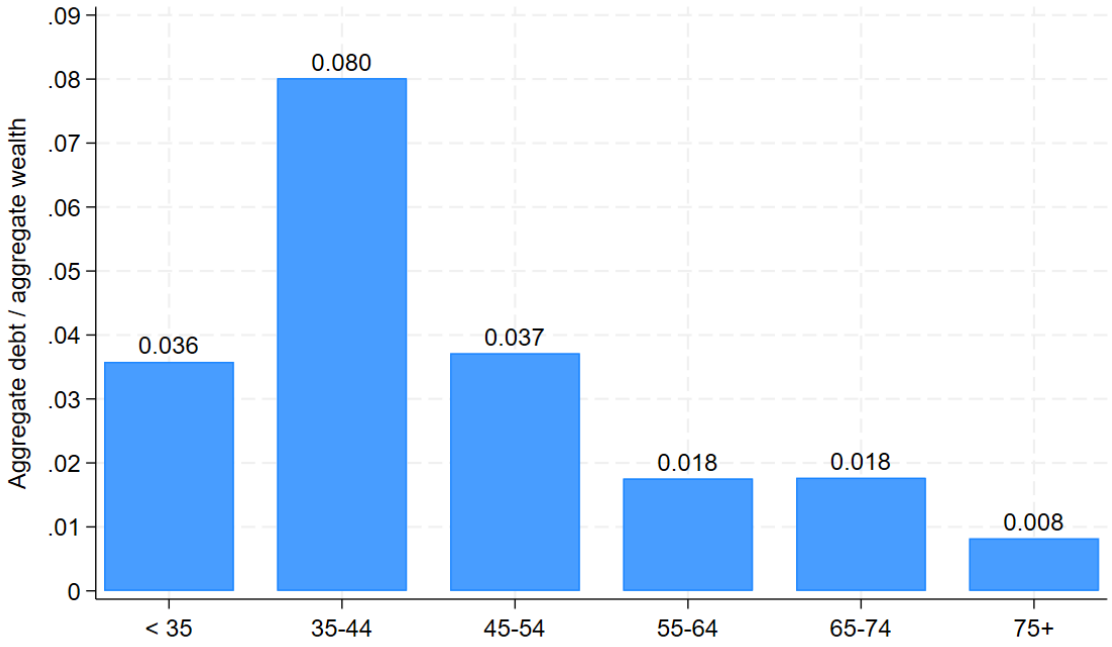

Notes: Borrowing concept does not include non-residential property debt and loans against HH-owned business. New borrowing is not directly observed in the SCF. We estimate new borrowing using observed borrowing in the SCF and the wealth-group specific annual growth rate of borrowing, 1989-2022 (see Data Appendix for more details). Change in unrealized gains is estimated using the SCF. See Data and Methodology section for more information. AGI is estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. See Data Appendix for more details. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Appendix Figure 4. Borrowing / Wealth by Household, Top 1% of Wealth Distribution, 2022 SCF



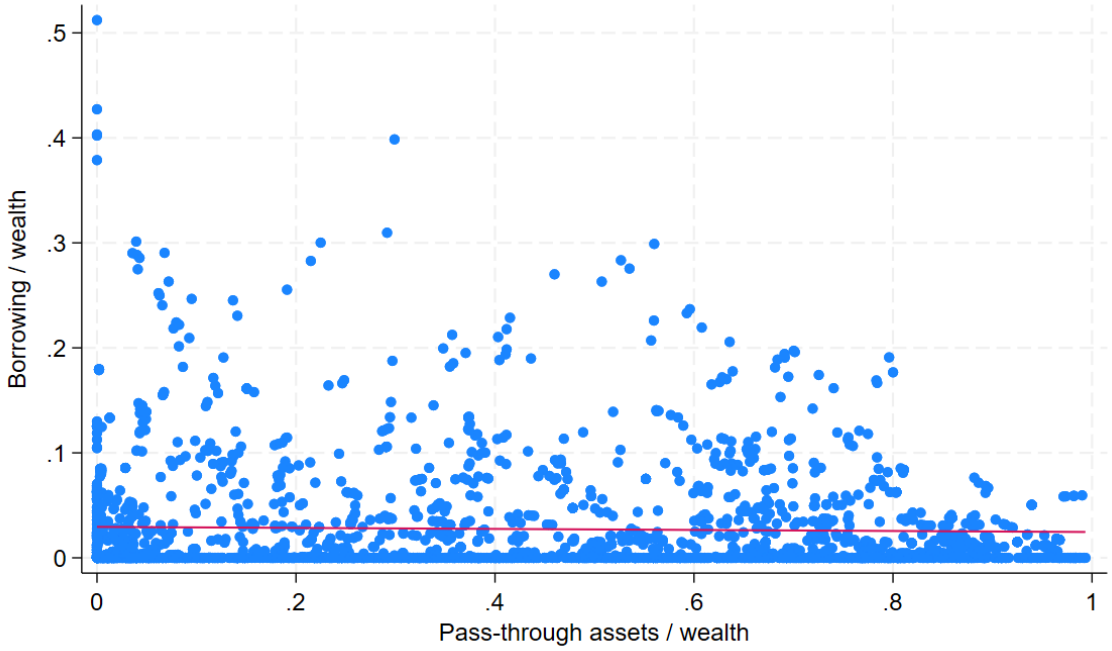

Notes: Histogram plots household-level debt / wealth. Borrowing / wealth is binned at the top for households with borrowing / wealth > 0.05. Sample restricted to the top 1% of net worth in the 2022 SCF. Borrowing concept does not include non-residential property debt and loans against HH-owned business. # of households computed using SCF-provided sample weights. Total # of implied households = 1,314,624. # of households with borrowing / wealth < 1/1000 = 715,319. First bin = 0-0.001. Proportion of households in first bin = 0.54. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Appendix Figure 5. Borrowing / Wealth by Age Group, Top 1% of Wealth Distribution, 2022 SCF



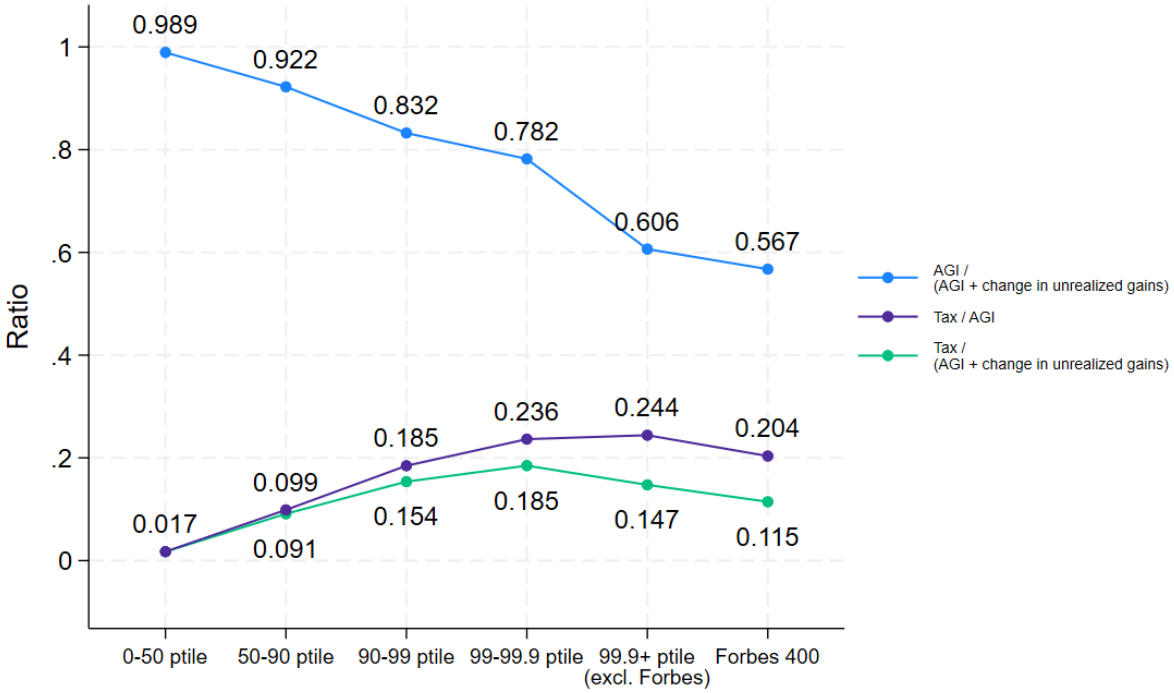

Notes: Sample restricted to the top 1% of net worth in the 2022 SCF. Borrowing concept does not include non-residential property debt and loans against HH-owned business. Age group is determined by age of the household head. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Appendix Figure 6. Borrowing / Wealth vs. Passthrough Assets / Wealth, Top 1% of Wealth Distribution, 2022 SCF




Notes: Line of best fit: debt / wealth = -0.00*(passthrough assets/wealth)+0.03. Pass-through assets are estimated following Smith et al. (2023), using their replication package. Sample restricted to top 1% of net worth in the 2022 SCF. Line of best fit uses SCF-provided sample weights. Size of the dots in the scatterplot do not reflect number of implied households. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Appendix Figure 7. Main Outcome Ratios with Real Change in Unrealized Gains and Realized Gains, 2004-2022 Averages




Notes: Tax refers to federal income tax liability. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data and Methodology section for more information. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Tax and AGI for the Forbes 400 are estimated following Yagan (2023). Change in unrealized gains and realized gains (within AGI) are adjusted for inflation. See Data Appendix for more information.

Appendix Table 1. Annualized Growth of Nominal Unrealized Capital Gains and Nominal Net Worth, 1989-2022

| Wealth group | Avg. nominal growth rate of unrealized gains, 1989-2022 | Avg. nominal growth rate of net worth, 1989-2022 |
|---|---|---|
| 0-50 percentile | 0.062 | 0.052 |
| 50-90 percentile | 0.056 | 0.057 |
| 90-99 percentile | 0.059 | 0.063 |
| 99-99.9 percentile | 0.057 | 0.066 |
| 99.9+ percentile | 0.069 | 0.074 |
| Forbes 400 | 0.080 | 0.084 |

Notes: Author calculations using SCF and data on Forbes 400 net worth. We do not have direct data on Forbes 400 unrealized gains by year. Aggregate unrealized gains for the Forbes 400 are estimated each year using the ratio of unrealized gains to net wealth for the 99.9%+ wealth group in the SCF. This ratio varies by year. For non-SCF years, this ratio is interpolated. See Data Appendix for more information. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024).

Appendix Table 2. Wealth Cutoffs and Average Net Wealth by Percentile, 2022

| | 0-50 pct | 50-90 pct | 90-99 pct | 99-99.9 pct | 99.9+ pct, below Forbes 400 | Forbes 400 |
|---|---|---|---|---|---|---|
| Lower Bound of Wealth Group ($ millions, 2022 dollars) | -0.56 | 0.25 | 2.29 | 13.98 | 62.13 | 2,700 |
| Avg. Net Worth ($ millions, 2022 dollars) | 0.06 | 0.84 | 4.92 | 24.33 | 155.41 | 10,012 |
| Aggregate Net Worth ($ millions, 2022 dollars) | 4,053,880 | 44,154,852 | 58,164,512 | 28,786,204 | 20,463,764 | 4,004,800 |

Notes: Author calculations using the SCF and data on Forbes 400 net worth in 2022 from Gastwirth et al. (2024).

Appendix Table 3. AGI / (AGI + Change in Unrealized Gains) Variants

| | AGI / (AGI + change in unrealized gains) | | AGI / (AGI + change in unrealized gains - change in unrealized tax-pref. savings gains) | | AGI / (AGI + change in unrealized gains - change in unrealized tax-pref. savings gains - change in unrealized housing gains) | |
|---|---|---|---|---|---|---|
| | Average, 2004-2022 | 2022 Only | Average, 2004-2022 | 2022 Only | Average, 2004-2022 | 2022 Only |
| 0-50 percentile | 0.982 | 0.969 | 0.985 | 0.975 | 0.998 | 0.998 |
| 50-90 percentile | 0.869 | 0.842 | 0.916 | 0.897 | 0.974 | 0.972 |
| 90-99 percentile | 0.745 | 0.758 | 0.823 | 0.824 | 0.873 | 0.871 |
| 99-99.9 percentile | 0.673 | 0.683 | 0.709 | 0.716 | 0.736 | 0.740 |
| 99.9+ percentile | 0.502 | 0.488 | 0.510 | 0.494 | 0.518 | 0.499 |
| Forbes 400 | 0.481 | 0.504 | | | | |

Notes: Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data and Methodology section for more information. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Tax and AGI for the Forbes 400 are estimated following Yagan (2023). See Data Appendix for more information. Tax-preferred savings includes annuities, life insurance, retirement accounts, and DB pension plans. Other includes trusts and other unrealized gains not covered by the SCF unrealized gains variable and not included in tax-preferred savings. Change in unrealized tax-preferred savings gains and change in unrealized housing gains are estimated using the estimated composition of unrealized gains by wealth group. See Data Appendix for more details. Forbes is excluded from some results because we do not have sufficient data on Forbes 400 members' composition of unrealized gains.

Appendix Table 4. Aggregate Borrowing / Aggregate Wealth by Wealth Group and Year

| Year | 0-50 percentile | 50-90 percentile | 90-99 percentile | 99-99.9 percentile | 99.9+ percentile (excluding Forbes) |
|---|---|---|---|---|---|
| 1989 | 0.787 | 0.173 | 0.059 | 0.025 | 0.021 |
| 1992 | 0.895 | 0.179 | 0.079 | 0.041 | 0.023 |
| 1995 | 1.055 | 0.178 | 0.068 | 0.037 | 0.017 |
| 1998 | 1.074 | 0.187 | 0.078 | 0.028 | 0.024 |
| 2001 | 0.934 | 0.170 | 0.066 | 0.031 | 0.010 |
| 2004 | 1.272 | 0.225 | 0.077 | 0.052 | 0.015 |
| 2007 | 1.408 | 0.228 | 0.084 | 0.036 | 0.012 |
| 2010 | 2.813 | 0.235 | 0.088 | 0.037 | 0.022 |
| 2013 | 2.289 | 0.223 | 0.074 | 0.033 | 0.011 |
| 2016 | 1.825 | 0.210 | 0.061 | 0.032 | 0.009 |
| 2019 | 1.705 | 0.214 | 0.064 | 0.029 | 0.013 |
| 2022 | 1.095 | 0.172 | 0.062 | 0.026 | 0.013 |

Notes: Borrowing concept does not include non-residential property debt and loans against HH-owned business. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Appendix Table 5. Aggregate Borrowing / Aggregate Unrealized Gains

| Year | 0-50 percentile | 50-90 percentile | 90-99 percentile | 99-99.9 percentile | 99.9+ percentile (excluding Forbes) |
|---|---|---|---|---|---|
| 1989 | 2.633 | 0.406 | 0.132 | 0.048 | 0.033 |
| 1992 | 3.370 | 0.444 | 0.181 | 0.072 | 0.044 |
| 1995 | 3.810 | 0.498 | 0.178 | 0.086 | 0.034 |
| 1998 | 3.326 | 0.511 | 0.189 | 0.056 | 0.041 |
| 2001 | 3.115 | 0.432 | 0.159 | 0.065 | 0.021 |
| 2004 | 3.110 | 0.510 | 0.174 | 0.121 | 0.026 |
| 2007 | 2.902 | 0.474 | 0.169 | 0.068 | 0.022 |
| 2010 | 16.155 | 0.684 | 0.274 | 0.096 | 0.044 |
| 2013 | 20.959 | 0.728 | 0.214 | 0.078 | 0.023 |
| 2016 | 6.932 | 0.624 | 0.173 | 0.082 | 0.017 |
| 2019 | 4.808 | 0.634 | 0.172 | 0.069 | 0.023 |
| 2022 | 2.681 | 0.421 | 0.153 | 0.065 | 0.023 |

Notes: Aggregate borrowing and aggregate unrealized gains estimated using the SCF. Borrowing concept does not include non-residential property debt and loans against HH-owned business. Our measure of total unrealized gains is estimated by upweighting the SCF unrealized gains variable to account for assets not covered by this variable (annuities, life insurance, retirement accounts, DB pension plans, trusts, and other). See Data Appendix for more details. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Appendix Table 6. Average Wealth and Average Borrowing by Wealth Group, 2022 SCF

| Wealth group | Avg. net worth (thousands of nominal $) | Avg. borrowing, includes non-residential property debt and loans against HH-owned business (thousands of nominal $) | Avg. borrowing, does not include non-residential property debt and loans against HH-owned business (thousands of nominal $) |
|---|---|---|---|
| 0-50 percentile | 61.75 | 67.67 | 67.59 |
| 50-90 percentile | 840.79 | 147.59 | 144.85 |
| 90-99 percentile | 4,919.31 | 329.38 | 303.98 |
| 99-99.9 percentile | 24,333.95 | 751.51 | 637.64 |
| 99.9+ percentile (excluding Forbes) | 155,413.69 | 2,395.22 | 2,010.57 |

Notes: Author calculations using the SCF. Forbes is not included because we do not have sufficient data on Forbes 400 members' debt.

Appendix Table 7. AGI / (AGI + Change in Unrealized Gains), All 3 Methods

| Wealth Percentile | Method 1 -- Average, 2004-2022 | Method 2 -- Average, 2004-2022 | Method 3 -- Average, 2004-2022 | Method 1 -- 2022 | Method 2 -- 2022 | Method 3 -- 2022 |
|---|---|---|---|---|---|---|
| 0-50 percentile | 0.982 | 0.938 | 0.964 | 0.969 | 0.930 | 0.949 |
| 50-90 percentile | 0.869 | 0.801 | 0.776 | 0.842 | 0.790 | 0.758 |
| 90-99 percentile | 0.745 | 0.674 | 0.643 | 0.758 | 0.718 | 0.720 |
| 99-99.9 percentile | 0.673 | 0.596 | 0.599 | 0.683 | 0.575 | 0.600 |
| 99.9+ percentile excluding Forbes 400 | 0.502 | 0.522 | 0.533 | 0.488 | 0.545 | 0.576 |
| Forbes 400 | 0.481 | 0.654 | 0.666 | 0.504 | 0.647 | 0.687 |

Notes: The methods vary on how change in unrealized gains is estimated. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data Appendix for details on all three methods. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Tax and AGI for the Forbes 400 are estimated following Yagan (2023). See Data Appendix for more information. 2004-2022 averages are averages of year-specific AGI / (AGI + Change in Unrealized Gains). SCF observations occur every three years, Forbes observations occur every year.

Appendix Table 8. Taxes / (AGI + Change in Unrealized Gains), All 3 Methods

| Wealth Percentile | Method 1 -- Average, 2004-2022 | Method 2 -- Average, 2004-2022 | Method 3 -- Average, 2004-2022 | Method 1 -- 2022 | Method 2 -- 2022 | Method 3 -- 2022 |
|---|---|---|---|---|---|---|
| 0-50 percentile | 0.017 | 0.016 | 0.017 | -0.047 | -0.045 | -0.046 |
| 50-90 percentile | 0.086 | 0.079 | 0.077 | 0.072 | 0.067 | 0.065 |
| 90-99 percentile | 0.137 | 0.124 | 0.119 | 0.153 | 0.145 | 0.146 |
| 99-99.9 percentile | 0.158 | 0.140 | 0.141 | 0.178 | 0.150 | 0.156 |
| 99.9+ percentile excluding Forbes 400 | 0.121 | 0.126 | 0.128 | 0.121 | 0.135 | 0.143 |
| Forbes 400 | 0.096 | 0.129 | 0.132 | 0.111 | 0.142 | 0.151 |

Notes: The methods vary on how change in unrealized gains is estimated. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data Appendix for details on all three methods. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Tax and AGI for the Forbes 400 are estimated following Yagan (2023). See Data Appendix for more information. 2004-2022 averages are averages of year-specific Taxes / (AGI + Change in Unrealized Gains). SCF observations occur every three years, Forbes observations occur every year.

Appendix Table 9. Change in Unrealized Gains / AGI, All 3 Methods

| Wealth Percentile | Method 1 -- Average, 2004-2022 | Method 2 -- Average, 2004-2022 | Method 3 -- Average, 2004-2022 | Method 1 -- 2022 | Method 2 -- 2022 | Method 3 -- 2022 |
|---|---|---|---|---|---|---|
| 0-50 percentile | 0.018 | 0.066 | 0.038 | 0.032 | 0.075 | 0.054 |
| 50-90 percentile | 0.151 | 0.249 | 0.289 | 0.187 | 0.265 | 0.319 |
| 90-99 percentile | 0.345 | 0.487 | 0.559 | 0.319 | 0.393 | 0.389 |
| 99-99.9 percentile | 0.487 | 0.687 | 0.681 | 0.465 | 0.740 | 0.667 |
| 99.9+ percentile excluding Forbes 400 | 1.016 | 0.949 | 0.919 | 1.050 | 0.836 | 0.737 |
| Forbes 400 | 1.111 | 0.569 | 0.541 | 0.984 | 0.545 | 0.455 |

Notes: The methods vary on how change in unrealized gains is estimated. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data Appendix for details on all three methods. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaled to match IRS Statistics of Income aggregates. Tax and AGI for the Forbes 400 are estimated following Yagan (2023). See Data Appendix for more information. 2004-2022 averages are averages of year-specific (Change in Unrealized Gains / AGI). SCF observations occur every three years, Forbes observations occur every year.

Appendix Table 10. Aggregate Change in Unrealized Gains and Aggregate Realized Gains by Year

With Forbes:

| Year | Change in unrealized gains -- Method 1 (billions of nominal dollars) | Change in unrealized gains -- Method 2 (billions of nominal dollars) | Change in unrealized gains -- Method 3 (billions of nominal dollars) | Realized capital gains -- all Methods (billions of nominal dollars) |
|---|---|---|---|---|
| 1995 | 591.725 | 755.520 | 992.219 | 88.355 |
| 1998 | 879.386 | 1121.466 | 1232.404 | 219.643 |
| 2001 | 1209.376 | 1554.315 | 1657.301 | 402.505 |
| 2004 | 1532.547 | 2103.678 | 2252.966 | 176.146 |
| 2007 | 2191.817 | 2484.871 | 2547.850 | 521.993 |
| 2010 | 1449.747 | 2483.949 | 2770.905 | 102.554 |
| 2013 | 1654.113 | 2490.751 | 2782.054 | 453.469 |
| 2016 | 2245.936 | 3380.666 | 3709.141 | 508.887 |
| 2019 | 2631.664 | 3796.055 | 4004.513 | 660.703 |
| 2022 | 3897.328 | 4870.651 | 4878.928 | 1571.210 |

Notes: 1989 and 1992 are omitted because we do not have the required data for Forbes 400 members in those years. The methods vary on how change in unrealized gains is estimated. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth et al. (2024). See Data Appendix for details on all three methods. For wealth groups other than the Forbes 400, realized capital gains are scaled using our scaling factors for total AGI. Realized capital gains for the Forbes 400 are estimated following Yagan (2023). See Data Appendix for more information.

Without Forbes:

| Year | Change in unrealized gains -- Method 1 (billions of nominal dollars) | Change in unrealized gains -- Method 2 (billions of nominal dollars) | Change in unrealized gains -- Method 3 (billions of nominal dollars) | Realized capital gains -- all Methods (billions of nominal dollars) |
|---|---|---|---|---|
| 1989 | 550.292 | 462.171 | 724.177 | 125.848 |
| 1992 | 557.055 | 590.868 | 855.702 | 45.968 |
| 1995 | 577.008 | 748.145 | 982.730 | 82.441 |
| 1998 | 847.393 | 1108.521 | 1220.317 | 204.415 |
| 2001 | 1173.524 | 1532.156 | 1636.273 | 371.879 |
| 2004 | 1489.388 | 2083.695 | 2231.321 | 156.651 |
| 2007 | 2133.316 | 2474.953 | 2540.434 | 481.485 |
| 2010 | 1397.925 | 2451.203 | 2739.019 | 79.842 |
| 2013 | 1583.128 | 2464.024 | 2755.844 | 406.682 |
| 2016 | 2156.376 | 3324.840 | 3655.324 | 462.052 |
| 2019 | 2510.673 | 3719.229 | 3933.901 | 606.805 |
| 2022 | 3731.726 | 4778.969 | 4802.370 | 1455.919 |

Notes: Values do not include Forbes 400 members. The methods vary on how change in unrealized gains is estimated. Change in unrealized gains is estimated using the SCF. See Data Appendix for details on all three methods. Realized capital gains are scaled using our scaling factors for total AGI. See Data Appendix for more information.

Appendix Table 11. Aggregate Borrowing / Aggregate Wealth by Wealth Group, Comparing Debt Concepts, 2004-2022 Averages

| Wealth group | Does not include non-residential real estate debt and loans against HH-owned business | Includes non-residential real estate debt and loans against HH-owned business |
|---|---|---|
| 0-50 percentile | 1.772 | 1.784 |
| 50-90 percentile | 0.215 | 0.221 |
| 90-99 percentile | 0.073 | 0.083 |
| 99-99.9 percentile | 0.035 | 0.049 |
| 99.9+ percentile (excluding Forbes) | 0.014 | 0.028 |

Notes: Values displayed are averages of year-specific (aggregate borrowing / aggregate wealth), 2004-2022. SCF observations occur every three years.

## Appendix Table 12

**Distributing "Excess" Margin and Insurance Policy Loans in Financial Accounts**
**2022 (Billlions of Dollars)**

| | |
|---|---|
| **Margin Loans: Fin. Accounts - SCF** | **293.30** |
| **Loans against Insr. Policies: Fin. Accounts - SCF** | **65.50** |

| Wealth Group | Share of SCF Margin Loans | Share of SCF Policy Loans | SCF Borrowing | SCF Borrowing +Excess Margin and Policy Loans | Unrealized Gains | SCF Borrowing/ Unrlzd Gains | (SCF Borrowing + Excess Marginand Policy Loans)/ Unrlzd Gains |
|---|---|---|---|---|---|---|---|
| 0-50 percentile | 0.0% | 13.1% | 4,509.0 | 4,517.5 | 1,150.9 | 391.8% | 392.5% |
| 50-90 percentile | 5.5% | 24.1% | 7,502.9 | 7,534.9 | 10,571.5 | 71.0% | 71.3% |
| 90-98 percentile | 15.5% | 6.3% | 2,927.0 | 2,976.6 | 10,408.5 | 28.1% | 28.6% |
| 98-99 percentile | 3.5% | 8.7% | 662.6 | 678.5 | 4,909.1 | 13.5% | 13.8% |
| 99.0-99.4 percentile | 6.3% | 0.2% | 257.7 | 276.4 | 2,822.0 | 9.1% | 9.8% |
| 99.4-99.8 percentile | 1.5% | 32.2% | 380.4 | 405.7 | 5,320.7 | 7.1% | 7.6% |
| 99.8-99.9 percentile | 8.1% | 0.2% | 154.0 | 177.9 | 2,196.9 | 7.0% | 8.1% |
| 99.9+ percentile | 59.5% | 15.2% | 264.6 | 449.2 | 10,827.4 | 2.4% | 4.1% |

Sources: Q2 2022 Financial Accounts of the United States; 2022 Survey of Conusmer Finances.
Notes: Excess margin loans shown in the Financial Accounts compared to the SCF are distributed to SCF respondents by their wealth group's total share of those loans. Thus, if a wealth group has 60% of the margin loans, 60% of the excess margin loans are distributed to that group The same exercise is done for policy loans.

## Appendix Table 13

**Debt of Partnerships and S-Corporations**
**2017**

| Entity Type | Loans Received | Equity | Assets | Debt/Equity | Debt/Assets |
|---|---|---|---|---|---|
| All Partnerships | 5,992 | 19,279 | 32,404 | 31.1% | 18.5% |
| All S-Corporations | 1,425 | 1,554 | 4,520 | 91.7% | 31.5% |
| | | | | | |
| Non-Financial Partnerships | 5,465 | 6,799 | 14,682 | 80.4% | 37.2% |
| Non-Financial S-Corps | 1,332 | 1,449 | 4,040 | 91.9% | 33.0% |

Notes: Authors' calculations from balance sheet data from the IRS Statistics of Income.

Appendix Table 14: Debt/Assets and Debt/Equity by Entity Status from 2014-2017

| VARIABLES | (1) Debt/Assets | (2) Debt/Equity |
|---|---|---|
| Partnership | -0.0636*** | -0.263*** |
| | (0.00717) | (0.0459) |
| Constant | 0.615*** | 2.678*** |
| | (0.0164) | (0.105) |
| Observations | 136 | 136 |
| R-squared | 0.920 | 0.856 |
| Year FEs | Yes | Yes |
| Industry FEs | Yes | Yes |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: Data obtained from IRS Statistics of Income. Results show regressions of Debt/Assets or Debt/Equity for non-financial passthroughs on entity status from 2014-2017 with Industry and Year fixed effects. The IRS uses 18 major industries for these firms.

Appendix Table 15

**Distributing "Excess" Partnership Borrowing 2022 (Billlions of Dollars)**

**Excess Partnership Borrowing = 11% of Loans to Partnerships = $837 billion in 2022**

| Year | Group | Share of All Private Buinsesses Owned by Wealth Group | SCF Debt | SCF Debt + Excess Partnership Borrowing | Unrealized Gains | SCF Borrowing/ Unrlzd Gains | (SCF Borrowing + Excess Partnership)/ Unrlzd Gains |
|---|---|---|---|---|---|---|---|
| 2022 | 0-50 percentile | 0.3% | 4,509 | 4,511.07 | 1,150.95 | 392% | 392% |
| 2022 | 50-90 percentile | 5.3% | 7,503 | 7,547.19 | 10,571.54 | 71% | 71% |
| 2022 | 90-98 percentile | 17.0% | 2,927 | 3,069.13 | 10,408.54 | 28% | 29% |
| 2022 | 98-99 percentile | 12.1% | 663 | 764.10 | 4,909.10 | 13% | 16% |
| 2022 | 99.0-99.4 percentile | 8.0% | 258 | 324.37 | 2,821.98 | 9% | 11% |
| 2022 | 99.4-99.8 percentile | 15.9% | 380 | 513.67 | 5,320.73 | 7% | 10% |
| 2022 | 99.8-99.9 percentile | 7.5% | 154 | 216.82 | 2,196.90 | 7% | 10% |
| 2022 | 99.9+ percentile | 34.0% | 265 | 548.93 | 10,827.37 | 2% | 5% |

Notes and Sources: Excess Partnerships borrowing is derived from Appendix Table X comparing the Debt/Assets of non-financial partnerships to non-financial S-corps. The excess in 2017 is equal to 11% of loans to non-financial partnerships. We assume that this relationship carries forward to 2022. We then distribute the excess borrowing by partnerships to wealth groups based on their share of private businesses owned in the SCF. Data on non-financial partnership borrowing in 2022 comes from the Financial Accounts of the United States.

## Figures and Tables References


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# Data Appendix

## I. Adjustments to Raw SCF Data

### a. Defined-benefit pension assets (DB assets)

The SCF does not include DB assets in its measures of assets and net wealth. We get estimates of DB assets from the Federal Reserve Board of Governors.

We received DB asset estimates for the SCF courtesy of Sarah Reber (sarah.j.reber@frb.gov). This .dta file contains DB asset information for each SCF observation (each observation in the DB asset data contains year and SCF id, allowing us to link the observations in the DB asset data directly to the raw SCF data). The original .dta file is in nominal dollars and contains multiple variables. Our final measure of DB assets is $currec_pv_dbamt_hhtot + future_pv_dbamt_hhtot + curjob_pv_dbamt_r + curjob_pv_dbamt_sp + annuities$. This definition follows the Federal Reserve's code for their Distributional Financial Accounts, which incorporates DB assets into the SCF.

### b. Upweighting SCF unrealized gains variable

The SCF provides a variable for total unrealized gains. For stocks and mutual funds, unrealized capital gains are measured directly in the survey – "How much has it [your family's stock] gained in value since it was obtained?" For other asset types, such as principal residences, unrealized gains are not asked about directly. If this is the case, the Federal Reserve computes unrealized gains using survey responses on the current value of the asset and the value of the asset when it was acquired. The SCF variable for total unrealized gains only covers certain asset types and misses some asset types that likely have unrealized gains. Thus, we believe the SCF unrealized gains variable is likely under-counting true unrealized gains because it does not cover annuities, life insurance, other financial assets, other non-financial assets, retirement accounts, and trusts.

To account for this, we upweight the SCF variable for total unrealized gains:

Let X be the fraction of all assets covered by the SCF unrealized gains variable.

Let B be the fraction of all assets that we assume have $0 unrealized gains (fixed income assets and vehicles).[28]

Then,

[28] We assume that DB assets do have unrealized gains, and thus are not included in B.

$$final\ SCF\ unrealized\ gains = SCF\ total\ unrealized\ gains\ variable * \left(\frac{1}{X}\right) * (1 - B)$$

Where $final\ SCF\ unrealized\ gains$ is our final measure of total unrealized gains.

### c. Estimating AGI and taxes from the SCF and scaling to SOI aggregates

We estimate AGI and tax liability from the SCF using a replication package from Gale et al. (2022). The original replication package covers SCF years 1989-2019, we modify it to cover 2022 as well.[29] This replication package estimates tax-relevant variables using the SCF, then calls TAXSIM from the NBER to calculate AGI and tax liability. Comparing aggregate estimated AGI and tax liability by AGI bin from the Gale et al. (2022) output to published IRS Statistics of Income (SOI) aggregates, we find that that there are large discrepancies (especially for the top AGI bin of $1,000,000 or more).

Thus, we scale the Gale et al. (2022) estimates to match SOI aggregates by year by AGI bin. We do not scale AGI and tax liability for individuals in the AGI class of "None". First, we use the Gale et al. replication package to estimate AGI and tax liability at the tax unit level.[30] Then, we aggregate these estimates by year according to five AGI bins: $1 to under $25k, $25k to under $50k, $50k to under $100k, $100k to under $1M, and $1M or more. For each year and AGI bin, we compute a scaling factor as

$$scaling\ factor_{t,AGI\ bin} = \frac{SOI\ aggregate_{t,AGI\ bin}}{SCF\ aggregates\ using\ Gale\ et\ al_{t,AGI\ bin}}$$

The AGI bin-specific scaling factor in year $t$ is different for AGI and tax liability. We assume that all of the Forbes 400 belongs to the top AGI bin and subtract out estimates of Forbes 400 AGI and tax liability from the relevant SOI aggregates before computing the scaling factors.[31]

Then, we re-scale tax unit AGI and tax liability estimates from the Gale et al. (2022) output. For tax unit $i$ in year $t$ in a given AGI bin:

[29] Gale et al. (2022) do not apply their code to 1989 and 1992, citing some changes to the survey structure between 1992 and 1995. Based on correspondence with SCF experts at the Federal Reserve Board of Governors, we believe the SCF is comparable across 1989-2022. Thus, we apply the Gale et al. (2022) code to 1989 and 1992 to estimate federal income tax liability and AGI. We do not observe any major trend breaks in the aggregated data.
[30] While observations in the SCF are households, not individuals, Gale et al. (2022) splits households into tax units.
[31] We do not have estimates of Forbes AGI or tax liability for tax years 1988 and 1991 (SCF years 1989 and 1992). We impute Forbes AGI and tax liability for these years using Forbes 400 AGI / SOI AGI for AGI bin $1M or more and Forbes 400 tax liability / SOI tax liability for AGI bin $1M or more, taking the average of these ratios for SCF years where we have Forbes 400 data (tax years 1994-2021). For AGI, this ratio varies between 0.05 and 0.0683 during the period tax year 1994 to tax year 2021, without much time trend. For tax liability, this ratio varies between 0.04 and 0.057, without much time trend.

$$final\ AGI_{i,t,AGI\ bin} = AGI\ from\ Gale\ et\ al_{i,t,AGI\ bin} * AGI\ scaling\ factor_{t,AGI\ bin}$$

and

$$final\ tax\ liability_{i,t,AGI\ bin} = tax\ liability\ from\ Gale\ et\ al_{i,t,AGI\ bin} * tax\ scaling\ factor_{t,AGI\ bin}$$

We also scale sub-components of AGI (wage and salary income, realized capital gains, etc.) using the same scaling factor as total AGI.

Gale et al. (2022) also estimate AGI and tax liability for individuals in the SCF household that are not part of the Primary Economic Unit (PEU). Observations in the SCF are at the PEU level, and very limited information is collected on non-PEU individuals.[32] After re-scaling AGI and tax liability estimates at the tax unit level, we drop non-PEUs. To get our final measure of household AGI and tax liability, we sum the AGI and tax liability of all tax units within a household.

The Gale et al. (2022) code does not compute AGI and tax liability for non-filers. We exclude non-filers from our aggregate estimates of AGI and tax liability.[33] Following Gale et al. (2022), we consider an observation in the SCF to be a non-filer if they meet all of the following criteria:

- Total income is non-negative
- Wage and salary income $\leq$ \$1k
- Schedule C business income $\leq$ \$1k
- Sum of other income $\leq$ \$1k

### d. Accounting for non-residential property debt and loans against household-owned business

The SCF debt concept does not include non-residential property debt and loans against household-owned business. Instead, these debt categories are netted out of their respective asset categories and the relevant asset categories are considered net equity rather than gross value. Thus, these debt types are not included in our debt measures, though they are included in our measure of net worth. We do not add these debt categories back to our debt measures because non-residential property debt and loans against household-owned business appear to exhibit

[32] Some broad information is collected on non-PEU individuals, such as total wealth and total income last year, though we exclude them from our main analysis.
[33] However, we still include non-filers in our estimates of assets, debt, and unrealized gains.

significant sampling variation in ways that other debt categories do not, particularly at the top of the wealth distribution. For example, non-residential property debt was 195% of the SCF debt concept in 2019. By contrast, non-residential property debt was only 13% of the SCF debt concept in 2022 (and debt as a whole grew from 2019 to 2022). This seems unlikely to reflect a real decline in non-residential real estate debt held by the top 0.1% of wealth holders. Additionally, there may be significant variation in whether loans for non-residential real estate are made directly to households or are made through business entities, which may help explain the variability of non-residential real estate debt in the SCF and why the Federal Reserve chooses to exclude it from the SCF debt concept.

On the asset side, we adjust the SCF measures of non-residential property assets and household-owned business such that these measures report the gross value of these assets rather than net equity.

## II. Data Sources for Forbes 400

### a. Net worth

Aggregate net worth of the Forbes 400 1989-2020 was provided by Danny Yagan. Aggregate net worth of the Forbes 400 in 2021 and 2022 comes from a back-of-the-envelope calculation using the average net worth of Forbes 400 members reported in Gastwirth et al. (2024).

### b. AGI, tax liability, and realized capital gains

We use SOI aggregates to estimate federal income tax liability for the Forbes 400 following Yagan (2023). The SOI publishes estimates of aggregate federal income tax liability for the top 400 filers by income, 1992-2014. Aggregate federal income tax liability for the top 400 filers of the income distribution 2015-2022 is estimated using SOI aggregates for the top 0.001 percent of the income distribution. Aggregate federal income tax liability for the top 400 filers and aggregate federal income tax liability for the top 0.001 percent are both available from 2001 to 2014. We estimate federal income tax liability for the top 400 filers by income, 2015-2022, in the following manner. First, we compute the average ratio of tax liability for the top 400 filers to the tax liability of the top 0.001 percent for years that both statistics are available. Then, we multiply this ratio by the federal income tax liability for the top 0.001 percent. After we obtain estimates of federal income tax liability for the top 400 filers by income for all years, we multiply these estimates by a scaling factor of 0.61 to estimate federal income tax liability for the top 400 filers in the wealth distribution.[34]

[34] 0.61 is determined by comparing income of the top of the income distribution in the SCF to income of the top of the wealth distribution. See Yagan (2023) for more details.

We estimate AGI and realized capital gains using the same method, utilizing SOI statistics on these two variables for the top 400 filers by income and the top 0.001 percent of the income distribution.

### c. Unrealized capital gains

We do not observe the stock of unrealized capital gains for the Forbes 400. We assume that the ratio of unrealized capital gains to net wealth for the Forbes 400 is the same as this ratio for the top 0.1% of the wealth distribution in the SCF. Given that the SCF occurs every three years and we have annual data on the Forbes 400, we interpolate this ratio in non-SCF years.

## III. Estimating Savings Rates by Wealth Group

We estimate savings rates following the pseudo-panel methodology of Mian et al. (2021) (henceforth MSS). MSS creates pseudo-panel groups using the household head's birth cohort and within-birth cohort income group. Because our analysis is interested in wealth groups as opposed to income groups, we create pseudo-panel groups using the household head's birth cohort and within-birth cohort wealth group. See Mian et al. (2021) for more details.

MSS produces estimates of savings rates and asset return rates that vary by SCF year. Savings rate estimates vary by pseudo-panel group while asset return rates do not. For our estimates of savings rates and asset return rates, we take the average savings rate and asset return rate over the period 1989-2019. 2022 is omitted because we use a replication package from MSS, and this replication package does not include 2022.

### a. Note on interpretation of the savings rates

MSS estimate the savings rate out of pre-tax income that does not include realized capital gains. We refer to this concept as "active savings".

### b. Adjusting MSS to exclude corporate retained earnings

To compute savings rates, MSS uses estimates of return rates for each asset class (private business, fixed income, real estate, corporate equity, miscellaneous financial assets, mortgage debt, and consumer credit debt). In determining the asset return rate for corporate equity, MSS avoids using capital gains on equity because they want to exclude corporate retained earnings from the asset return rate. They consider corporate retained earnings as part of individual active savings.

We do not want to attribute corporate retained earnings to households' savings rates. We adjust the replication package from MSS to exclude corporate retained earnings from calculations of active savings rates. First, instead of calculating the asset return rate, $\pi_{corp\ equity}$, as a residual to match aggregate savings from the National Income and Product Accounts (NIPA), we use the equity capital gain variable from JST Macrohistory data.[35]

After making this substitution, we must compute two asset return rates as residuals – the asset return rates for miscellaneous assets and private business assets. These are computed to match NIPA aggregate savings and Financial Accounts totals. Originally, MSS use the following two categories from NIPA to estimate aggregate savings: domestic business (undistributed corporate profits, inventory valuation adjustment, and capital consumption adjustment) + households and institutions (personal saving).[36] Since we do not want to include savings by businesses as part of active savings, we compute the residuals to match only households and institutions (personal saving), departing from MSS.

## IV. Estimating Change in Unrealized Gains

### a. Using unrealized gains estimated from the SCF and imputed unrealized gains for Forbes 400 (Method 1)

For wealth groups other than the Forbes 400, this method estimates the change in unrealized gains ($\Delta UR$) from period t-1 to t using our measure of final unrealized gains (upweighting the SCF total unrealized gains variable) and wealth group-specific nominal, annual growth rates of unrealized gains, estimated using our measure of final unrealized gains from the SCF (described in Data Appendix section I.b).

For the Forbes 400, this method estimates $\Delta UR$ using the estimated stock of unrealized gains each year and the nominal, annual growth rate of unrealized gains for the Forbes 400. Estimating the stock of unrealized gains each year for the Forbes 400 is detailed in Data Appendix section II.c.

[35] We also update the JST Macrohistory data used in the MSS replication package. The original replication package did not have data on equity capital gains for 2016 and 2019. The update JST Macrohistory data was downloaded here: https://www.macrohistory.net/database/.

[36] These items come from NIPA Table 5.1--https://apps.bea.gov/iTable/?reqid=19&step=3&isuri=1&1921=survey&1903=137#eyJhcHBpZCI6MTksInN0ZXBzIjpbMSwyLDMsM10sImRhdGEiOltbIk5JUEFfVGFibGVfTGlzdCIsIjEzNyJdLFsiQ2F0ZWdvcmllcyIsIlN1cnZleSJdLFsiRmlyc3RfWWVhciIsIjIwMjIiXSxbIkxhc3RfWWVhciIsIjE5ODkiXSxbIlNjYWxlIiwiLTkiXSxbIlNlcmllcyIsIkEiXV19. Undistributed corporate profits, inventory valuation adjustment, and capital consumption adjustment are lines 5-7. Personal savings is line 9.

*SCF*

1. Compute nominal growth rate of unrealized gains by wealth group (for each wealth group $\theta$):

$$unrealized\ gains\ growth_{\theta} = \left(final\ SCF\ unrealized\ gains_{2022,\theta}\ /\ final\ SCF\ unrealized\ gains_{1989,\theta}\right)^{\frac{1}{33}} - 1$$

2. Estimate $unrealized\ gains_{t-1}$:

$$unrealized\ gains_{t-1,\theta} = \frac{final\ SCF\ unrealized\ gains_{t,\theta}}{(1+unrealized\ gains\ growth_{\theta})}$$

3. Estimate $\Delta UR_{t-1\ to\ t,\theta}$, the change in unrealized gains from period t-1 to t for wealth group $\theta$:

$$\Delta UR_{t-1\ to\ t,\theta} = final\ SCF\ unrealized\ gains_{t,\theta} - unrealized\ gains_{t-1,\theta}$$

*Forbes 400*

1. Estimate unrealized gains for each year, we assume that the ratio of unrealized gains to net worth is the same as the top 0.1% of the SCF[37]:

$$unrealized\ gains_{t,Forbes} = net\ worth_{t,Forbes} * \left(\frac{final\ SCF\ unrealized\ gains}{net\ worth}\right)_{t,top\ 0.1\%\ SCF}$$

2. Compute nominal growth rate of unrealized gains for the Forbes 400:

$$unrealized\ gains\ growth_{Forbes} = \left(unrealized\ gains_{2022,Forbes}\ /\ unrealized\ gains_{1989,Forbes}\right)^{\frac{1}{33}} - 1$$

3. Estimate $unrealized\ gains_{t-1,Forbes}$:

$$unrealized\ gains_{t-1,Forbes} = \frac{unrealized\ gains_{t,Forbes}}{(1 + unrealized\ gains\ growth_{Forbes})}$$

[37] SCF data is observed every three years, but Forbes data is observed annually. We interpolate the ratio of unrealized gains to net wealth of the top 0.1% in the SCF for non-SCF years.

4. Estimate $\Delta UR_{t-1\ to\ t,Forbes}$, the change in unrealized gains from period t-1 to t for the Forbes 400:

$$\Delta UR_{t-1\ to\ t,Forbes} = unrealized\ cap.gains_{t,Forbes} - unrealized\ cap.gains_{t-1,Forbes}$$

*Inflation-adjusted unrealized gains and realized capital gains (Appendix Figure 7)*

1. Compute inflation rate using CPI-U-RS factors from the SCF, 1988-2021 (we use 1988 and 2021 because realized capital gains are measured in the previous calendar year and our estimates of unrealized capital gains are for the period t-1 to t, which would cover calendar year t-1):

$$inflation\ rate_{1988-2021} = (CPI_{2021}\ /\ CPI_{1988})^{\frac{1}{33}} - 1$$

2. Estimate nominal $unrealized\ gains_{t-1}$ for SCF and Forbes following the methods above.

3. Estimate $real\ \Delta UR$:

$$real\ \Delta UR_{t-1\ to\ t,\theta} = unrealized\ gains_{t-1,\theta} * (unrealized\ gains\ growth_{\theta} - inflation\ rate_{1988-2021})$$

4. Adjust realized capital gains for inflation:

$$real\ realized\ gains_{t-1\ to\ t,\theta} = nominal\ realized\ gains_{t-1\ to\ t,\theta} * (1 - inflation\ rate_{1988-2021})$$

5. Adjust AGI for real realized cap. gains:

$$real\ AGI_{t-1\ to\ t,\theta} = nominal\ AGI_{t-1\ to\ t,\theta} - nominal\ realized\ cap.gains_{t-1\ to\ t,\theta} + real\ realized\ cap.gains_{t-1\ to\ t,\theta}$$ [38]

[38] Real AGI here just means that realized capital gains are adjusted for inflation. Other sources of AGI are not adjusted for inflation.

**b. Using external data on asset return rates from MSS (Method 2)**

MSS, the methodology we follow to estimate active savings rates, utilizes external data sources for estimates of asset return rates across various asset types (these return rates vary by year).[39] For this method, we use asset return rates computed using the MSS replication package to estimate $\Delta UR$.

MSS implicitly assumes that vehicles, residential property other than primary residence, and net equity in non-residential real estate do not accrue capital gains. While this differs from our primary methodology, we follow MSS here as a robustness check.

*SCF*

1. Split SCF asset categories into the five MSS asset categories, following their method to split mutual funds, quasi-liquid retirement accounts, life insurance, and miscellaneous assets into a fixed income component and equity component using aggregate data from the Financial Accounts.
    a. The five MSS asset categories are: fixed income, corporate equity, private business wealth, real estate, and miscellaneous financial assets.

2. Get portfolio composition for period t and wealth group $\theta$:

$$\left(\frac{asset\ class}{total\ assets}\right)_{t,\theta,c} = \frac{asset\ class_{t,\theta,c}}{\sum_{c=1}^{5} asset\ class_{t,\theta,c}}$$

    Where c is the MSS asset category (fixed income, corporate equity, private business wealth, real estate, or miscellaneous financial assets).

3. Estimate total active savings (subscript for total active savings is t-1 because we assume that all savings occurs at the beginning of the period, following MSS):

$$total\ active\ savings_{t-1,\theta} = \left(total\ income_{t-1\ to\ t,\theta} - realized\ gains_{t-1\ to\ t,\theta}\right) * MSS\ active\ savings\ rate_{\theta}$$

4. Estimate active savings for each asset class c. Assume portfolio composition in period t-1 is same as period t. Assume active savings is distributed to different asset classes

[39] These external data sources include the National Income and Product Accounts, the Financial Accounts, and the JST Macrohistory database.

according to portfolio composition (e.g., if 60% of assets are in corporate equity, then attribute 60% of active savings to corporate equity):

$$savings_{t-1,\theta,c} = total\ active\ savings_{t-1,\theta} * \left(\frac{asset\ class}{total\ assets}\right)_{t,\theta,c}$$

5. Estimate wealth in asset class c for period t-1, $W_{t-1,\theta,c}$ (we assume that savings occurs at the beginning of the period following MSS):

$$W_{t-1,\theta,c} = \frac{W_{t,\theta,c}}{(1+q_c)} - savings_{t-1,\theta,c}$$

$q_c$ is the asset return rate from MSS. MSS estimate $q_c$ by year, we take the average 1989-2019 (MSS data is only available through 2019).

6. Compute $\Delta gains$ for each asset class c, where $\Delta gains$ includes unrealized gains and realized gains (we assume that savings occurs at the beginning of the period following MSS):

$$\Delta gains_{t-1\ to\ t,\theta,c} = \left(W_{t-1,\theta,c} + savings_{t-1,\theta,c}\right) * q_c$$

7. Sum $\Delta gains$ across all asset classes:

$$\Delta gains\ total_{t-1\ to\ t,\theta} = \sum_{c=1}^{5} \Delta gains_{t-1\ to\ t,\theta,c}$$

8. Subtract out realized capital gains to get $\Delta UR$:

$$\Delta UR_{t-1\ to\ t,\theta} = \Delta gains\ total_{t-1\ to\ t,\theta} - realized\ gains_{t-1\ to\ t,\theta}$$

*Forbes 400*

Estimating $\Delta UR$ for the Forbes follows the same method as estimating $\Delta UR$ for the SCF with three changes:

1) Step 2. We do not observe the portfolio composition for the Forbes 400. Following Smith et al. (2023), we assume that 42.3% of Forbes 400 assets are in public equity (this maps to corporate equity in MSS terminology) and 38.8% of Forbes 400 assets are in private business (this maps to private business wealth in MSS terminology). That leaves 18.9% of assets unallocated. We allocate this 18.9% to fixed income assets, real estate, and miscellaneous assets using the portfolio split of the top 0.1% of the SCF each year. The corporate equity and private business percentages are constant throughout the entire period, while the other three asset categories change with each SCF year. This gives us a portfolio composition for the Forbes 400 every three years, since we are relying on the SCF. However, our Forbes data is annual. Thus, we interpolate net wealth composition for years between SCF years.
2) Steps 5 and 6. Unlike the SCF data, we observe net worth in period t-1. Thus, instead of estimating $W_{t-1,Forbes,c}$ following Step 5, we use the observed net worth data and estimated portfolio composition.
3) Active savings rate. We do not have an estimate of the active savings rate for the Forbes 400. Thus, we assume that Forbes 400 savings follows the savings behavior of the top 0.1% in the SCF and use the top 0.1% SCF savings rate for the Forbes 400.

**c. Using the nominal growth rate of all wealth observed in the SCF, 1989-2022 (Method 3)**

*SCF*

1. Compute estimated wealth for period t less active savings over period t-1 to t, call this $W_{t,\theta}^{-}$:

$$W_{t,\theta}^{-} = W_{t,\theta} - \left(total\ income_{t-1\ to\ t,\theta} - realized\ gains_{t-1\ to\ t,\theta}\right) * MSS\ active\ savings\ rate_{\theta}$$

2. Estimate wealth in period t-1, assuming the nominal growth rate of all wealth in the SCF, 1989-2022:

$$W_{t-1,\theta} = W_{t,\theta}^{-} \,/\, (1 + nominal\ growth\ rate\ of\ all\ wealth\ in\ SCF_{1989-2022})$$

3. Using data from the Financial Accounts, we estimate that 69% of wealth gain comes from unrealized gains. Estimate $\Delta UR$:

$$\Delta UR_{t-1\ to\ t,\theta} = nominal\ growth\ rate\ of\ all\ wealth\ in\ SCF_{1989-2022} * 0.69 * W_{t-1,\theta} - realized\ gains_{t-1\ to\ t,\theta}$$

*Forbes 400*

Estimating $\Delta UR$ for the Forbes 400 with this method follows the same methodology used for the SCF with one change:

1) Instead of estimating $W_{t-1,\theta}$ as we do in Step 2 for the SCF, we use the observed net worth of Forbes in period t-1.

## V. Estimating Other Variables not Observed in the SCF

### a. Unrealized gains for tax-preferred savings assets

Unrealized gains for tax-preferred savings assets are not directly observed in the SCF. We estimate unrealized gains for tax-preferred savings assets for wealth group $\theta$ in period t using the ratio of tax-preferred savings assets to assets covered by the SCF unrealized gains variable (not upweighted). Tax-preferred savings assets include annuities, life insurance, retirement accounts, and DB assets.

$$\begin{aligned} &unrealized\ gains\ in\ tax\ preferred\ savings\ assets_{t,\theta} \\ &\quad = SCF\ unrealized\ gains\ variable_{t,\theta} \\ &\quad * \frac{tax\ preferred\ savings\ assets_{t,\theta}}{assets\ covered\ by\ SCF\ unrealized\ gains\ variable_{t,\theta}} \end{aligned}$$

### b. "Other" unrealized gains

We estimate "other" unrealized gains as a residual, using our final measure of unrealized gains (upweighting the SCF unrealized gains variable) and estimates of unrealized gains for specific categories. "Other" unrealized gains includes trusts and other unrealized gains not covered by the SCF total unrealized gains variable and not included in tax-preferred savings.

For wealth group $\theta$ in period t:

$$\begin{aligned} &other\ unrealized\ gains_{t,\theta} \\ &\quad = final\ SCF\ unrealized\ gains_{t,\theta} - unrealized\ gains\ in\ primary\ residence_{t,\theta} \\ &\quad - unrealized\ gains\ in\ private\ businesses_{t,\theta} \\ &\quad - unrealized\ gains\ in\ other\ real\ estate_{t,\theta} \\ &\quad - unrealized\ gains\ in\ stocks\ and\ mutual\ funds_{t,\theta} \\ &\quad - unrealized\ gains\ in\ tax\ preferred\ savings\ assets_{t,\theta} \end{aligned}$$

Unrealized gains in primary residence, unrealized gains in private businesses, unrealized gains in other real estate, and unrealized gains in stocks and mutual funds are observed in the SCF.

Unrealized gains in tax-preferred savings assets are estimated (detailed in Data Appendix section V.a).

### c. New borrowing

We estimate new borrowing from period t-1 to t, using the nominal, annual growth rate of debt observed in the SCF and the stock of existing borrowing in period t. New borrowing varies by time period and wealth group.

1. Estimate nominal, annual growth rate of debt for wealth group $\theta$:

$$borrowing\ growth_{\theta} = \left(borrowing_{2022,\theta} \,/\, borrowing_{1989,\theta}\right)^{\frac{1}{33}} - 1$$

2. Estimate stock of borrowing in period t-1:

$$borrowing_{t-1,\theta} = \frac{borrowing_{t,\theta}}{(1 + borrowing\ growth_{\theta})}$$

3. Estimate new borrowing from period t-1 to t for wealth group $\theta$:

$$new\ borrowing_{t-1\ to\ t,\theta} = borrowing_{t-1,\theta} * (borrowing\ growth_{\theta})$$

### d. Consumption

We estimate consumption using "active savings" rates, computed following MSS. Savings rates from MSS vary by wealth group and are the savings rates out of pre-tax income that does not include realized capital gains.

Consumption for wealth group $\theta$ from period t-1 to t is

$$\begin{aligned} consumption_{t-1,\theta} \\ &= SCF\ total\ income_{t-1\ to\ t,\theta} \\ &- \left(SCF\ total\ income_{t-1\ to\ t,\theta} - scaled\ realized\ capital\ gains_{t-1\ to\ t,\theta}\right) \\ &* MSS\ active\ savings\ rate_{\theta} \end{aligned}$$

All income variables are scaled using the scaling factors from Data Appendix section I.c.

**e. Change in unrealized tax-preferred savings gains and change in unrealized housing gains**

We estimate the change in unrealized tax-preferred savings gains and the change in unrealized housing gains from period t-1 to t for wealth group $\theta$ using the ratio of unrealized gains in these categories to total unrealized gains and our estimates of total change in unrealized gains.

$$\Delta unrealized\ gains\ in\ tax\ preferred\ savings_{t-1\ to\ t,\theta} = \frac{unrealized\ gains\ in\ tax\ preferred\ savings_{t,\theta}}{final\ SCF\ unrealized\ gains_{t,\theta}} * \Delta UR_{t-1\ to\ t,\theta}$$

$$\Delta unrealized\ gains\ in\ primary\ residence_{t-1\ to\ t,\theta} = \frac{unrealized\ gains\ in\ primary\ residence_{t,\theta}}{final\ SCF\ unrealized\ gains_{t,\theta}} * \Delta UR_{t-1\ to\ t,\theta}$$

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