How Much Do Unrealized Gains and Borrowing Reduce the Income Taxes of the Rich?

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Abstract: As deficits rise and concerns about tax avoidance by the rich increase, we study how unrealized gains and borrowing affect Americans' income taxes. We have four main findings: First, measuring "economic income" as currently-taxed income plus new unrealized gains, the income tax base captures 60% of economic income of the top 1 percent of wealth-holders and the vast majority of income for lower wealth groups. Second, adjusting for unrealized gains substantially lessens the degree of progressivity in the income tax, although it remains largely progressive. Third, we quantify for the first time the amount of borrowing across the full wealth distribution. Focusing on the top 1 percent, while total borrowing is substantial, new borrowing each year is fairly small (1-2% of economic income) compared to their new unrealized gains, suggesting that "buy, borrow, die" is not a dominant tax avoidance strategy for the rich. Fourth, consumption is less than liquid income for rich Americans, partly because the rich have a large amount of liquid income, and partly because their savings rates are high, suggesting that the main tax avoidance strategy of the super-rich is "buy, *save*, die."

I. Introduction

ProPublica reports that from 2014-2018, the combined assets of Elon Musk, Jeff Bezos, and Warren Buffett increased in value by more than $137 billion. Yet their income as recognized by the tax system—adjusted gross income (AGI)—totaled only $5.7 billion over that period, just 4 percent of the increase in their wealth (Eisinger et al. 2021). They are not taxed on more because income tax's realization rule requires owners to sell assets like stock or land before increases in their value are taxed.

Instead of selling appreciated assets, however, taxpayers can borrow against them to generate cash while still avoiding tax. There are reports of wealthy Americans borrowing extensively: Musk, for example, recently borrowed $1 billion from SpaceX and $500 million from banks secured by appreciated stock (Maidenberg and Higgins 2023). Moreover, the "step-up" in basis at death eliminates all income taxes on unsold gains held at death. In concert, this allows rich

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Americans to *buy* assets, *borrow* against those assets when they appreciate to consume those gains, and when they *die*, use the stepped-up basis to avoid any income tax on the asset.[1] Tax scholars have thus worried that "buy, borrow, die" allows the rich to "live luxuriously… [and still] avoid all income taxation," all while reducing estate tax burdens as well (McCaffery 2017 at 306).

The realization rule has important advantages, including solving liquidity and valuation issues. Nevertheless, stories like these—with rich Americans enjoying huge increases in the value of their unsold assets and also sometimes borrowing against this appreciation—have helped drive a spate of recent tax proposals that alter the realization rule to the center of tax policy debates. These proposals are partly motivated by the notion that the super-rich are not taxed enough, along with concerns about high budget deficits. For example, the White House has proposed a tax on unsold gains for centi-millionaires (Department of the Treasury 2023), which Vice President Harris' campaign has endorsed.[2] But how much does failing to tax "unrealized gains" (i.e., increases in the value of unsold assets) or borrowing against those gains shrink the tax base, especially for the super-rich? This paper answers those questions for the first time.

We measure how much income is missed by the federal income tax system due to the realization rule across the full wealth distribution. In addition, we assess for the first time how much borrowing is undertaken by rich Americans, and we estimate to what degree "buy, borrow, die" narrows the 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, unrealized gains, 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 aim to measure a concept of "economic income" that consists of both adjusted gross income (AGI), which is already subject to income tax, plus the untaxed changes in the value of taxpayers' unsold assets over the year.[3] Our measurement is a piece of the commonly used Haig-

[1] The loan is repaid by having the taxpayer's heirs sell some of the asset, but, because of the basis step-up, this will trigger no income tax.

[2] 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.

[3] Adjusted gross income is larger than taxable income due to taxpayers deducting either the standard amount or their itemized deductions. 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 the "income tax base."

Simons definition of income, which includes all consumption and changes in the value of savings, regardless of whether the underlying assets are realized.[4]

Despite 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, making our analysis particularly important. 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 the *New York Times*, *Wall Street Journal*, *Financial Times*, *Economist*, and *Forbes* (e.g., Ensign and Rubin 2021; Hyatt 2021; Leonhardt 2021; Foley 2022; *The Economist* 2024). We have the following four main findings:

(1) Tax Base vs. Economic Income. For the top 1 percentile of wealth-holders (above $14 million in 2022), 60% of economic income is in the tax base over 2004-2022 on average. 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), interest and dividends (7% of economic income), and realized capital gains (16% of economic income).[5]

Below the top 0.1 percentile of wealth-holders (above $62 million in 2022), the tax base—as represented by AGI—captures a substantial majority of economic income. For example, the tax base captured 75% of the economic income of those in the 90-99th percentiles over 2004-2022 and 67% for those in the 99.0-99.9th percentiles. Unrealized gains were nonetheless significant for these groups. Their aggregate totals of unrealized gains in 2022 were $23 trillion and $12 trillion, respectively. In the top 0.1 percent of wealth, 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.

(2) Average Tax Rates Accounting for Unrealized Gains. Calculating average tax rates using economic income in the denominator instead of AGI makes the income tax system look substantially less progressive because unrealized gains are concentrated at the top of the wealth

[4] 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.

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

distribution.[6] Still, average tax rates as a share of economic income rise across the wealth groups until we reach the top 0.1 percentile, after which average tax rates then fall somewhat. In our primary analyses, we follow the tax system and do not adjust for inflation. Adjusting for inflation, however, limits realized and unrealized gains to the real increase in purchasing power they embody, and, as we show in a robustness analysis, this adjustment increases our measure of progressivity somewhat.

(3) Borrowing. We document considerable borrowing by rich Americans. Still, 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 about $475 billion in unrealized gains.[7] But, for the 99-99.9th percentile (and top 0.1 percent) 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 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 50-90th percentiles of wealth had $18 trillion in unrealized gains in 2022 and had borrowed $7.6 trillion (42% of unrealized gains), while those in the top 1% had unrealized gains of $23 trillion and borrowed $1.0 trillion (4% of unrealized gains).

(4) Consumption. We estimate that consumption by high wealth-holders is smaller than their taxed income, explaining why these Americans do not need to borrow. Partly this is because, as described above, rich Americans enjoy large amounts of liquid, taxable income. Moreover, using a pseudo-panel method, we estimate that high wealth groups save a considerable fraction of AGI, reaching results similar to Dynan et al. (2004). 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 to avoid income tax. If, however, the taxpayer's AGI exceeds her consumption, then 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

[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 47% of wealth of the top 1% of wealth holders, and thus if borrowing substitutes for sales of average assets worth $1.02 trillion, this would produce about $475 billion in gains.

the assets. This simpler—and, it appears, dominant—tax avoidance strategy is more like "buy, *save*, die."

These results are informative as policymakers consider changes to the realization rule and other 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 make up a smaller fraction of those groups' economic income. And the results show the scope of borrowing by the very rich, opening up the possibility of taxing it as a partial realization of unsold gains (Fox and Liscow 2024). However, 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 small fraction of the unsold gains of the very rich.

Our work contributes to several literatures. Several papers attempt to measure average income tax rates using broader concepts of income than that used by the income tax system (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. A bit lower in the wealth distribution, the Treasury has scored the budgetary impact of creating a withholding tax on unsold gains of centi-millionaires (Department of Treasury 2023), and Batchelder and Kamin (2019) have estimated the revenue from mark-to-market and retrospective accrual taxation for the top 1%. Bricker et al. (2020) 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 build 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 based on total wealth. By using data on actual unrealized gains, we reflect the fact that different asset classes accrue

unrealized gains at very different rates (e.g., stocks much faster than bonds) and that within some asset classes, returns vary by wealth in important ways (Smith, Zidar, and Zwick 2023). As a result, our estimates of unrealized gains look fairly different from Bricker et al. (2020).[8]

Our work on borrowing draws on McCaffery (2017 and 2020), who described the existence of "buy, borrow die." Relatedly, Underwood and Yost (2023) examine CEOs' pledges of shares to support loans and find that CEOs are more likely to pledge shares if they have a larger share of unrealized gains in the stock. Our work on the consumption and savings behavior of the rich using SCF data to explain the amount of borrowing builds on work by Mian, Straub, and Sufi (2021a) and Feiveson and Sabelhaus (2019). We also connect to a longstanding literature on the differences between income tax bases and consumption tax bases (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 a tax base consisting of their current consumption.

II. Data and Methodology

We combine several data sources to produce our estimates. We review each in turn before discussing methodology.

A. 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 households in the 2022 SCF, for example, 256 have wealth that exceeds $62 million (the top 0.1 percent wealth cutoff). A random sample with 4,595 observations would have only 5 households exceeding this cutoff. This oversampling provides granular coverage of essentially all the wealth (and income) distribution up to Forbes 400 billionaires, who are excluded from the SCF sampling regime.[9]

[8] In addition, we measure these variables going back to 1989, rather than for just 2016 (notably, an outlier year for taxes/AGI).

[9] The SCF excludes these individuals because their data could not be anonymized "without rendering their data virtually useless" (Federal Reserve 2010). Notably, the top of the SCF distribution has a similar level of wealth to the

The SCF contains comprehensive questions concerning all of respondents' assets, breaking them out into over thirty types, including data on the unrealized capital gains accrued on such assets. The SCF-based estimates of the share of wealth owned by different wealth groups and trends at the top of the wealth distribution are largely similar to the baseline estimates of Smith, Zidar, and Zwick ("SZZ") (2023). Those authors' estimates of wealth are derived by capitalizing income streams reported on tax returns and allowing for heterogeneous rates of return. For example, the SCF-based estimate for the share of wealth held by the top 0.1 percent differs from SZZ's estimate for that group by only 0.18 percentage points on average from 1989-2016.[10]

The SCF data on wealth also 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 assets to Financial Accounts assets is about 97%. There are larger differences between the SCF and the Financial Accounts for private businesses, but as we explain in the Data Appendix, we follow Feiveson and Sabelhaus in using the SCF figures because they will likely be more reflective of market value than the book-value based Financial Accounts estimates.

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 the second quarter of 2022, the Financial Accounts showed total household debt of $18.14 trillion, while the 2022 SCF conducted during this period implied household debt of $16.66 trillion, or 92% of the amount shown in the Financial Accounts. We employ a variety of additional sensitivity checks in our robustness section to ensure

bottom of the Forbes 400 list, 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.

[10] The SCF tracks SZZ's baseline somewhat less closely for the top 1 percent. Over 1989-2016, the SZZ 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 SZZ's baseline fairly closely in both levels and trends, with a correlation of 0.75.

that we are adequately covering borrowing by the wealthy, including analyses of securities margin borrowing, life insurance borrowing, estate tax data, 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 changes to be used with TAXSIM. SCF data are representative of households rather than tax units, and while these frequently overlap, they do not always do so.[11] 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 that are generally not taxable, such as interest from municipal bonds, some Social Security payments, and government transfers like SNAP ("food stamps") and TANF ("welfare"), 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 of $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 1.49 and 0.73 for those groups. Appendix Table 1 lays out these scaling factors in detail.

We do not include state and local taxes because our focus is on the individual federal income tax's realization rule and borrowing.[12] For the same reason, we do not pass through a share

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

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

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 liabilities.

There is increasing concern about non-response biasing even high-quality government surveys,[13] 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 Zwick (2023) derived from income tax returns. Such matching would be unlikely if non-response were substantially impacting the SCF results.

B. 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 from 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.

C. Estimating Unrealized Gains and New Borrowing

A core goal of the paper is to estimate new unrealized gains and losses accruing to different wealth groups 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, we cannot directly observe ΔUR on a household-by-household basis over time. Instead, we aggregate the SCF data up to the wealth-group level to measure the change in unrealized gains on average within wealth groups over time. In Appendix Table 2, we show that on average unrealized gains increase at roughly the same annual rate (6.0%) as nominal wealth (6.2%) from 1989 to 2022, with unrealized gains thus composing a similar fraction of

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

wealth at the start and end of our periods.[14] High-wealth groups saw their wealth grow the fastest over this period. That relationship also appears to be present for unrealized gains, although it is less clear than in the wealth data. For each period, we assume that the rate by which ΔUR increases for a given wealth group matches the historical average given in Appendix Table 2. For a given year t and wealth group θ, $\Delta UR_{t,\theta} = UR_{t-1,\theta} * R_{\theta}$, where R_{θ} is the average growth rate of unrealized gains for that group.

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 are aware of to look at the effect of adding unrealized gains on average tax rates across the full wealth or income distribution. That paper relies on two assumed rates of returns at which unrealized gains accrue 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 (Smith, Zidar, and Zwick 2023). These assumptions matter; we estimate significantly different unrealized gains than Bricker et al. (2020).

In the robustness analyses described below, we also use two other methodologies to estimate ΔUR and find qualitatively similar results.

We estimate new borrowing in a manner similar to that for 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 wealth-group-specific rate of change of borrowing such that $Borrowing_{t,\theta} = Borrowing_{t-1,\theta} * \beta_{\theta}$ where β_{θ} is the average rate of increase of borrowing for that group over the time period. 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 that the SCF asks about: non-residential real estate borrowing

[14] 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.

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, which in turn causes potential problems in reliably estimating the growth rate of debt. In Appendix Tables 4 and 5, we show that including those sources of borrowing, however, does not have much effect on the main results.

D. Pseudo-Panels for Consumption and Savings

To estimate consumption and savings using the SCF, we follow Feiveson and Sabelhaus (2019) and Mian et al. (2021a) in using "pseudo-panels." That is, we treat a given wealth group as being repeatedly observed over time, even though the same individuals within the group are not repeatedly sampled. We follow Mian et al. (2021a) in calculating the implied consumption and savings for different wealth groups (within a given age cohort). In short, the SCF contains comprehensive measures of both income and wealth, and from this, consumption and savings behavior can be imputed over time using various accounting identities.[15] This method raises some issues in terms of measurement error, though Baker et al. (2022) find that with good data, the measurement error is usually small and centered around 0. The Appendix provides 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 that do not rely on the pseudo-panel assumptions (Mian et al. 2021b).

III. Main Results

We present our four main results here. First, we show that unrealized gains are very large at the top of the wealth distribution. Still, the tax base contains most economic income for the top 1 percent, and we decompose the elements of AGI that produce this result. Second, we show that although income taxes are less progressive as a share of economic income than as a share of AGI, they are still progressive up to the 99.9th percentile. Third, we document a lot of borrowing for the rich, but show that it is a small share of economic income and unrealized gains for the top 1 percent. Fourth, we estimate that consumption is considerably less than AGI for the top 1 percent, helping

[15] For example, if one 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 $Haig\ Simons\ Income = Consumption + \Delta Wealth$, which implies $Consumption = H.S.Income - \Delta Wealth$

to explain why this group does not borrow against a large fraction of their unrealized gains to finance consumption.

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 using the wealth distribution for that year. We also include the Forbes 400 as an additional group in the top 1 percent where the data are available. Appendix Table 6 provides the wealth cutoffs, average wealth, and total wealth for each group in 2022.[16] Appendix Table 6 provides the wealth cutoffs, average wealth, and total wealth for each group in 2022.

A. Income Tax Base as a Share of Economic Income

First, we examine how much economic income is covered by the current income tax system. As noted above, economic income is a more comprehensive measure of changes in economic well-being than AGI because it 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 the ratio of AGI to economic income, averaged over 2004-2022, across our wealth groups. As expected, 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 50-90th percentiles. Below the top 0.1 percent of wealth, the tax base still captures a substantial majority of economic income. In particular, the tax base captures 75% of economic income for the 90-99th percentiles and 67% for the 99.0-99.9th percentiles. Although the tax base captures a substantial majority of the economic income for the 90-99.9th percentiles, they still have a lot of economic income that goes currently untaxed: this group had total unrealized gains of about $35 trillion as of 2022.

[16] 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 from the previous calendar year.

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

Holding fixed behavior—and without changes to the realization rule—changing tax rates on ordinary income and capital gains will therefore reach a large majority of economic income of those in the 90-99th percentiles of wealth, 60% of the economic income of the top 1 percent as a whole, and half the economic income of the top 0.1 percent on average from 2004-2022. It is important to keep in mind that the 99.0-99.9th percentiles own a majority of all the wealth in the top 1% as a whole (Appendix Table 6). Thus, the tax system capturing 67% of the economic income of the 99.0-99.9th percentiles ends up being quite influential in our analyses of the top 1% as a whole.

For all wealth subgroups, there is little change in these results over time, as shown in Figure 2.[17] It is also worth noting that an important fraction of capital gains realized (and thus included in AGI) in a given year may have accrued many years before, thus lowering the real tax rate somewhat on such gains through deferral.[18]

To understand what drives AGI for the rich, Figure 3 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%).

[17] It bears emphasizing that this is partly a result of our modeling choices. To reduce year-to-year volatility, we estimate $\Delta UR_{t,\theta} = UR_{t-1,\theta} * R_{\theta}$ with R_{θ}—the rate of increase in unrealized gains for a wealth group θ based on a historical average —not changing from year to year. $UR_{t-1,\theta}$ does vary from year to year, however, based on SCF data.

[18] The most recent publicly available SOI data (tax years 2014 and 2015) show an average holding period of about 8 years for realized capital gains. As a back-of-the-envelope estimate, we calculate the deferral advantage under the realization rule, rather than subject to Haig-Simons taxation. The average nominal 1-year Treasury rate from 1989-2022 was just over 3% and about 1.5% from 2004-2022. An asset held for 8 years that grows at the nominal risk-free rate of 3% (1.5%), and that would be taxed at a 20% statutory rate, is equivalent to exempting about 8% (4%) of Haig-Simons income or reducing the rate on Haig-Simons income to 18.4% =(20%*(1-0.08)). At an 8% interest rate, the 8 years of deferral would reduce effective tax rates by 18%; yielding $(20\% * (1 - 0.18) \approx 16\%$ effective rate on Haig-Simons income.

Also, note that the 8-year holding period in the SOI data should be treated with caution because, for a majority of capital gains—those derived from mutual funds, S-corporations and partnerships, among others—the holding period is not reported on individual tax returns and thus is not included in the SOI analysis.

Figure 4 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 50-90th percentiles, homes remain an important contributor, but are joined by tax-preferred savings vehicles (i.e., retirement assets). In the top 90-99th percentiles, 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.

Appendix Figure 1 and Appendix Table 7 show how our results change if we exclude unrealized gains embodied in tax-preferred savings vehicles and primary residences. For assets in traditional IRAs and 401(k)s, Congress has explicitly chosen to exempt unrealized and even realized returns in these accounts 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, the U.S. tax code exempts the first $500,000 of gains on the sale of a primary residence for married taxpayers (and half that for singles). 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). Excluding these items tends to increase the share of AGI over modified economic income for the bottom 99% of the wealth distribution. For example, excluding these items increases the ratio from 0.745 to 0.873 for the 90-99th percentiles over 2004-2022. The ratio for the 99.0-99.9th percentiles is impacted, but more modestly, going from 0.673 to 0.736.

Finally, Appendix Figure 2 shows the distribution of $\frac{AGI}{Economic\ Income}$ for the top 1 percent. The results are quite heterogeneous: for example, the 25th percentile is 0.37, and 75th percentile is 0.77.

B. Average Tax Rates as a Share of Economic Income

We turn next to tax rates as a share of economic income. Figure 1 also shows federal income taxes (after all credits and deductions and not including FICA taxes) as a share of AGI and economic income on average from 2004-2022. Note that $\frac{Tax}{Economic\ Income} = \frac{Tax}{AGI} * \frac{AGI}{Economic\ Income}$. So, the bottom line in the figure 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 the traditional measure using AGI. This blunts the progressivity of the income tax: the line for taxes as a share of economic 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 99.9th percentile: average tax rates on economic income for the bottom 50% are about 1.7%, while for the 99.0-99.9th percentiles they are 15.8%. Average rates on economic income fall, however, in the 99.9th percentile (12.1%) and the Forbes 400 (9.6%), with the Forbes 400's average tax rate close to that paid by the 50-90th 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 3 and 4, we show Tax/AGI and Tax/Economic Income over time, but neither exhibits time trends except a small decrease in the tax rates of the bottom 50% of wealth-holders.

Table 1 and Appendix Figure 1 show how our tax rate results change if we exclude unrealized gains embodied in tax-preferred savings vehicles and primary residences. The differences are again important below the top 1%. For example, even for the 90-99th percentiles, tax as a share of modified economic income is 16.1%, which is closer to the traditional $\frac{tax}{AGI}$ =18.4% than to the tax share of our unmodified economic income of 13.7%. The change in the top 1% is smaller, however, because the primary source of their unrealized gains is businesses,[19] and to a lesser extent stock.

[19] It is true that parallel to I.R.C. § 121 for housing, I.R.C. § 1202 provides for an exclusion for some realized gains on the sale of stock in a private business structured as a C-corporation. Arguably then, we should also exclude some unrealized gains in the value of private businesses when modifying economic income, similar to how we exclude housing gains. But §1202 appears to cover a relatively small fraction of gains on business sales. Treasury estimates

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, among other things, it lets taxpayers engage in the "buy, borrow, die" strategy, allowing them to consume unsold gains without ever paying income tax on them. We are the first to quantify this phenomenon. We do not have data on borrowing for the Forbes 400, so we omit this group in our analysis of borrowing. Nevertheless, Fox and Liscow (2024)—using SEC disclosures of borrowing against publicly traded stock and other back-of-the-envelope calculations—estimate that the Forbes billionaires' existing borrowing is large (about $100 billion), but also that their new borrowing is a small fraction (under 2%) of their very, very, large economic income. This is largely consistent with our estimates here for rich SCF respondents.

For high-wealth Americans, the existing amount of borrowing as of 2022 is substantial. Those in the top 1 percent had borrowed $1.02 trillion and those in the next 9 percent another $3.6 trillion. Given that the top 1 percent's assets are 47% unrealized gains, their borrowing would have unlocked about $475 billion of unrealized gains if it displaced sales of average assets. The parallel figure for the next 9 percent is unlocking $1.45 trillion of unrealized gains. Likewise, new borrowing by the top 1 percent is economically meaningful: $62 billion in 2022, potentially unlocking another roughly $30 billion in unrealized gains each year. These findings align with Fox and Liscow (2024)'s conclusion that taxing ultra-wealthy Americans' new and existing borrowing as a partial realization of their appreciated assets could raise considerable revenue.

Nevertheless, when we compare new borrowing for these rich taxpayers to their economic income or unrealized gains, it looks small. Figure 5 estimates annual new borrowing across the wealth distribution as a share of economic income in 2022. For the top 1 percent as a whole, new borrowing as a share of economic income is about 2% of economic income. By contrast, their new unrealized gains are about 40% of their economic income in the most recent SCF. For this group,

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that § 1202 will cost the fisc $1.8 billion in 2024 compared to $58 billion for § 121 or $238 billion for exclusions of income defined benefit plans, defined contribution plans, and IRAs.

if all new borrowing was replaced by sales of average assets, it would increase the percentage of economic income captured by the tax base only marginally, by about 1 percentage point. That in turn would raise the average tax rate of the group by about 0.2 percentage points. Put differently, we estimate that if we could force taxpayers to replace *all* "buy, borrow, die" borrowing this year with sales of their assets, it would only quite modestly raise average effective tax rates at the top (0.2 percentage points).

We now quickly discuss a few other pieces of evidence that suggest that, on average, the wealthy are not primarily avoiding taxes on unrealized gains by borrowing. First, Appendix Table 8 shows that (total borrowing)/(total unrealized gains) is small at the top: roughly 4% for the top 1 percent as a whole in recent years. Second, Appendix Table 9 shows (total borrowing)/(total wealth) over time. Over the last decade, borrowing has been about 1% of wealth for the top 0.1 percent and about 3% of wealth for the 99.0-99.9th percentiles. Third, Appendix Figure 7 shows that there is not an increase in borrowing/wealth as wealthy 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.

Despite the data just listed, there is also evidence consistent with *some* rich taxpayers borrowing to unlock a larger fraction of their unrealized gains or engaging in "buy, borrow, die." Appendix Figure 5 shows that 54% of households in the top 1 percent borrow very little (less than 0.1% of their wealth), but about 15% of rich households borrow more than 5% of their wealth and thus potentially unlock a relatively large percentage of their unrealized gains.

In Figure 6, we outline the sources of borrowing by the top 1 percent. Most of this group's borrowing (66%) is mortgages on first or second homes. Another large chunk (12% of total debt) is in margin borrowing against stock and other securities, which we examine in greater detail in the robustness section. As noted above, the primary role played by borrowing against homes and stock is perhaps not surprising because they are the 'easiest' to borrow against due to being more easily valued and more easily sold in case of default. By contrast, we see in the SCF data relatively little borrowing from 3rd parties against the household's equity in privately owned businesses,

despite this making up a large share of the portfolio of the top 1 percent. This might be because as these assets are 'hard' to borrow against; difficult to value and difficult to sell in case of default, leading to much higher borrowing costs.

We turn now to borrowing by households outside the top 1%. Lower wealth Americans, unsurprisingly, borrow a much larger share of their economic income than higher wealth groups, as high as 8% for the bottom group in Figure 5. Similarly, Appendix Figure 6 shows that borrowing has grown as a percent of economic income for the bottom wealth group, from about 4% in 1989-2001 to 8% in 2022, even though other wealth groups exhibit no noticeable time trend in their borrowing.

Figure 7 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 middle and upper middle-class phenomenon: Americans in the 50-90th percentiles of wealth had $18 trillion in unrealized gains in 2022 and had borrowed $7.6 trillion (42% of unrealized gains), while those in the top 1% had unrealized gains of $23 trillion and had borrowed $1.0 trillion (4% of unrealized gains). That said, little of this borrowing by those in the 50-90th percentiles is probably explicitly tax motivated. Instead, generally the borrowing consists of the purchase of a home using a long-term mortgage. In addition, in most cases, the taxpayer accumulates her unrealized gains after the borrowing, as the house subsequently appreciates in value and the taxpayer accumulates unrealized gains her retirement accounts.

D. Explaining Borrowing by the Rich: 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 the consumption patterns for our different wealth groups and compare these to liquid income. We divide AGI (which is generally equivalent to liquid income) into two

parts.[20] 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. The second part is realized gains. To estimate consumption, we first estimate savings rates out of AGI- following the pseudo-panel methodology of Mian et al. (2021a), 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, which is different than in our primary analyses. (However, as shown in Appendix Table 3, and discussed below, this method produces similar results to our baseline method of calculating unrealized gains).

With the savings rates derived from the pseudo-panels, we then back out aggregate levels of consumption. Figure 8 displays the consumption, AGI-, and realized capital gains as a share of economic income by wealth group in 2022. Again, note that AGI- and realized capital gains together make up AGI. The bottom wealth group in this figure consumes more than its economic income by either dipping into existing wealth and/or borrowing. For each wealth group in the top 10%, consumption is less than AGI. For the 99.0-99.9th percentiles, AGI- alone exceeds consumption. Thus, on average, the ultra-wealthy do not need to rely on "buy, borrow, die" to finance their consumption. Their liquid, taxable income already covers it.

To explain why liquid income exceeds consumption, we must answer two questions: 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 3 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 to cover nearly all their consumption.

In addition, the top 1% has a notably large amount of realized capital gains, perhaps surprisingly so given the tax attractions of the step-up in basis at death. Part of the reason for these realizations is that they do not have direct control over the timing of capital gains realizations for

[20] The main exception to this characterization is profits accruing to passthroughs over which the household does not have control, which are taxable, but not necessarily easily liquid.

a significant portion of assets in their portfolio, like hedge fund, venture capital, and private equity investments (Sarin et. al 2021). And, even billionaires elect to sell their stock: Musk sold nearly $40 billion of Tesla stock in 2021-22 (Mohamed 2022); Bezos sold about $20 billion in 2020-21 (Haring 2024). This provides cash to consume or diversify holdings without the complexity and fees of borrowing. Moreover, as noted, while borrowed funds can be used to diversify by buying different assets, thus lowering the risk of holding a highly concentrated position, it also requires increasing portfolio risk by increasing leverage. Finally, within (or sometimes in violation of) insider trading law, executives may sell if they think their own stock is over-valued in order to avoid future losses, whatever the tax advantages of holding onto the stock. For example, Cohen, Malloy and Pomorski (2012) find some corporate insiders are abnormally able to avoid losses through timely sales.[21]

The result that liquid income tends to exceed consumption also tends to hold 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 implied consumption given their economic income. Only about 15% of households have AGI less than their implied consumption. When we add the ability to easily spend 10% of their most liquid assets like bank accounts, this number drops further to 12%.

These results raise the second question of why consumption is so 'low' relative to AGI and economic income, or put differently, what exactly are the rich saving for? It is worth noting that our definition of consumption here includes both charitable donations and inter-vivos gifts to family, so the fact that the rich "consume" less than their AGI and much less than their economic income is notable. A bequest motive is likely part of the explanation: desiring to leave more wealth to heirs or charities at death. So is the (likely) steeply declining return to additional personal consumption at high levels of spending. Ingrained habits could also play a role. Finally, wealth

[21] Likewise, if executives believe the market as a whole is over-valued, they may end up selling their stock and putting the proceeds in a safe asset because shorting the overall market is highly risky (De Long et. al. 1990).

itself may act as a kind of scorecard (see Carroll (2000) drawing on Max Weber's *The Protestant Ethic and the Spirit of Capitalism* (1958) for a model of this sort).

In any case, "buy, save, die" appears to describe a much larger share of behavior in our data than does "buy, borrow, die."

IV. Robustness

In this section, we conduct several robustness checks. We first consider alternative ways of measuring unrealized gains, which leaves the results qualitatively unchanged. We then compare our findings on borrowing to other measures outside of the SCF, which provide support that the SCF-based measure is qualitatively accurate.

A. Unrealized Gains

i. Adjusting for Inflation

In Appendix Figure 8, we reexamine the share of economic income captured by the tax base and average tax rates shown in Figure 1, except we adjust realized and unrealized gains for inflation. This figure then shows the portion of real economic income captured by 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 99.0-99.9th percentiles. The analysis does accentuate the result that most of economic income is captured in the tax base: 79% for the 99.0-99.9th percentiles, 61% for the top 0.1% excluding the Forbes 400, and 58% for the Forbes 400. For the top 1 percent as a whole, this averages to roughly 70%.

ii. Other Ways of Measuring Unrealized Gains

We have two robustness methods for measuring unrealized gains. In the first robustness 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 their assets held within that class. We then subtract the household's realized capital gains in year t to reach the household's ΔUR_t.

In the second robustness 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 of nominal wealth growth in the SCF from 1989-2022 (i.e., 6.2% in each year). Thus we calculate $\Delta UR_t = 6.2\% * 69\% * W_{t-1} - realized\ cap.gains_t$. The Appendix discusses these methodologies in more detail.

Appendix Tables 3 and 10 show the portion of economic income captured by the tax base and average tax rates, respectively, after accounting for unrealized gains using these two other methods of calculating unrealized gains. In general, the other two methods produce results that are fairly similar to the baseline. For the bottom 90% of the wealth distribution, the robustness checks produce estimates of AGI/(economic income) that are a little lower than the baseline specification (because they estimate higher unrealized gains). For the 90th to the 99.9th percentiles, the baseline specification is between the two robustness checks. For example, for the 99.0-99.9th percentiles, the first robustness check has a ratio of 0.702 and the second has a ratio of 0.599, whereas the baseline was 0.673. For the top 0.1%, the baseline method is below the two robustness methods. For example, for the top 0.1% excluding the Forbes 400,[22] the robustness methods produce 0.679 and 0.533, whereas the baseline estimate is 0.502.[23]

B. Borrowing

i. Comparing to Financial Accounts and External Margin-Borrowing Data

[22] Because both robustness methods require all households to earn the same return either within asset classes (Method 1) or on all assets (Method 2), they are unlikely to match the growth of unrealized gains of the Forbes 400, who—ex post at least—have earned much higher returns on their assets than the population at large. This explains why the ratio of AGI/(economic income) is much higher for the robustness methods for the Forbes 400 than the baseline (because the robustness methods predict much lower unrealized gains, and hence lower economic income).

[23] Appendix Tables 11 and 12 provide additional insights into the differences between our main method and two robustness methods, showing the ratio of changes in unrealized gains to AGI by wealth group, and also aggregate changes in unrealized gains across all wealth groups. Our baseline estimates usually fall somewhere between the two robustness methods, though it depends on the wealth group.

The SCF data on household debt fairly closely match 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 1989-2022 period is 0.995. In general, the SCF tends to produce estimates of household debt that are about 5% smaller than the Financial Accounts in recent years. A large fraction of this discrepancy—$1.5 trillion— in 2022 is composed of larger Financial Accounts figures for educational loans, auto loans, and credit cards.[24] 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.[25] By contrast, however, the Financial Accounts 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). Margin loans in the Financial Accounts 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.[26] This is likely to explain most of the discrepancy, as other Financial Accounts data shows that the bulk of this margin borrowing is done by hedge funds—and we do not aim to capture such borrowing here.[27]

Borrowing by executives of publicly traded companies against their shares is also in line with our results. These executives must disclose borrowing against their shares in their company (i.e., margin loans). There are examples of such individuals taking out large margin loans against share appreciation: Musk, as noted above, Larry Ellison (Fox and Liscow 2024), and Carl Icahn

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

[25] Such loans make up about 2% of debt for the top 1% of wealth-holders in 2022. By contrast these kinds of debt were 33% of the debt of the bottom 50%.

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

[27] The 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.

(Lombardo 2023). Nevertheless, Underwood and Yost (2023) find that margin borrowing among executives as a whole is fairly uncommon. Their data show that CEOs pledged shares to support borrowing in about 4% of firm-years. This is consistent with Puleo et al. (2021), who find in a random sample of publicly traded firms in the S&P 1500 that on average executives pledged 2.3% of their shares to support borrowing, which implies borrowing equal to about 1% of the value of the shares.[28] Thus, Musk, Ellison, and Icahn are important empirically due to the billions they have borrowed, but in general they do not seem representative of the wider class of margin borrowing by insiders at public companies, making the SCF figures for margin borrowing seem more reasonable.

This paucity of borrowing by insiders at publicly traded companies is notable because there are good reasons to think that, if anything, they would borrow *more* than others. It is the case that insiders at public companies may be deterred from borrowing because they know they will have to report it, and doing so may be viewed unfavorably by investors because it could worsen the risk of share price crashes.[29] But a variety of factors point in the other direction. In particular, executives' wealth is concentrated in highly liquid and easily valued publicly traded stock, which should decrease the cost of borrowing and make it more attractive.[30] As a result, Underwood and Yost (2023) report that interest rates on margin loans may be as low as 0.5% to 1.5% above benchmark inter-bank interest rates.[31]

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[28] For example, Fox and Liscow (2024), based on *Wall Street Journal* reporting, assume that shareholders of large, concentrated positions pledge on average $3 worth of shares for each $1 of borrowing.

[29] In particular, investors may fear that if the share price starts to decline, the lender will make a margin call, and if the executive declines to put up additional collateral in response to the margin call, the lender will end up selling a large block of stock to satisfy the loan. This sale will drive the stock price further down (and may trigger additional margin calls for others who have borrowed against the stock).

[30] Margin loans on such liquid stock should generally be low-risk for banks because the bank knows exactly how much the stock is worth at the time of the loan, and if the value of the collateral falls sufficiently to trigger a margin call, the bank can simply sell the collateral and pay off the loan if the executive does not provide additional collateral.

[31] Other information suggests sometimes higher premiums in the 3% range above inter-bank rates. When Elon Musk lined up $12 billion of financing to buy Twitter by borrowing against $60 billion of Tesla stock, he agreed to pay 3% above the benchmark rate (Morgan Stanley 2022). Wells Fargo's pricing for the largest (and thus cheapest) margin loans at least starts at the *Wall Street Journal Prime Rate* + 1.75%, with discounts up to 2.5% for having large accounts with Wells Fargo. The Wall Street Journal Prime Rate is currently 8%, while 1 year Treasury yields are closer to 4%, so on net rich clients would pay an advertised rate about 3% above the Treasury rate.

Nevertheless, although we think the SCF figure is reasonable, as a robustness check, we distribute the additional borrowing shown in the Financial Accounts for margin loans and also loans against insurance in Appendix Table 13. Doing this increases borrowing by the top 1% because these kinds of loans are concentrated in that group. After this adjustment, however, borrowing still remains a small fraction of unrealized gains: about 3% for the top 0.1% and 8% for the 99.0-99.9th percentile.

ii. 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 to enable additional tax-free consumption. 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.[32] We are not aware of any major tax reason to use this more complex form of borrowing, but there could be non-tax reasons to do so.[33] Similarly, a taxpayer who owns an operating partnership that already has appreciated assets might have the partnership borrow against that appreciation and pay out the proceeds, instead of borrowing against her appreciated shares in the partnership itself. Such borrowing would usually not show up in the SCF if the entity is the borrower and no personal assets are used as collateral.

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.[34] As a result, we might hypothesize that if taxpayers often use businesses as vehicles to facilitate personal

[32] Borrowing by a partnership increases the taxpayer's "outside" basis in the partnership. This means that the payout will not usually trigger tax as a result of exceeding the taxpayer's outside basis. (Willis, Postlewaite & Alexander 2024 at 6.02)

[33] 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 they might use an entity for privacy reasons, so it is not clear who the purchaser of an asset is.

[34] In general, borrowing by an S-corporation from a third party does not increase the shareholder's basis in shares. Thus, a shareholder who caused the S-corporation to borrow against appreciated assets and pay out the proceeds might well exceed her basis in the shares, triggering tax (Eustice, Kuntz & Bogdanski 2024).

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 14 shows debt/equity and debt/assets of partnerships and S-corporations. Among all industries, partnerships have much less leverage measured by debt/equity or debt/assets. However, outside of finance, partnerships do in fact have a higher debt/equity 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-corporations and partnerships within the same industry) shows in Appendix Table 15 that partnerships employ less borrowing, not more.

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 suggest that personal borrowing facilitated by entities is likely to be relatively limited.

As a sensitivity check, however, we assume that any additional debt/assets shown for non-financial partnerships compared to non-financial S-corporations is attributable to excess personal borrowing. The results are shown in Appendix Table 16. While this adjustment increases the amount of borrowing at the top, such borrowing remains small compared to wealth and unrealized gains. For example, for the top 0.1%, after the adjustment, borrowing roughly doubles, but remains small compared to wealth (about 2.5%) and unrealized gains (about 5%).

One other piece of evidence sheds light on the apparently limited role of personal borrowing via entities. Insiders at publicly traded firms must disclose their share pledging to support borrowing. That is true even if their beneficial ownership is indirect because they hold their shares through an entity that they own. If the entity pledges these shares to support borrowing, they will need to report it on SEC forms. Nevertheless, as noted above, rich public company

executives appear to borrow a fairly small fraction of their wealth in that data, even where we should see borrowing regardless of whether they choose to use an entity to borrow. This in turn suggests (in this population at least) the use of entities is not obscuring a much wider use of borrowing by the rich than is shown in the SCF data.[35]

iii. Comparison to Estate Tax Data

Appendix Table 17 compares borrowing in the SCF to borrowing shown on estate tax returns, which are filed by taxpayers dying while holding very large estates.[36] In general, $\frac{debt}{assets}$ for estate tax returns is a bit larger than for the most relevant portion of the SCF sample: those 70 years old and over.[37] This difference is modest for estates with $11.4 million to $50 million of assets (3.4% of assets in the estate tax data versus 2.5% of assets in the SCF). By contrast, for those with assets over $50 million, the estate tax data show a higher level of borrowing (4.2% of assets) than for older SCF respondents (0.6%-0.8% of assets). That said, although borrowing in the estate tax data is larger for this group, it is still a fairly small share of their assets and unrealized gains.

Moreover, the literature suggests treating the estate tax data circumspectly, since relying on it may exaggerate the amount of borrowing during life. Decedents appear to change their behavior and engage in estate tax avoidance techniques in the years before death in ways that reduce reported assets on their eventual estate tax return (Saez and Zucman 2016; Kopczuk 2007). This will drive up reported $\frac{debt}{assets}$ in the estate tax data. More directly, Saez and Zucman note that if death was random, after controlling for age and other demographics, the income tax returns of estate tax decedents could be inverse-mortality weighted to recover information about the living

[35] Appendix Figure 9 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, we might expect that those households would have a lower level of measured borrowing in the SCF (since their true borrowing was being done with the pass-through). Appendix Figure 9, 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.

[36] In 2019, an estate tax return was required to be filed if the gross value of the estate, after adjusting upward for inter-vivos gifts, exceeded $11.4 million (IRS 2024).

[37] Formally mortality-weighting the SCF yields similar results.

population as a whole. By contrast, they show empirically that—presumably because of these changes in behavior and estate tax avoidance—inverse mortality weighting the income tax returns of such decedents is pretty far from being representative. This implies that it will often be problematic to infer information about the living rich from estate tax data.

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, the remaining 40% of economic income that would be missed is a large share by any measure. Second, using economic income as a benchmark, the tax system is still progressive, though substantially less so than when using AGI as our measure of income. Average tax rates peak in the 99.0-99.9th percentiles, which 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 when compared to economic income or unrealized gains. "Buy, borrow, die" does not appear to be a dominant tax avoidance strategy for this group. Fourth, we estimate that consumption is less than AGI for the top 1%. The wealthy have fairly high liquid income, partly from business income, salaries, and realized gains. And there are a variety of reasons why they may not consume much of their income, including steeply declining returns to consuming more at such a high level of wealth. In the end, then, it appears that the main tax avoidance strategy of the super-rich for unrealized gains 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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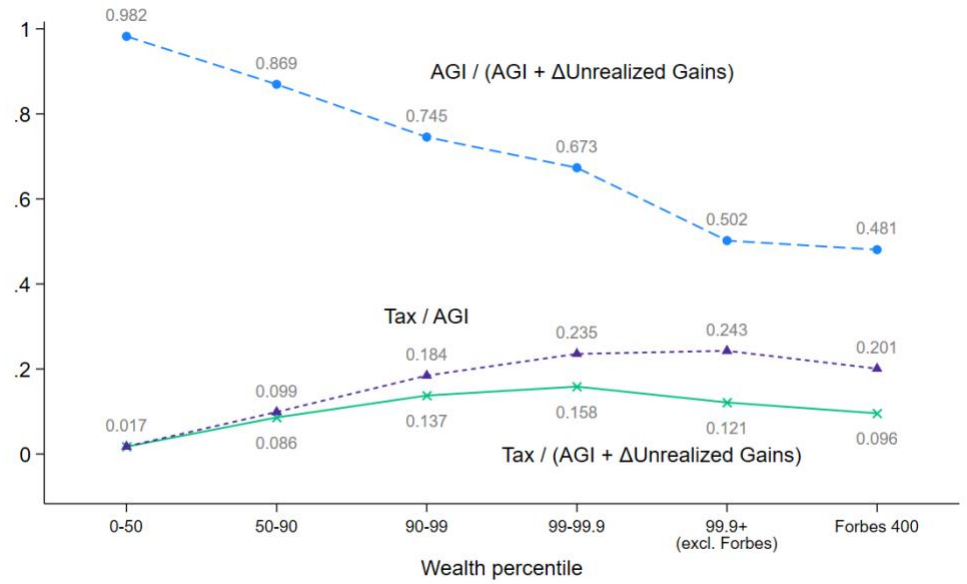
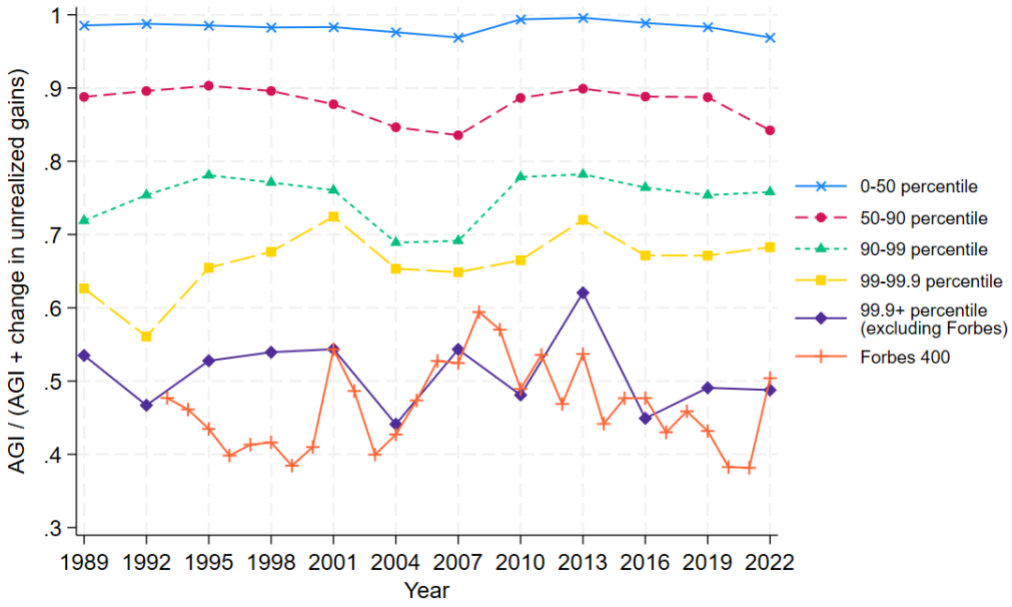
Figures

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



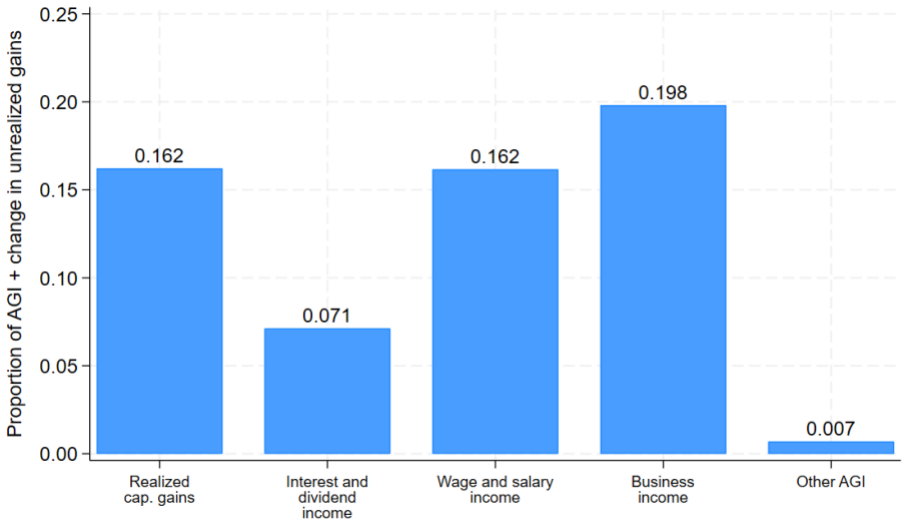
Notes: Ratios are averaged over the period 2004-2022. "Tax" refers to federal income tax liability. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication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

Figure 2. AGI / (AGI + Change in Unrealized Gains) Over Time



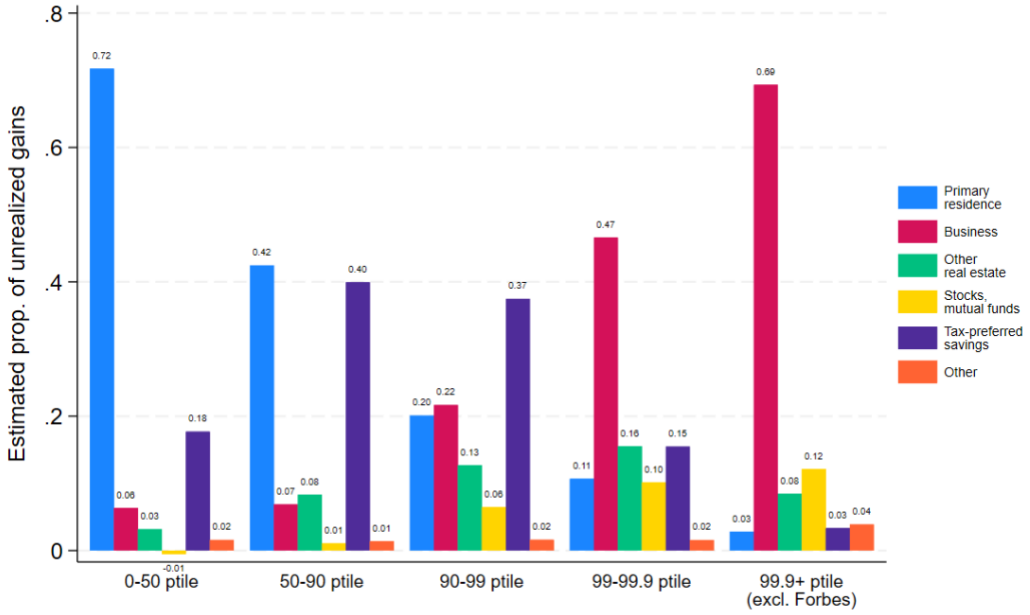
Notes: "Year" is SCF survey year, AGI is measured over the prior calendar year. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. Aggregate net worth of Forbes 400 in 2021 and 2022 comes from Gastwirth 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 data. AGI for the Forbes 400 is estimated following Yagan (2023). See Data Appendix for more information.

Figure 3. Components of AGI as Share of AGI + Change in Unrealized Gains, Top 1% of Wealth, 2022 SCF



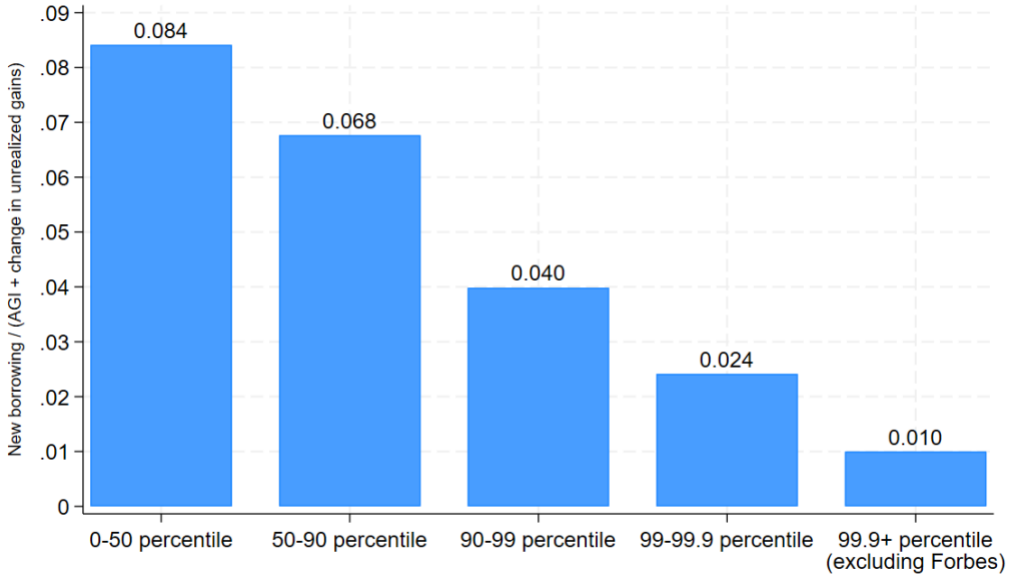
Notes: Sample is restricted to the top 1% of net worth in the 2022 SCF. Change in unrealized gains is estimated using the SCF. See Data and Methodology section for more information. AGI is estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaling to match IRS Statistics of Income data. Realized capital 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. The Forbes 400 are not included because we do not have sufficient data on their composition of AGI.

Figure 4. Unrealized Gains by Asset Type, Average 2004-2022



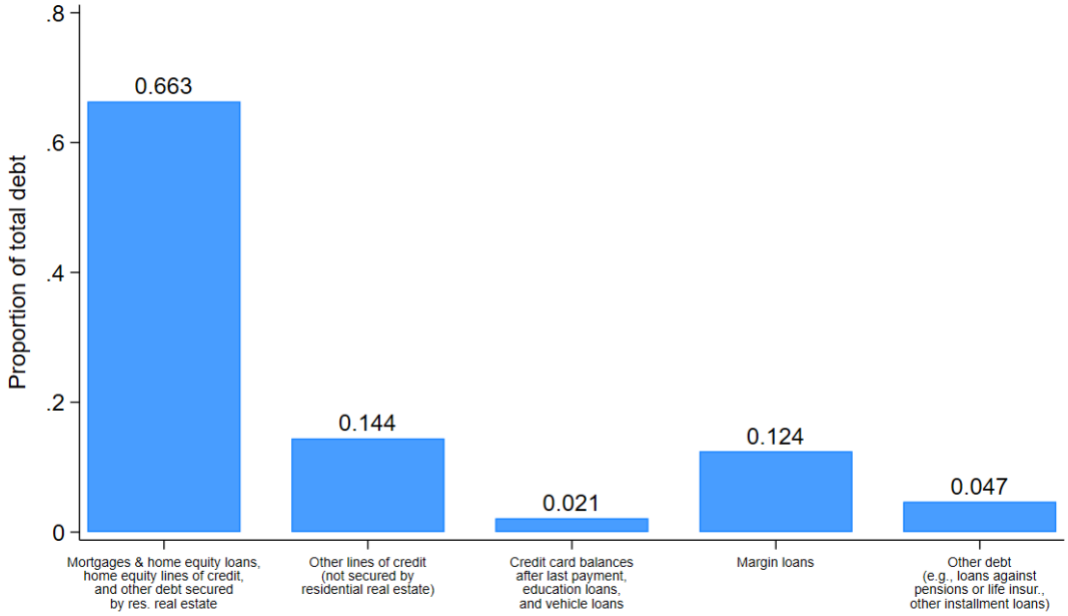
Notes: Estimates are averages of 2004-2022 ratios. "Tax-preferred savings" includes annuities, life insurance, individual retirement accounts, and defined-benefit ("DB") pension plans. "Other" includes trusts and any asset not already classified (e.g., art). We assume, as in Mian et al. (2021a), that fixed income assets have 0 unrealized gains on average. Our measure of total unrealized gains is estimated by up-weighting 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 assets). Unrealized gains on respondents' "primary residence;" "business;" "other real estate;" and "stocks, mutual funds" are observed in the SCF. The unrealized gains in the tax-preferred savings category and other category are thus not directly observed in the SCF; we estimate unrealized gains in these categories. See Data Appendix for more details. The Forbes 400 are not included because we do not have sufficient data on the composition of their unrealized gains.

Figure 5. New Borrowing/(AGI + Change in Unrealized Gains) by Wealth Group, 2022 SCF



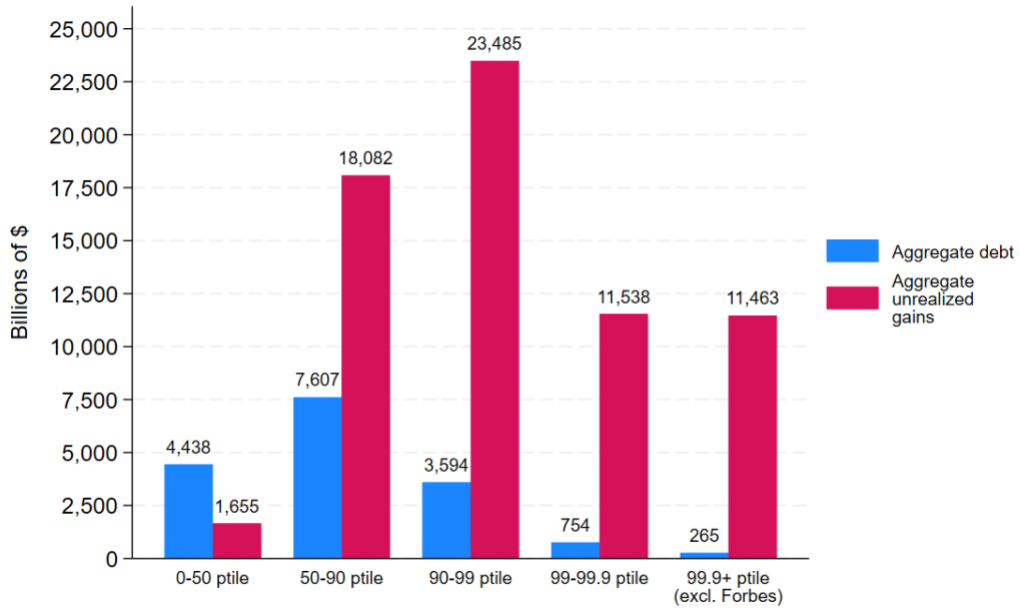
Notes: Our measure of borrowing follows the "debt" variable in the Federal Reserve's SCF Summary Extract and therefore does not include non-residential property debt and loans from household-owned businesses. See Data and Methodology section. New borrowing is not directly observed in the SCF. We estimate new borrowing using observed borrowing in the SCF and the annual growth rate of borrowing for each wealth group over 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 scaling to match IRS Statistics of Income data. See Data Appendix for more details. The Forbes 400 are not included because we do not have sufficient data on their debt.

Figure 6. Sources of Debt, Top 1% of Wealth Distribution, 2022



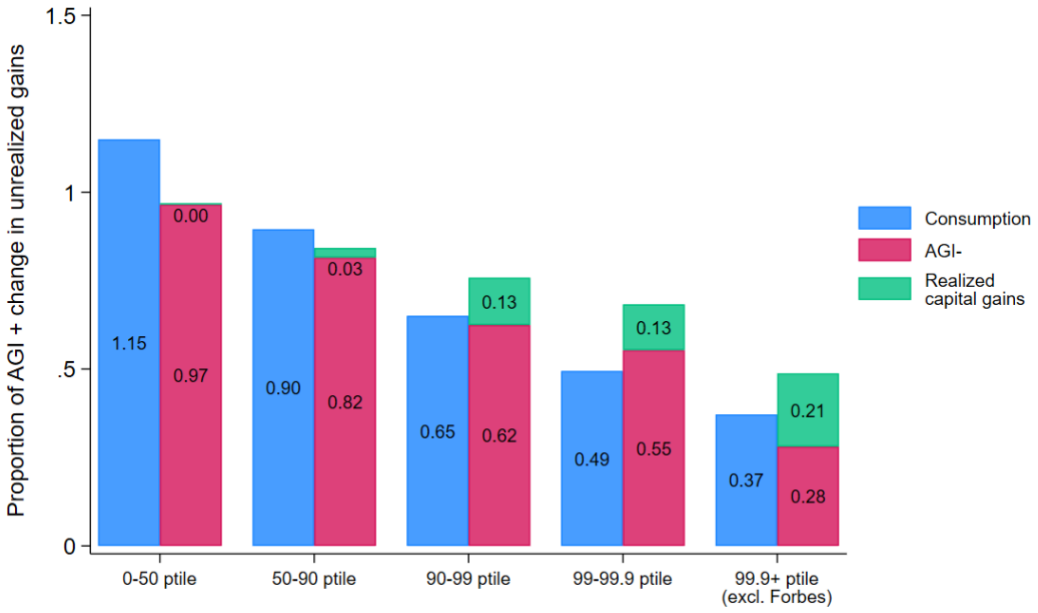
Notes: The sample is restricted to the top 1% of net worth in the 2022 SCF. Our measure of borrowing follows the "debt" variable in the Federal Reserve's SCF Summary Extract and therefore does not include non-residential property debt and loans from household-owned businesses. See Data and Methodology section. Proportions are computed using the aggregate of each category of debt over total debt. The Forbes 400 are not included because we do not have sufficient data on their debt.

Figure 7. Aggregate Unrealized Gains and Aggregate Borrowing by Wealth Group, 2022 SCF



Notes: Our measure of borrowing follows the "debt" variable in the Federal Reserve's SCF Summary Extract and therefore does not include non-residential property debt and loans from household-owned businesses. See Data and Methodology section. Our measure of total unrealized gains is estimated by up-weighting 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 assets). See Data Appendix for more details. The Forbes 400 are not included because we do not have sufficient data on their debt.

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



Notes: Consumption is estimated following Mian et. al. (2021a), see Data Appendix for more information. Consumption includes tax payments. Estimated 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 scaling 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 percentiles because the estimated savings rate is negative (consumption is greater than income). The Forbes 400 are not included because we do not have sufficient data on their savings rates.

Tables

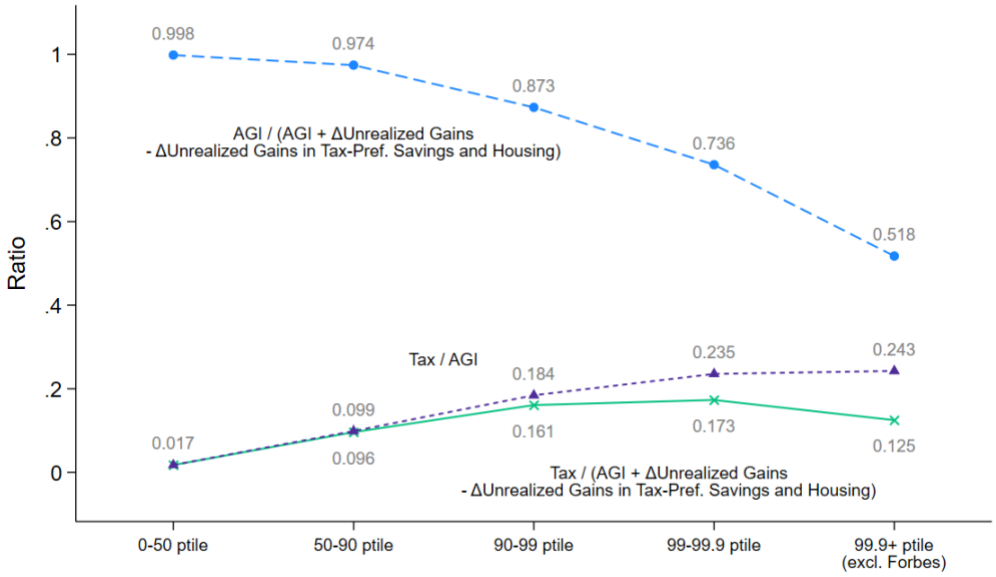
Table 1. Tax / AGI Variants

	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	n/a	n/a	n/a	n/a

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 scaling 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. The Forbes 400 are excluded from some results because we do not have sufficient data on their composition of unrealized gains.

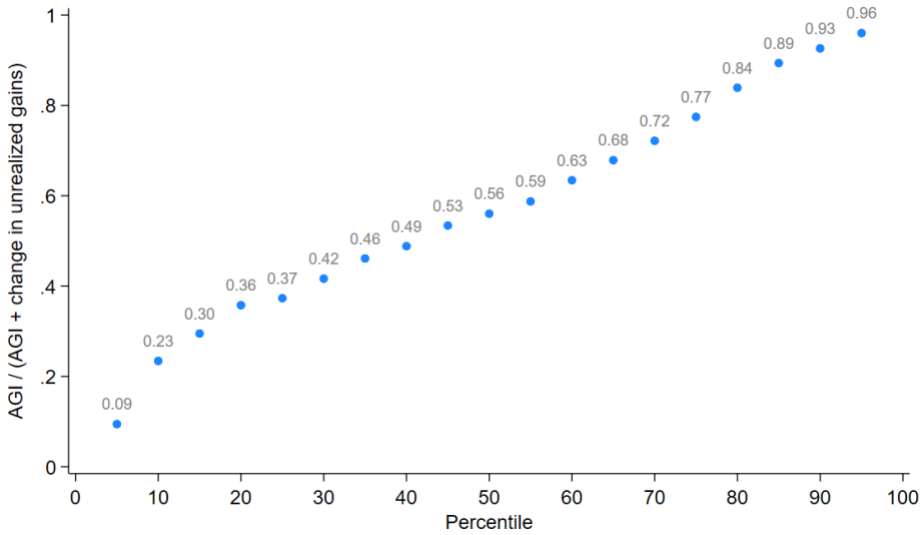
Appendix Figures

Appendix Figure 1. Tax Base and Tax Rates Adjusting for Tax-Preferred Savings and Housing, Average 2004-2022



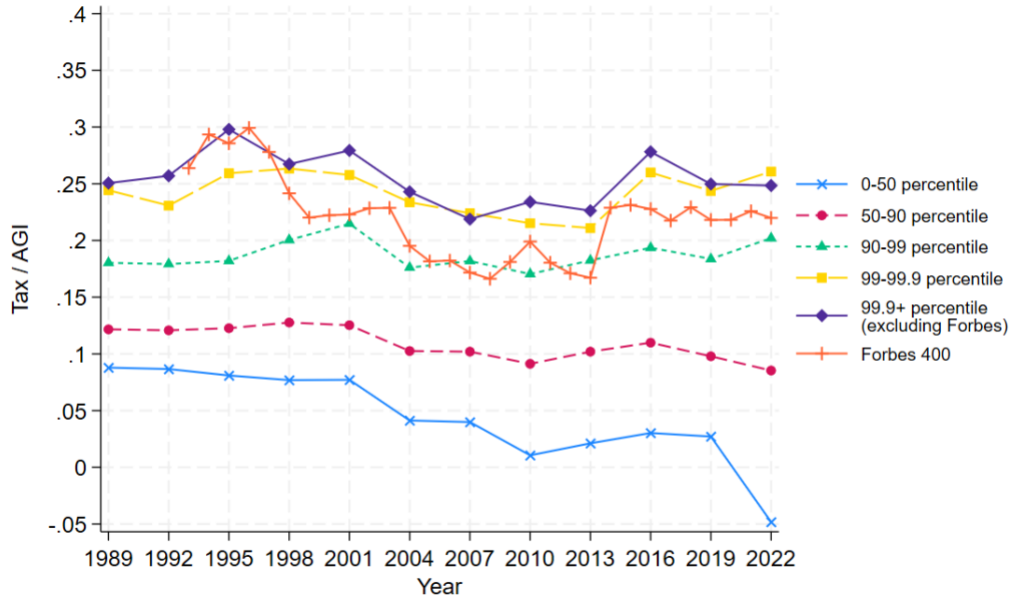
Notes: "Tax" refers to federal income tax liability. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. See Data and Methodology section for more information. "Tax-preferred savings" includes annuities, life insurance, individual retirement accounts, and defined-benefit ("DB") pension plans. Change in unrealized gains in tax-preferred savings and housing are estimated by multiplying the change in total unrealized gains by the ratio of unrealized gains in tax-preferred savings and housing to total unrealized gains. The unrealized gains in housing are observed in the SCF. The unrealized gains in the tax-preferred savings category are not directly observed in the SCF; we estimate unrealized gains in these categories. See Data Appendix for more details. The Forbes 400 are not included because we do not have sufficient data on the composition of their unrealized gains.

Appendix Figure 2. AGI / (AGI + Change in Unrealized Gains) by Household, Top 1% of Wealth Distribution, 2022 SCF



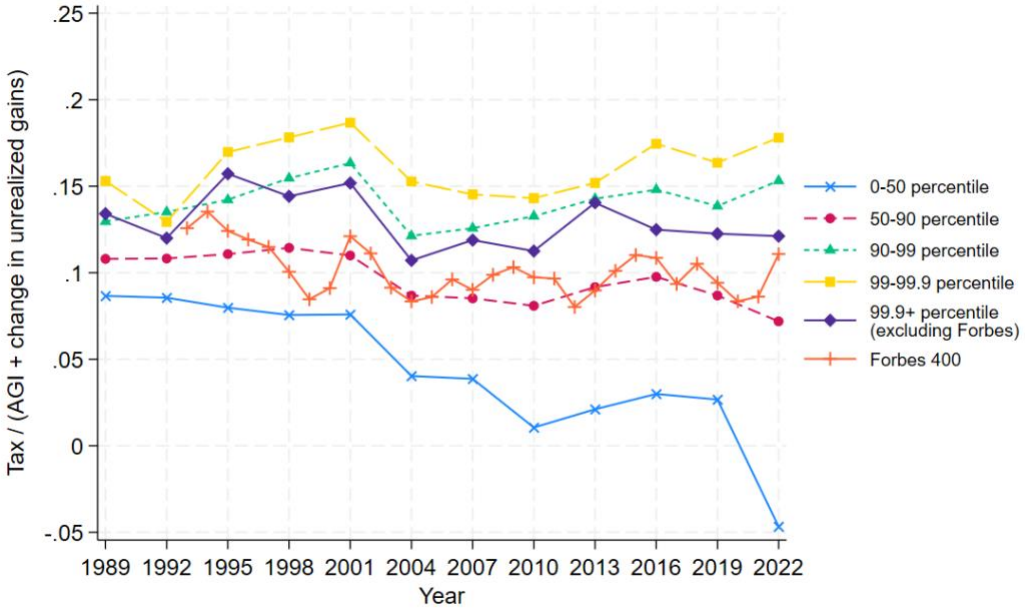
Notes: This figure plots the distribution of household-level AGI / (AGI + change in unrealized gains) for the top 1% of net worth in the 2022 SCF. The x-axis displays the percentile ranking and the y-axis displays the value of AGI / (AGI + change in unrealized gains) that corresponds to the given percentile. The numbers displayed above the points are the values of AGI / (AGI + change in unrealized gains). The Forbes 400 is not included because we do not have sufficient information to estimate household-level AGI / (AGI + change in unrealized gains).

Appendix Figure 3. Federal Income Tax / AGI



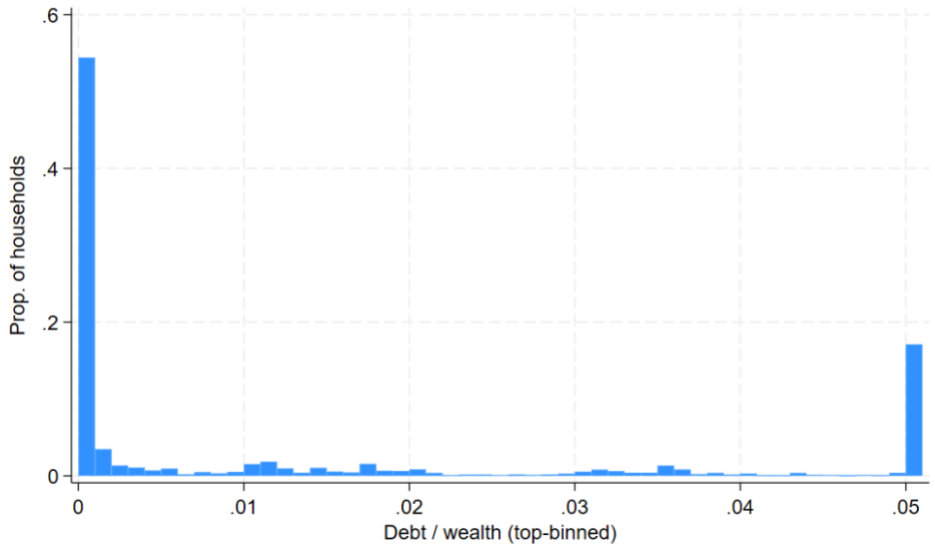
Notes: "Year" is SCF survey year, AGI and federal income tax are measured over the prior calendar year. "Tax" refers to federal income tax liability. For wealth groups other than the Forbes 400, federal income tax and AGI are estimated with NBER TAXSIM, using a replication package from Gale et al. (2022), then scaling 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 4. Federal Income Tax / (AGI + Change in Unrealized Gains)



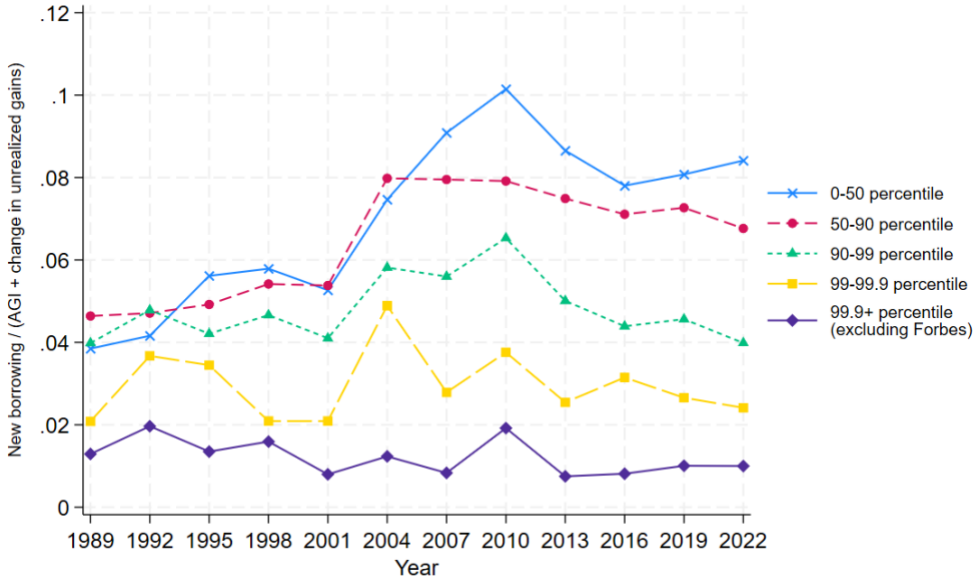
Notes: "Year" is SCF survey year. AGI and federal income tax are measured over the prior calendar year. "Tax" refers to federal income tax liability. Change in unrealized gains is estimated using the SCF and data on Forbes 400 net worth. Danny Yagan provided data on Forbes 400 net worth from 1989-2020. 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 scaling 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 5. Borrowing / Wealth by Household, Top 1% of Wealth Distribution, 2022 SCF



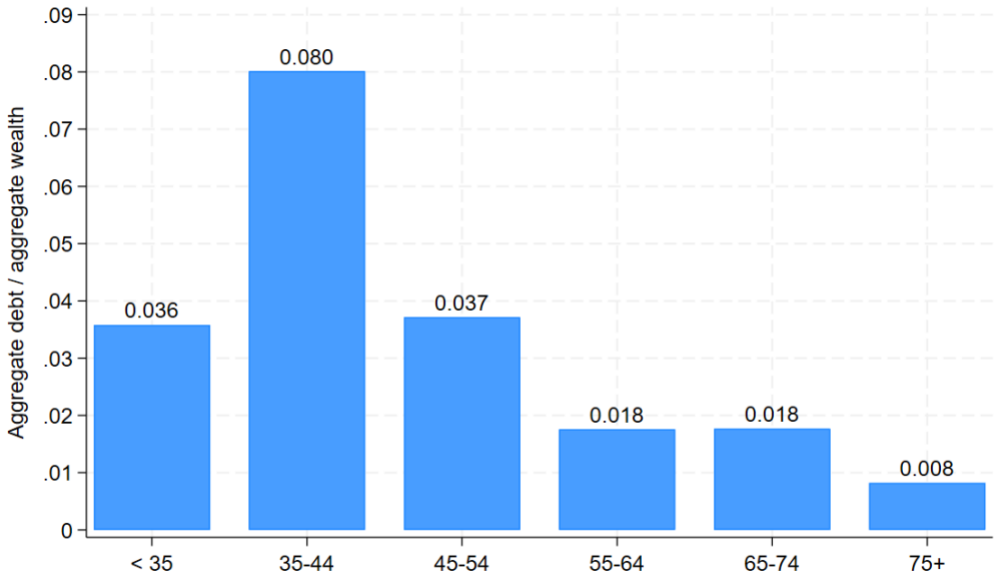
Notes: The histogram plots household-level debt / wealth. Debt / wealth is binned at the top for households with a debt-to-wealth ratio greater than 0.05. Sample is restricted to the top 1% of net worth in the 2022 SCF. Our measure of debt follows the "debt" variable in the Federal Reserve's SCF Summary Extract and therefore does not include non-residential property debt and loans from household-owned businesses. See Data and Methodology section. The total number of implied households in the top 1% is 1,314,624 using the SCF provided sample weights. The number of households with a borrowing-to-wealth ratio less than .001 is 715,319. The first bin contains households with debt-to-wealth ratios up to 0.001 and includes 54 percent of all households. The Forbes 400 are not included because we do not have sufficient data on their debt.

Appendix Figure 6. New Borrowing / (AGI + Change in Unrealized Gains)



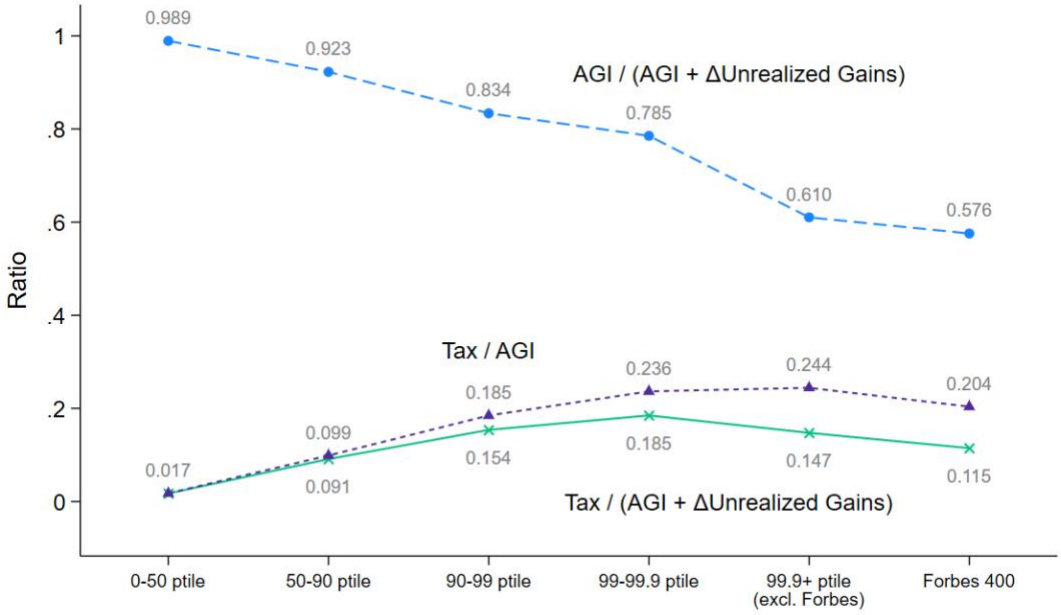
Notes: Our measure of borrowing follows the "debt" variable in the Federal Reserve's SCF Summary Extract and therefore does not include non-residential property debt and loans from household-owned businesses. See Data and Methodology section. New borrowing is not directly observed in the SCF. We estimate new borrowing using observed borrowing in the SCF and the annual growth rate of borrowing for each wealth group over 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 scaling to match IRS Statistics of Income aggregates. See Data Appendix for more details. The Forbes 400 are not included because we do not have sufficient data on their debt.

Appendix Figure 7. Borrowing / Wealth by Age Group, Top 1% of Wealth Distribution, 2022 SCF



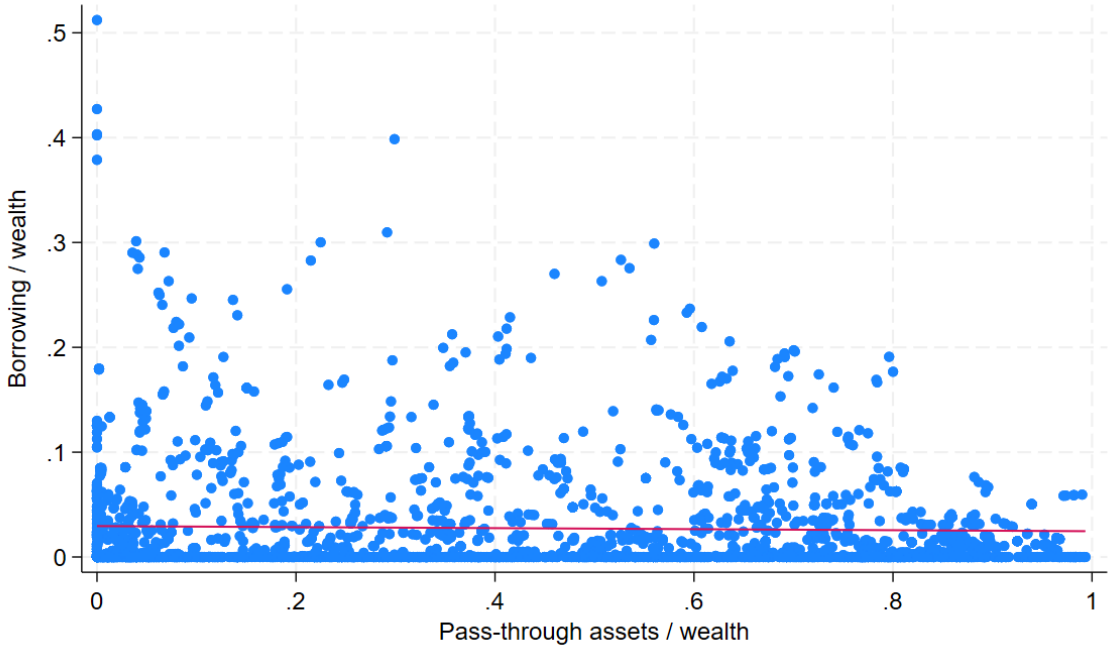
Notes: Sample is restricted to the top 1% of net worth in the 2022 SCF. Our measure of borrowing follows the "debt" variable in the Federal Reserve's SCF Summary Extract and therefore does not include non-residential property debt and loans from household-owned businesses. See Data and Methodology section. Age group is determined by age of the household head. The Forbes 400 are not included because we do not have sufficient data on their debt.

Appendix Figure 8. Tax Base and Tax Rates Adjusting for Inflation, Average 2004-2022



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 scaling 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, if these are components of the denominator. AGI in the numerator of AGI / (AGI + Unrealized Gains) is not adjusted for inflation. See Data Appendix for more information.

Appendix Figure 9. Borrowing / Wealth vs. Passthrough Assets / Wealth, Top 1% of Wealth Distribution, 2022 SCF



Notes: The line of best fit has a slope of 0.00 and y-intercept of 0.03. Pass-through assets are estimated following Smith et al. (2023), using their replication package. Sample is restricted to top 1% of net worth in the 2022 SCF. The line of best fit uses SCF-provided sample weights. The size of the dots in the scatterplot do not correspond with the number of implied households. The Forbes 400 are not included because we do not have sufficient data on their debt.

Appendix Tables

Appendix Table 1. Average, Minimum, and Maximum Scaling Factors Used for AGI and Federal Tax Liability

	AGI scaling factors			Federal tax liability scaling factors		
AGI bin (nominal dollars)	Avg., 1989-2022 SCFs	Min., 1989-2022 SCFs	Max., 1989-2022 SCFs	Avg., 1989-2022 SCFs	Min., 1989-2022 SCFs	Max., 1989-2022 SCFs
None	n/a	n/a	n/a	n/a	n/a	n/a
$1 to Under $25,000	1.246	1.144	1.334	1.428	0.014	2.563
$25,000 to Under $50,000	1.064	1.001	1.125	1.115	0.920	1.494
$50,000 to Under $100,000	0.946	0.769	1.016	0.985	0.679	1.665
$100,000 to Under $1,000,000	0.730	0.506	0.881	0.683	0.428	0.836
$1,000,000 or More	0.685	0.462	0.848	0.621	0.406	0.768

Notes: Scaling factors are computed in the following manner. We first estimate AGI and federal tax liability from the SCF at the tax-filer level with NBER TAXSIM, using a replication package from Gale et al. (2022). These estimates are aggregated by year and AGI bin. The final scaling factors vary by year and AGI bin. The AGI scaling factors are computed as the ratio of aggregate AGI from the IRS Statistics of Income to aggregate AGI from the SCF using NBER TAXSIM. The federal tax liability scaling factors are computed as the ratio of aggregate federal tax liability from the IRS Statistic of Income to aggregate federal tax liability from the SCF using NBER TAXSIM. See the Data Appendix for more details. We do not scale AGI and tax liability for the "None" category, which is tax-filers with AGI less than $1.

Appendix Table 2. Annualized Growth of Unrealized Capital Gains and 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 3. AGI / (AGI + Change in Unrealized Gains), With Robustness Methods for Calculating Unrealized Gains

Wealth Percentile	Baseline Method - Average, 2004-2022	Robustness Method 1 - Average, 2004-2022	Robustness Method 2 - Average, 2004-2022	Baseline Method - 2022	Robustness Method 1 - 2022	Robustness Method 2 - 2022
0-50 percentile	0.982	0.943	0.964	0.969	0.936	0.949
50-90 percentile	0.869	0.825	0.776	0.842	0.816	0.758
90-99 percentile	0.745	0.734	0.643	0.758	0.790	0.720
99-99.9 percentile	0.673	0.702	0.599	0.683	0.684	0.600
99.9+ percentile excluding Forbes 400	0.502	0.679	0.533	0.488	0.733	0.576
Forbes 400	0.481	0.685	0.666	0.504	0.817	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 scaling 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. The 2004-2022 averages are averages of year-specific AGI / (AGI + Change in Unrealized Gains). SCF data are observed every three years; Forbes data are observed every year.

Appendix Table 4. 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 from HH-owned business (thousands of nominal $)	Avg. borrowing, does not include non-residential property debt and loans from HH-owned business (thousands of nominal $)
0-50 percentile	62	68	68
50-90 percentile	841	148	145
90-99 percentile	4,919	329	304
99-99.9 percentile	24,334	752	638
99.9+ percentile (excluding Forbes)	155,414	2,395	2,011

Notes: Author calculations using the SCF. The Forbes 400 are not included because we do not have sufficient data on their debt.

Appendix Table 5. 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 from HH-owned business	Includes non-residential real estate debt and loans from 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) over 2004-2022. SCF data are observed every three years.

Appendix Table 6. 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 7. 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	n/a	n/a	n/a	n/a

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 scaling 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. The Forbes are excluded from some results because we do not have sufficient data on their composition of unrealized gains.

Appendix Table 8. 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 are estimated using the SCF. Borrowing does not include non-residential property debt and loans from household-owned businesses. 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. The Forbes 400 are not included because we do not have sufficient data on their debt.

Appendix Table 9. 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 does not include non-residential property debt and loans from household-owned businesses. The Forbes 400 are not included because we do not have sufficient data on their debt.

Appendix Table 10. Taxes / (AGI + Change in Unrealized Gains), All 3 Methods

Wealth Percentile	Baseline Method - Average, 2004-2022	Robustness Method 1 - Average, 2004-2022	Robustness Method 2 - Average, 2004-2022	Baseline Method - 2022	Robustness Method 1 - 2022	Robustness Method 2 - 2022
0-50 percentile	0.017	0.016	0.017	-0.047	-0.045	-0.046
50-90 percentile	0.086	0.081	0.077	0.072	0.070	0.065
90-99 percentile	0.137	0.136	0.119	0.153	0.160	0.146
99-99.9 percentile	0.158	0.165	0.141	0.178	0.178	0.156
99.9+ percentile excluding Forbes 400	0.121	0.164	0.128	0.121	0.182	0.143
Forbes 400	0.096	0.136	0.132	0.111	0.180	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 scaling 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. The 2004-2022 averages are averages of year-specific Taxes / (AGI + Change in Unrealized Gains). SCF data are observed every three years; Forbes data are observed every year.

Appendix Table 11. Change in Unrealized Gains / AGI, All 3 Methods

Wealth Percentile	Baseline Method - Average, 2004-2022	Robustness Method 1 - Average, 2004-2022	Robustness Method 2 - Average, 2004-2022	Baseline Method - 2022	Robustness Method 1 - 2022	Robustness Method 2 - 2022
0-50 percentile	0.018	0.061	0.038	0.032	0.069	0.054
50-90 percentile	0.151	0.212	0.289	0.187	0.225	0.319
90-99 percentile	0.345	0.364	0.559	0.319	0.266	0.389
99-99.9 percentile	0.487	0.432	0.681	0.465	0.463	0.667
99.9+ percentile excluding Forbes 400	1.016	0.493	0.919	1.050	0.365	0.737
Forbes 400	1.111	0.507	0.541	0.984	0.223	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 scaling 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. The 2004-2022 averages are averages of year-specific (Change in Unrealized Gains / AGI). SCF data are observed every three years, Forbes data are observed every year.

Appendix Table 12. Aggregate Change in Unrealized Gains and Aggregate Realized Gains by Year

With Forbes:

Year	Change in unrealized gains - Baseline Method (billions of nominal dollars)	Change in unrealized gains - Robustness Method 1 (billions of nominal dollars)	Change in unrealized gains - Robustness Method 2 (billions of nominal dollars)	Realized capital gains - all Methods (billions of nominal dollars)
1995	591.725	567.844	992.219	88.355
1998	879.386	830.227	1232.404	219.643
2001	1209.376	1117.896	1657.301	402.505
2004	1532.547	1624.431	2252.966	176.146
2007	2191.817	1817.141	2547.850	521.993
2010	1449.747	1914.568	2770.905	102.554
2013	1654.113	1846.121	2782.054	453.469
2016	2245.936	2470.745	3709.141	508.887
2019	2631.664	2768.536	4004.513	660.703
2022	3897.328	3363.446	4878.928	1571.210

Notes: The years 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 - Baseline Method (billions of nominal dollars)	Change in unrealized gains - Robustness Method 1 (billions of nominal dollars)	Change in unrealized gains - Robustness Method 2 (billions of nominal dollars)	Realized capital gains - all Methods (billions of nominal dollars)
1989	550.292	320.661	724.177	125.848
1992	557.055	443.621	855.702	45.968
1995	577.008	558.561	982.730	82.441
1998	847.393	816.800	1220.317	204.415
2001	1173.524	1111.791	1636.273	371.879
2004	1489.388	1603.842	2231.321	156.651
2007	2133.316	1804.627	2540.434	481.485
2010	1397.925	1884.517	2739.019	79.842
2013	1583.128	1814.932	2755.844	406.682
2016	2156.376	2425.721	3655.324	462.052
2019	2510.673	2708.190	3933.901	606.805
2022	3731.726	3325.870	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 13. Distributing "Excess" Margin and Insurance Policy Loans in Financial Accounts, 2022

Wealth group	Share of SCF margin loans	Share of SCF policy loans	SCF debt	SCF debt + excess margin and policy loans	Unrealized gains	SCF debt / unrealized gains	(SCF debt + excess margin and policy loans) / unrealized gains
0-50 percentile	0.000	0.127	4,437.76	4,446.06	1,654.97	2.681	2.686
50-90 percentile	0.045	0.243	7,606.98	7,636.09	18,081.75	0.421	0.422
90-99 percentile	0.225	0.153	3,594.21	3,670.09	23,485.29	0.153	0.156
99-99.9 percentile	0.447	0.345	754.31	907.90	11,538.32	0.065	0.079
99.9+ percentile (excluding Forbes)	0.284	0.133	264.74	356.66	11,463.35	0.023	0.031

Notes: Aggregate margin loans and loans against insurance policies comes from the Q2 2022 Financial Accounts of the United States. Excess margin loans are the difference between aggregate margin loans in the 2022 SCF and aggregate margin loans reported in the Financial Accounts. This totals $293.30 billion. Excess loans against insurance policies are the difference between aggregate policy loans in the 2022 SCF and aggregate policy loans reported in the Financial Accounts. This totals $65.50 billion. Excess margin loans 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 reported in the 2022 SCF, then 60% of the excess margin loans are distributed to that group. The same exercise is done for policy loans. Values displayed are billions of nominal dollars.

Appendix Table 14. Debt of Partnerships and S-Corporations

Partnerships and S-Corporations, 2017					
Entity type	**Loans received**	**Equity**	**Assets**	**Debt/equity**	**Debt/assets**
All Partnerships	5,992	19,279	32,404	0.311	0.185
All S-Corporations	1,425	1,554	4,520	0.917	0.315
Non-Financial Partnerships	5,465	6,799	14,682	0.804	0.372
Non-Financial S-Corps	1,332	1,449	4,040	0.919	0.33

Notes: Author calculations from balance sheet data from the IRS Statistics of Income. Values displayed are millions of nominal dollars.

Appendix Table 15: Debt/Assets and Debt/Equity by Entity Status from 2014-2017

	(1)	(2)
VARIABLES	Debt/Assets	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 are from the 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 16. Distributing "Excess" Partnership Borrowing, 2022

Wealth group	Share of all private businesses owned by wealth group	SCF debt	SCF debt + excess partnership borrowing	Unrealized gains	SCF debt / unrealized gains	(SCF debt + excess partnership borrowing) / unrealized gains
0-50 percentile	0.003	4,437.76	4,440.32	1,654.97	2.681	2.683
50-90 percentile	0.058	7,606.98	7,655.34	18,081.75	0.421	0.423
90-99 percentile	0.293	3,594.21	3,839.83	23,485.29	0.153	0.163
99-99.9 percentile	0.306	754.31	1,010.41	11,538.32	0.065	0.088
99.9+ percentile (excluding Forbes)	0.340	264.74	549.09	11,463.35	0.023	0.048

Notes: Excess partnership borrowing is derived from Appendix Table 14 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 excess loans to non-financial partnerships are also 11% in 2022, giving us a total of $837 billion. We then distribute the excess borrowing by partnerships to wealth groups based on their share of private businesses owned in the 2022 SCF. Data on non-financial partnership borrowing in 2022 comes from the Financial Accounts of the United States. Values displayed are billions of nominal dollars.

Appendix Table 17: Debt/Assets: Estate Tax vs. SCF in 2019

Value of assets (gross estate)	Estate tax	SCF: All respondents	SCF: All respondents ("expanded debt")	SCF: >= 70 years old	SCF: >= 70 years old ("expanded debt")
$11.4 million < $20 million	0.034	0.041	0.052	0.023	0.025
$20 million < $50 million	0.035	0.040	0.060	0.026	0.027
$50 million or more	0.042	0.013	0.035	0.006	0.008

Notes: SOI data from Estate Tax for deaths occurring in 2019 and SCF data in 2019. As discussed in the Appendix, the SCF Summary Extract's Debt concept excludes debt attributable to non-residential real estate and borrowing from household owned businesses. "Expanded Debt" includes those variables.

Data Appendix

I. Adjustments to Raw SCF Data

a. Defined-benefit pension assets

The SCF does not include defined-benefit pension assets (DB assets) in its measures of assets and net wealth. We obtain estimates of DB assets for each SCF household from the Federal Reserve Board of Governors.

We received these DB asset estimates 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 [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. For these assets, 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. Still, the SCF variable for total unrealized gains only covers certain asset types and misses some asset types that likely have unrealized gains, including annuities, life insurance, other financial assets, other non-financial assets, retirement accounts, and trusts. Thus, we believe the SCF unrealized gains variable is likely under-counting true unrealized gains.

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).[38]

Then,

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

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

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

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 extend to 2022.[39] 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.[40] 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.[41]

Then, we rescale 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:

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

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 for total AGI.

[39] 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.

[40] While observations in the SCF are households, not individuals, Gale et al. (2022) split households into tax units.

[41] 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.

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.[42] After re-scaling AGI and tax liability estimates at the tax unit level, we drop non-PEU individuals. 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.[43] Following Gale et al. (2022), we consider an observation in the SCF to be a non-filer if it meets 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 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

[42] 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.
[43] However, we still include non-filers in our estimates of assets, debt, and unrealized gains.

Aggregate net worth of the Forbes 400 over 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 and top 0.001 percent by income; the former estimates are available over the period 1992-2014 and the latter from 2001-2021 Aggregate federal income tax liability for the top 400 filers from 2015-2021 is estimated 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.[44]

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. Aggregate AGI of the top 400 filers and top 0.001 percent by income are both available over the period 2001-2014. Aggregate realized gains of the top 400 filers and top 0.001 percent by income are both available for 2014.

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 is conducted every three years and we have annual data on the Forbes 400, we interpolate this ratio for 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 focuses on 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

[44] The 0.61 scaling factor 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.

period 1989-2019. We omit 2022 because we use a replication package from MSS, which does not include 2022.

a. Note on interpretation of the savings rates

MSS estimate the savings rate out of a measure 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 Jordà-Schularick-Taylor (JST) Macrohistory data.[45]

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) and households and institutions (personal saving).[46] 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 (ΔUR) from period t-1 to t using our measure of final unrealized gains (upweighting the

[45] 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 from https://www.macrohistory.net/database/.

[46] 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 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 ΔUR 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.

SCF

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

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

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 θ:

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

Forbes 400

1. Estimate unrealized gains for each year, assuming that the ratio of unrealized gains to net worth is the same as the top 0.1% of the SCF[47]:

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

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

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

[47] 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.

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

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

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 the 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 includes 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 capital gains:

$$real\ AGI_{t-1\ to\ t,\theta} = nominal\ AGI_{t-1\ to\ t,\theta} - nominal\ realized\ cap.gains_{t-1\ to\ t,\theta} + real\ realized\ cap.gains_{t-1\ to\ t,\theta}$$ [48]

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

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

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).[49] For this method, we use asset return rates computed using the MSS replication package to estimate ΔUR.

MSS implicitly assumes that vehicles, residential property other than primary residences, 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. Compute portfolio composition for period t and wealth group θ:

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

   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 the same as period t. Assume active savings are distributed to different asset classes according to portfolio composition (e.g., if 60% of assets are in corporate equity, then attribute 60% of active savings to corporate equity):

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

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

5. Estimate wealth in asset class c for period t-1, $W_{t-1,\theta,c}$ (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 from 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 (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 ΔUR:

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

Forbes 400

Estimating ΔUR for the Forbes follows the same method as estimating ΔUR 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. For that group, we use the top 0.1% SCF savings rate, thus assuming that Forbes 400 savings follows the savings behavior of the top 0.1%.

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, denoted as $W_{t,\theta}^{-}$:

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

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 ΔUR:

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

Forbes 400

Estimating ΔUR 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 the Forbes 400 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 θ 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 θ 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 residences, private businesses, other real estate, and 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 θ:

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

2. Estimate the 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 θ:

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

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 θ 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 θ using the ratio of unrealized gains in these categories to total unrealized gains and our estimates of the total change in unrealized gains.

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

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