What Is the Average Federal Individual Income Tax Rate on the Wealthiest Americans?*

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Abstract

I estimate the average federal individual income tax rate paid by America's 400 wealthiest families, using a relatively comprehensive estimate of their Haig-Simons income: their change in wealth, plus U.S. individual taxes. I do so using publicly available statistics from the IRS Statistics of Income Division, the Survey of Consumer Finances, and Forbes magazine from 1992 to 2020. My baseline analysis uses all years of data and systematically varies start and end years. This paper's baseline estimates of the average federal individual income tax rate on the wealthiest 400 families are 9.6 percent in nominal terms and 12.0% in real (inflation-adjusted) terms. Sensitivity analyses yield nominal estimates in the 6.7-14.6% range and real estimates in the 8.4-17.9% range. These estimates can be combined with effective corporate income tax rates to estimate all-in effective income tax rates on the wealthiest.

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1 Introduction

Average income tax rates equal taxes paid as a share of income. Traditional analyses typically use an income concept that excludes unrealized capital gains – i.e., appreciation in stock and other property that was not converted to cash through sale or gift. Those unrealized capital gains avoid income tax until sale or gift, and then are taxed at preferred rates at sale or gift – and never face income tax if bequeathed at death. This paper asks: what was the average federal individual income tax rate paid by the 400 wealthiest American families' in recent years, computed using a more comprehensive measure of income that includes unrealized capital gains?

Among the wealthy, unrealized capital gains are a major form of Haig-Simons income, the commonly-used income concept named after the contributions of Haig (1921) and Simons (1938). Haig-Simons income equals a family's change in wealth, plus taxes and consumption, and thus measures how much more the family can consume in the current year, over and above beginning-of-year wealth. Data limitations – especially the difficulty of measuring changes in wealth from unrealized capital gains – typically prevent economists from measuring average tax rates with Haig-Simons income in the denominator (e.g., Joint Committee on Taxation 2012).

This paper seeks to overcome those data limitations for the special case of the 400 wealthiest Americans, all of whom in recent years have been billionaires. Forbes magazine annually surveys the wealthiest Americans and analyzes publicly available data such as Securities and Exchange Commission filings in order to estimate the wealth of the 400 wealthiest American families. This paper estimates the Haig-Simons income of the wealthiest 400 families from year t to year t' as the change over time of aggregate Forbes 400 wealth from t to t', plus U.S. individual income taxes estimated from U.S. federal income tax returns (see below). This computation corresponds to studying the wealthiest in any given year, as opposed to studying a fixed population of the wealthiest such as the 1992 Forbes 400 (many of whom died by 2020) or the 2020 Forbes 400 (some of whom like Mark Zuckerberg were in elemetary school in 1992). This estimate of Haig-Simons income excludes consumption and various taxes including foreign and corporate income taxes taxes, which implies that my baseline tax rate estimates may be overestimates by construction.

To estimate taxes paid by the 400 wealthiest families in any given year, this paper multiplies the taxes paid by the 400 highest-tax-return-reported-income families by 0.61. From 1992 to 2014, the Internal Revenue Service published aggregate federal individual income taxes paid by the 400 tax units (typically families) with the highest adjusted gross income reported on tax returns ("reported income"). In later years, I estimate the aggregate taxes of the top 400 families ranked by reported income, based on top-0.001 percent (approximately the top 1,500 families) aggregates and historical ratios.

The 0.61 factor is computed as follows. The wealthiest families often do not have the highest reported income. For example, Warren Buffett was the second wealthiest American in 2015, but his voluntariliy-released tax return showed that he was not in 2015's top 14,000 families ranked by reported income. I therefore proxy the taxes paid by the wealthiest 400 as equal to the taxes paid by the 400 highest-reported-income families multiplied by an adjustment factor of 0.61. The adjustment factor derives from the Survey of Consumer Finances, which excludes the top 400 wealthiest families by construction and lacks data on taxes but contains data on wealth and reported income. I adopt three key, and strong, assumptions: that the highest-reported-income and highest-wealth groups pay the same average tax rate, that the ratio of the reported incomes for the next-1000 groups is the same as the ratio of reported incomes for the top-400 groups, and that the excluded top 400 families by wealth contained 100 of the top 400 families by reported income. Under those assumptions, I compute the adjustment factor to be equal to the aggregate reported income of families ranked 1 through 1000 by wealth in the SCF, divided by the aggregate reported income of families ranked 301 through 1300 by reported income in the SCF, yielding 0.61. Assuming greater overlap among the two top-400 groups would yield a smaller adjustment factor and smaller estimated tax rates.

In my baseline estimates, I estimate the average federal individual income tax rate on Haig-Simons income for the wealthiest 400 American families to be 9.6% of nominal Haig-Simons income and 12.0% of real (inflation-adjusted) Haig-Simons income.[1] These average tax rates equal the median average tax rate estimated over all 435 combinations of start and end years over the 1992-2020 period. Varying the start and end year reduces the influence of any particular start or end year. Median average tax rates are very similar when estimated over all combinations of at least five years, at least ten years, at least fifteen years, or at least twenty years. Over the 2010-2020 period, I estimate an average tax rate of 8.6% nominal and 10.5% real.

I produce numerous additional alternative analyses. When adding state and local taxes to the numerator and denominator in order to estimate a combined federal-plus-state-plus-local income tax rate estimate,

[1] Haig-Simons income is typically computed in real terms (e.g., Simons 1938). However, the United States and most advanced countries do not adjust for inflation when taxing realized capital gains (Harding and Marten 2018; Slemrod and Chen 2023). I therefore report both versions.

the baseline estimates become 12.2% nominal and 15.1% real. When adding foreign tax credits in order to obtain a federal-plus-foreign income tax rate estimate, I obtain 10.2% nominal and 12.7% real. When adding charitable contributions – the one form of consumption visible on many individual income tax forms – to the denominator in order to better approximate Haig-Simons income, I obtain 9.2% nominal and 11.3% real. When combining all of the above, I obtain 12.2% nominal and 15.0% real. When using extreme adjustment factors of either 0.41 or 1 rather than 0.61, I obtain 6.7% and 14.6% nominal and 8.4% and 17.9% real, respectively. When assuming alternative growth rates in top wealth as estimated in Smith, Zidar, and Zwick (2023), I find no change in nominal and real rates: 9.6% nominal and 12.0% real.

These estimated tax rates are much smaller than traditional top average federal individual income tax rates estimated by the Congressional Budget Office (2021), Joint Committee on Taxation (2021), U.S. Department of the Treasury Office of Tax Analysis (2020), and the Tax Policy Center (2021).[2] These traditional estimates differ from mine in three key respects. First, and most fundamentally, traditional estimates typically exclude from their income measures the unrealized (and untaxed) capital gains that motivate this paper.[3] Second, tax-preferred realized capital gains are a larger share of income for the top 400 than they are for the larger top groups for which these other estimates are produced. Third, I examine income tax rates by wealth rather than by income, and unrealized capital gains may be even more concentrated among high-wealth families than high-income families.

In contrast, this paper's average federal individual income tax rate estimates are over twice as large as the estimate from ProPublica's Eisenger, Ernsthausen, and Kiel (2021) of a 3.4% average federal individual income tax rate over the 2014-2018 period on 2021's 25 wealthiest Americans. That analysis followed a nearly identical method as the current paper, except that it used the panel structure of the Forbes 400 to compute the nominal 2014-2018 wealth growth of 2021's 25 wealthiest Americans, and utilized illegally leaked federal income tax return data to compute the actual taxes paid by those 25 wealthiest Americans.

Finally, this paper's estimates happen to be broadly similar to the Saez and Zucman (2019)'s estimates of average domestic individual taxes as a share of the 400 wealthiest families' "national income": an average of 11.4% over years 1992-2018. They estimate both lower taxes paid by the 400 wealthiest families and

[2] See Splinter (2020) for a review and comparison of various methods.

[3] At least the Joint Committee on Taxation (2012) would prefer to use unrealized capital gains in their income measure, writing that "Economists generally agree that, in theory, a Haig-Simons measure of income is the best measure of economic well-being" but "Because of data limitations, the formulation of expanded income [i.e., JCT's income measure] embodies significant departures from the Haig-Simons concept. For instance, it includes realized, not accrued [i.e., unrealized], income from capital gains..."

also use the national income concept which excludes substantial capital gains (see below) thus yielding a smaller income denominator, which happen to combine to yield similar average tax rate estimates. Saez and Zucman utilize a method similar to mine for estimating the taxes paid by the 400 wealthiest families, except they rely on an adjustment factor of 0.45 rather than 0.61 and thereby estimate lower taxes paid. Their adjustment factor is computed more straightforwardly and is consistent with two alternative methods they explore, whereas mine is internally consistent with the SCF's exclusion of the 400 wealthiest families and the additional assumptions I specify.

This paper's analysis has important limitations. First, I lack individual-level data on taxes and administrative data on income for the wealthiest Americans, so this paper aims to provide a best estimate based on publicly available data. Both taxes and Haig-Simons income are estimated with unknown error, including, for example, because of components omitted from my Haig-Simons estimates which would tend to lead to overestimated tax rates.

Second, this paper excludes several taxes that would be needed in order to estimate an all-in tax rate over a lifetime, including estate taxes, property taxes, and sales taxes. Even when focusing attention just on income taxes on the wealthiest – for example, in order to compare to income taxes on high-income laborers – this paper's analysis excludes corporate income taxes. The all-in average income tax rate on corporate income equals the average corporate income tax rate τ_C, plus the average individual income tax rate τ_I times one minus the average corporate income tax rate: $\tau_C + \tau_I(1 - \tau_C)$. For low values of the average individual income tax rate τ_I, most of the all-in average income tax rate will be due to the average corporate income tax τ_C. For example, when combining a 10% effective federal individual income tax rate with the current statutory federal corporate income tax rate of 21% (which due to deductions is likely an upper bound on the effective rate), one would obtain an all-in effective federal income tax rate on corporate income of 29%. A robust analysis of effective corporate income tax rates is beyond the scope of this paper and is an important area for future work.

Third, this paper is silent on the ideal definition of taxable income and in particular whether capital gains ought to be included. Real capital gains on corporate stock derive from three sources: higher current after-tax corporate earnings, higher future after-tax corporate earnings, and lower real interest rates. Only the first component appears in national income. The third component does not reflect an increase in welfare if people have fixed consumption plans (e.g., Cochrane 2020; Greenwald, Leombroni, Lustig, and Van Nieuwerburgh

2021; Fagereng, Gomez, Gouin-Bonenfant, Holm, Moll, and Natvik 2022). In practice, advanced nations around the world do tax realized capital gains. Recent proposals including in the United States to tax unrealized capital gains would exempt charitable giving, a likely major component of the consumption plans of the very wealthy (U.S. Department of the Treasury 2021, 2022).[4] Surveys suggest that voters do not generally support full immediate taxation of unrealized gains but do support collecting slow and partial prepayment of capital gains tax on the unrealized gains of the very wealthiest, as in President Biden's Billionaire Minimum Income Tax proposal (Katz-Brown, 2022; Liscow and Fox, 2022; Orth, 2022).[5]

This paper is organized as follows. Section 2 describes the U.S. tax treatment of capital gains. Section 3 details data sources and the measurement strategy. Section 4 presents the results. Section 5 concludes.

2 U.S. Taxation of Capital Gains

The United States taxes capital gains typically only at sale or gift (except to charities), which are the two primary "realization" events. Almost all capital assets are covered. At realization events, the taxable amount equals the fair market value at realization minus the cost basis of the property, typically equal to the original purchase price.[6]

The applicable federal individual income tax rate equals the ordinary income tax rate for assets held for one year or less. For assets held for more than one year, the federal individual income tax rate equals a rate weakly lower than the applicable ordinary rate. Most realized capital gains are taxed as long-term capital gains. For taxpayers in the top one percent of taxable income, the combined marginal federal individual income tax rate on realized long-term capital gains equals 23.8%.[7] For taxpayers with millions of dollars of realized capital gains, the average federal individual income tax rate on realized long-term capital gains

[4] President Biden's 2021 proposal was to treat death as a realization event for the wealthy; unrealized gains on assets donated to charity at death would be exempt from capital gains tax due at death. President Biden's 2022 Billionaire Minimum Income Tax proposal was to collect slow and partial prepayment on unrealized gains of the very wealthiest taxpayers during life and to credit those prepayments against capital gains tax due at the realization events of sale, gift, or death. Charitable giving would not be a realization event and thus would trigger a refund for taxpayers who give a sufficiently large share of their appreciated assets to charity.

[5] Katz-Brown (59% support, 31% oppose, 11% do not know) and Orth (61% support, 22% oppose, 17% not sure) are polls of the Billionaire Minimum Income Tax proposal (see the previous footnote for more detail). Liscow and Fox in a Qualtrics survey find opposition to immediately and fully taxing unrealized gains but find 59 percent of respondents support gradual tax prepayment on the wealthiest's unrealized gains in order to protect Social Security; they did not ask the question without the Social Security earmark.

[6] In any year, capital losses arbitrarily offset capital gains; only net capital gains are taxed. A net capital loss up to $3,000 in any year can be deducted from ordinary income; any excess must be carried forward to future tax years.

[7] For married couples filing taxes jointly in 2023, the applicable long-term capital gains rate is 0% for those with taxable income less than or equal to $89,250, 15% for those with taxable income between $89,251 and $553,850, and 20% for those with taxable income greater than $553,850. In addition, for married filing jointly tax units with at least $250,000 in modified adjusted gross income (equal to adjusted gross income plus certain deductions), the 3.8% net investment income tax (also known as the "Medicare surtax") applies to the lesser of net investment income (which includes realized capital gains) and the amount by which modified adjusted gross income exceeds $250,000. Lower thresholds apply to other filing types.

approaches 23.8%. State and local taxes often apply to capital gains income as well.

Taxpayers can defer realization without interest, thereby enjoying a reduced effective rate on their capital gains (e.g., Auerbach 1991). Consider a taxpayer with one dollar of capital gains on an asset that will return r next year and an alternative investment opportunity that will also return r. If the taxpayer holds the asset and realizes the capital gain at the end of next year at tax rate t, they will receive $(1-t)(1+r)$ after tax. If instead the taxpayer realizes the one dollar gain immediately by selling the asset, invests in the alternative opportunity, and realizes the resulting gain at the end of next year, then they will receive only $(1-t)^2(1+r)$. Over many years, this "deferral advantage" can substantially reduce the effective capital gains tax rate.

In fact, when taxpayers defer realization until death and bequeath appreciated property, no one ever pays capital gains tax on the capital gain. Death is not a realization event. Instead, the cost basis of the property is set equal to the fair market value at death, also called "stepped-up basis".[8] Hence, an heir who immediately sells the inherited property pays no tax. Of course, estate taxes may be owed on the fair market value of the property at death.

3 Method and Data

This paper combines publicly available data from the IRS Statistics of Income (SOI) Division, the federal Reserve Board's Survey of Consumer Finances (SCF), and Forbes magazine's estimates of the wealthiest 400 Americans to estimate the federal individual income tax rate paid by the wealthiest 400 families. For reference, Forbes estimates that the 400 wealthiest Americans in 2020 had wealth ranging from $2.1 billion to $179 billion. This paper's tax rate estimate is dollar-weighted: it is an estimate of total federal individual income taxes paid by the wealthiest families, divided by an estimate of those families' income. I estimate the average federal income tax rate over all 435 combinations of start years and end years in the 1992–2020 range and use the median of those 435 estimates as my baseline estimate.

This paper's estimation procedure divides an estimate of the federal individual income taxes paid by the 400 wealthiest families by a relatively comprehensive estimate of their Haig-Simons income. For the numerator, I start by estimating the taxes paid by the families with the highest reported income on tax returns. I then estimate how the income of the highest-wealth families compares to the income of the

[8]The United States has twice enacted "carryover basis" whereby basis does not get stepped-up at death and instead carries over to the heir. The 1976 instance was repealed in 1980 and never took effect. The 2001 instance took effect only for the year 2010 and was optional: estate exectors could elect either carryover basis or the estate tax (Congressional Research Service 2021).

highest-reported-income families, and use that as an adjustment factor to estimate the taxes paid by the highest-wealth families. For the denominator, I use changes in the reported wealth of the Forbes 400 to estimate the income of the 400 wealthiest families, plus observed U.S. individual taxes paid.

For a given start year t and end year t' such that $t, t' \in [1992, 2020]$ and $t' \geq t$, my estimate of the average federal individual income tax rate τ_I equals:

$$\tau_I^{t,t'} = \frac{\sum_{s=t}^{t'} \text{FEDTAX}_s^{W,1,400}}{\text{WEALTH}_{t'}^{W,1,400} - \text{WEALTH}_{t-1}^{W,1,400} + \sum_{s=t}^{t'} \left(\text{FEDTAX}_s^{W,1,400} + \text{STATETAX}_s^{W,1,400}\right)} \tag{1}$$

where $\text{FEDTAX}_s^{W,1,400}$ equals aggregate federal individual income tax payments in year s paid by families with wealth W ranks 1 through 400 in year s, where $\text{WEALTH}_s^{W,1,400}$ equals aggregate wealth W, and $\text{STATETAX}_s^{W,1,400}$ equals observed state and local individual tax payments. The remainder of the section details the construction of each element of this tax rate formula.

3.1 Numerator: The estimated federal individual income taxes paid by the wealthiest 400 families

For each tax rate estimate over years t and t', the numerator of my tax rate estimate $\sum_{s=t}^{t'} \text{FEDTAX}_s^{W,1,400}$ equals the sum from t to t' of the annual estimated aggregate federal individual income taxes paid by each year-s's wealthiest 400 families. I construct the numerator by estimating the taxes paid by the highest-reported-income families between t and t', then multiply by an adjustment factor based on the Survey of Consumer Finances (SCF) to account for the fact that highest-reported-income families are not the same as the highest-wealth families.

SOI published estimates of the taxes paid by the 400 highest-reported-income families annually from 1992 through 2014. In a first and straightforward step, I extend this series through 2020. To do this, I rely on estimates of the total federal individual income tax paid by the top 0.001 percent, available from SOI annually from 2001 through 2020. For the years 2001 through 2014, when both estimates are available, the ratio of taxes paid by the top 400 to taxes paid by the top 0.001 percent varies only slightly around 0.59. I therefore estimate the taxes paid by the 400 highest-income families for the period 2015 through 2020 by assuming that each year's taxes paid by the 400 highest-income families equals 0.59 times that year's taxes paid by the top 0.001 percent. The availability of the SOI data limits my analysis to the 1992-2020 period.

For each year, my SOI-based estimate of taxes paid by the 400 highest-reported-income families surely exceeds the taxes paid by the 400 highest-wealth families: some of the wealthiest families have lower reported income and pay less tax. For example, Warren Buffett was a member of the 2015 Forbes 400, but his voluntarily-released 2015 tax return information indicates 2015 adjusted gross income of $11.6 million (Cohen 2016). The thresholds for top percentile groups in 2015 in the SOI estimates show that $11.9 million was required to be in the top 0.01 percent (about 14,000 families). Thus, Buffett was not even in the top 14,000 tax units ranked by reported income, let alone in the top 400 ranked by reported income. Moreover, he paid $1.8 million in federal individual income tax in 2015, far less than the $36 million average for the top 0.001 percent or the $9 million average for the top 0.01 percent. As a result, the 2015 taxes paid by the top 400 families ranked by reported income would overstate the 2015 taxes paid by the top 400 families ranked by wealth.

Hence, I must convert my SOI-based estimate of taxes paid by the highest-reported-income families into an estimate of taxes paid by the highest-wealth families. I do so by multiplying the SOI-based estimate by an adjustment factor of 0.61, constructed as follows from the Survey of Consumer Finances which contains information both on approximate reported income and on wealth.

For a given year s, my goal for the numerator of the tax rate is to estimate taxes paid by the families with wealth rank 1 through 400, which I write as $\text{FEDTAX}_s^{W,1,400}$. The SOI data give me an estimate of the taxes paid by the families with reported-income R rank 1 through 400: $\text{FEDTAX}_s^{R,1,400}$. Ideally, I would multiply $\text{FEDTAX}_s^{R,1,400}$ by an adjustment factor equal to the ratio of the tax paid by the 400 highest-wealth families to the tax paid by the 400 highest-reported-income families:

$$\text{FEDTAX}_s^{W,1,400} = \text{FEDTAX}_s^{R,1,400} \times \underbrace{\frac{\text{FEDTAX}_s^{W,1,400}}{\text{FEDTAX}_s^{R,1,400}}}_{\text{Ideal adjustment factor}} \tag{2}$$

However, the ideal adjustment factor cannot be directly measured in publicly available data. The best available data source – the SCF – lacks information on taxes paid and excludes the Forbes 400 wealthiest from the survey sample by construction. I make three strong assumptions that allow me to approximate the ideal adjustment factor using reported incomes among families ranked 401 through 1400 (i.e., the "next-1000" groups ranked either by reported income or by wealth), which is approximately the rest of the top 0.001 percent. First, I assume that the highest-reported-income and highest-wealth groups pay the same average tax rate.[9] Second, I assume that the ratio of the reported incomes for the next-1000 groups is the

[9]I lack direct evidence on the average tax rate paid by the highest-wealth families. In principle, the average tax rate could

same as the ratio of reported incomes for the top-400 groups. Third, I assume that the ratio of the reported incomes of the two next-1000 groups does not vary by year, so that I can pool multiple waves v of the SCF in order to effectively increase sample size. Under those assumptions, I can replace the ideal adjustment factor with the following alternative adjustment factor that uses only next-1000 information:

$$\text{FEDTAX}_s^{W,1,400} = \text{FEDTAX}_s^{R,1,400} \times \underbrace{\text{E}_v\left[\frac{\text{REPORTEDINCOME}_v^{W,401,1400}}{\text{REPORTEDINCOME}_v^{R,401,1400}}\right]}_{\text{Equivalent adjustment factor under assumptions}} \tag{3}$$

where $\text{REPORTEDINCOME}_v^{W,401,1400}$ equals aggregate reported income R by those in wave v with wealth W ranks 401 through 1400, where $\text{REPORTEDINCOME}_v^{R,401,1400}$ is the analogous aggregate of families ranked by reported income R, and where E_v indicates the mean across SCF survey waves v.

Estimating the reported income of the next 1000 ranked by wealth $\text{REPORTEDINCOME}_v^{W,401,1400}$ is relatively straightforward: the SCF excludes the top 400 by wealth, so I simply use the reported income of the wealthiest families in the SCF. That is, I estimate $\text{REPORTEDINCOME}_v^{W,401,1400}$ as equal to the reported income of the SCF observations that represent families ranked 1 through 1000 by wealth in the SCF.[10]

Estimating the reported income of the next 1000 ranked by reported income $\text{REPORTEDINCOME}_v^{R,401,1400}$ is more challenging and requires a strong additional assumption, as it depends on how much overlap there is between the Forbes 400 and the top 400 by reported income. If there is full overlap, then none of the top 400 by reported income should be in the SCF. I could then estimate $\text{REPORTEDINCOME}_v^{R,401,1400}$ using the reported income of the SCF observations that represent families ranked 1 through 1000 by reported income in the SCF. Doing so would yield an adjustment factor of 0.41, similar to Saez and Zucman (2019)'s estimate of 0.45.[11] However, the assumption of full overlap would imply that the desired ratio for the top 400 would be one: aggregate tax payments by the top 400 families ranked by reported income would equal aggregate tax payments by the top 400 families ranked by wealth, since those two groups comprise the exact same

differ in either direction. The highest-income families could pay a lower average tax rate because they are high-income due to large single-year capital gains realizations that are taxed at low rates. Alternatively, the highest-wealth families could pay a lower share of their tax-return income in taxes due to large charitable deductions.

[10]The Survey of Consumer Finances intentionally excludes from its sample anybody included in the Forbes 400 due to privacy concerns. However, some Forbes 400 wealth may be represented by families included in the Survey of Consumer Finances sample, and some additional observations are also excluded from the SCF sample. Bricker, Hansen, and Volz (2019) propose a method for augmenting the SCF with the Forbes 400 data without double counting. I simplify by assuming that there is a sharp cutoff between the two and do not rely on the Survey of Consumer Finances to compute any full-U.S.-population aggregates.

[11]Saez and Zucman report the ratio of the reported incomes of the top 0.001% of families in the SCF ranked by reported income to the reported incomes of the top 0.001% of families in the SCF ranked by wealth, equal to 2.3; the inverse of 2.3 equals 0.44. Combining that analysis with two other analyses, they employ an adjustment factor of 0.45.

families. Hence, two potential assumptions – that there is full overlap, and that the ratio of the reported incomes for the next-1000 groups is the same as the ratio of reported incomes for the top-400 groups – are jointly rejected by the data.

At the other extreme, if none of the Forbes 400 is in the top 1400 by income, then the appropriate SCF observations to use would be those with reported income ranks 401 through 1400 in the SCF. Doing so would exclude many high-reported-income families from the calculation and thereby yield the higher adjustment factor of 0.65. A higher adjustment factor leads to a higher resulting tax rate estimate.

This paper adopts an assumption that yields an adjustment factor on the high end of the 0.41-0.65 range: it assumes an overlap of 100, i.e. that the excluded top 400 families by wealth contained only 100 of the top 400 families by reported income. I therefore estimate $\text{REPORTEDINCOME}_v^{R,401,1400}$ as equal to the reported income of the SCF observations that represent families ranked 301 through 1300 by reported income in the SCF:[12]

$$\text{FEDTAX}_s^{W,1,400} = \text{FEDTAX}_s^{R,1,400} \times \underbrace{\text{E}_v \left[\frac{\text{REPORTEDINCOME}_v^{W,\text{SCF rank1,SCF rank1000}}}{\text{REPORTEDINCOME}_v^{R,\text{SCF rank301,SCF rank1300}}} \right]}_{\text{Actual adjustment factor computed in the SCF}} \tag{4}$$

I compute the adjustment factor specified in Equation (4) using the ten SCF waves v between years 1992 and 2019 (the SCF is a triennial survey). Doing so, I obtain an adjustment factor of 0.61. Thus, my estimate of taxes paid by the wealthiest 400 families equals the SOI-based taxes paid by the 400 highest-reported-income families multiplied by my 0.61 adjustment factor.

3.2 Denominator: Estimated income

I divide my estimate of taxes paid by the wealthiest 400 by my relatively comprehensive estimate of the wealthiest 400's Haig-Simons income: their estimated change in wealth $\text{WEALTH}_{t'}^{W,1,400} - \text{WEALTH}_t^{W,1,400}$, plus easily estimable U.S. taxes $\sum_{s=t}^{t'} \left(\text{FEDTAX}_s^{W,1,400} + \text{STATETAX}_s^{W,1,400}\right)$. This income measure excludes consumption and various other taxes, which is a force leading to understated Haig-Simons income and therefore overstated federal individual income tax rates on Haig-Simons income.

[12] Technically, because the SCF is a survey with sample weights, I mean the observations that when weighted represent these ranks. When weighted ranks do not exactly align with the desired range boundaries, I "split" the closest higher-ranked observation such that it retains its reported income level and with the necessary weight to exactly achieve the weighted boundary level. For example, in summing families with weighted ranks 301 through 1300 by reported income, suppose I observe two consecutive SCF observations: one with weighted rank 1310, and another with weighted rank 1280 and reported income y. For the purposes of summing families with weighted ranks 301 through 1300, I impute a new observation with weighted rank 1300 and reported income y.

This paper's baseline source for top-400 wealth is the Forbes 400 list of the wealthiest Americans. Forbes magazine annually surveys the wealthiest Americans and incorporates publicly available data including Securities and Exchange Commission filings, court filings, probate records, and news articles in order to estimate the wealth of the 400 wealthiest Americans (Peterson-Withorn 2022). Though the list highlights individuals, Forbes attempts to include immediate family wealth while excluding dispersed family fortunes, which may correspond well to the tax unit ("family") concept utilized for the estimated tax rate numerator. The Forbes data are available for the 1982-2022 range; I use only years 1991-2020, which are the years corresponding to the available SOI data.

The date for which the Forbes 400 estimates wealth has varied over time. In 2020, Forbes used market prices near the end of July. In 2019, Forbes used market prices in September. For simplicity, I treat the Forbes 400 as end-of-year wealth estimates. Hence, to estimate comprehensive income for the period from t to t', I begin by subtracting the aggregate wealth (net worth) of the Forbes 400 in $t{-}1$ $\text{WEALTH}_{t-1}^{W,1,400}$ from the aggregate wealth of the Forbes 400 in t' $\text{WEALTH}_{t'}^{W,1,400}$. I then add two additional components of Haig-Simons income that are available in tax data: federal individual income taxes paid $\sum_{s=t}^{t'} \text{FEDTAX}_s^{W,1,400}$ (estimated above) and state and local individual tax deductions $\sum_{s=t}^{t'} \text{STATETAX}_s^{W,1,400}$ (estimated from the same SOI data using the same 0.61 adjustment factor).[13]

Families enter and exit the Forbes 400. An alternative to subtracting aggregate Forbes 400 wealth in $t{-}1$ from aggregate Forbes 400 wealth in t' would be to try to estimate the wealth change for a fixed set of the wealthiest Americans and to impute wealth to those not on the list in either year. For example, one could choose the 2020 Forbes 400 as the population of interest. If a member of the 2020 list was not a member of an earlier year's list, one could impute their wealth to be somewhere between zero and the minimum Forbes 400 wealth in that earlier year. That alternative population and procedure would lead to a larger income denominator than the one I use. An implication of such an alternative is that young billionaires in 2020 were very young and not wealthy in the earlier years of the sample, which would require amending the adjustment factor to exclude the taxes paid by the formerly wealthy in earlier years of the sample. For example, Mark Zuckerberg – the eleventh wealthiest person in 2020 – was eight years old and not wealthy in 1992, the first year of this paper's analysis. As a separate alternative, one could choose the 1992 Forbes 400

[13] I impute the state and local tax deductions for the top 400 for the period 2015–2020 as the top 400's share of the top 0.001 percent's state and local tax deductions in 2014 multiplied by the total deductions of the top 0.001 percent for 2015–2020. The 2017 tax law limited the state and local tax deduction. For each year in 2018-2020 only, I impute total state and local tax deductions of the top 0.001% tax units by multiplying 2018-2020 top 0.001% federal taxes by the ratio of total 2014-2017 state and local tax deductions to total 2014-2017 top 0.001% federal taxes.

as the population of interest. However, many of those members have since died. By utilitizing the Forbes 400 in each given year, I aim to analyze the wealthiest at each given point in time.

3.3 Inflation Adjustment

The preceding method does not adjust for inflation. The United States and most advanced countries do not adjust for inflation when taxing realized capital gains (Harding and Marten 2018; Slemrod and Chen 2023). However, Haig-Simons income is typically intended to be a real (inflation-adjusted) concept (e.g., Simons 1938). I therefore provide both nominal and real estimates. To adjust for inflation, I deflate year-s numerator and denominator values to the same base year using the GDP price index.

4 Results

4.1 Baseline Results

Asset prices and therefore changes in wealth are volatile. As a result, the average federal individual income tax rate $\tau_I^{t,t'}$ (Equation 1) is sensitive to the start year t and end year t'. To reduce sensitivity to start and end years, my baseline tax rate estimate τ_I equals the median of $\tau_I^{t,t'}$ across all 435 pairs (t, t') such that $t, t' \in [1992, 2020]$ and $t' \geq t$:

$$\tau_I = \text{Med}_{(t,t')|t,t' \in [1992,2020], t' \geq t} \left[\tau_I^{t,t'} \right] \tag{5}$$

The median is a stabler moment than the mean because, over some short time horizons, the change in Forbes 400 wealth is small or negative which yields tax rate estimates $\tau_I^{t,t'}$ that exceed one or are less than zero (see, e.g., Slemrod and Chen 2023). Over longer time horizons over this period, the change in Forbes 400 wealth is never small or negative, and the mean converges to the median as I demonstrate below.

The first row of Table 1a displays the nominal baseline results, while Table 1b displays the real (inflation-adjusted) baseline results. I find a median nominal average federal individual tax rate of 9.6% and a real rate of 12.0%. These are the paper's baseline estimates of the average federal individual income tax paid by the wealthiest 400 American families over the 1992-2020 period as a fraction of their Haig-Simons income.

4.2 Varying the Time Horizon

Table 2 illustrates the sensitivity of the tax rate estimates to start and end years and helps to motivate Table 1's systematic variation of start and end years. Table 2 lists all twenty-nine estimates of the average federal individual income tax rate $\tau_I^{t,t'}$ for start year $t = 1992$ and end year $t' \in [1992, 2020]$. The nominal (column 3) and real (column 4) estimates are relatively high for end years that lie during and immediately after recessions (such as 2001 and 2009) and are relatively stable over long horizons (i.e., the bottom half of the table). The median of the table's twenty-nine nominal estimates (column 3) is 9.4% and the mean is 9.6%, while the median of the table's twenty-nine real estimates (column 4) is 11.7% and mean is 12.3%. Those values are close to the medians and means listed in Table 1a-b row 1, which are computed over all 435 estimates $\tau_I^{t,t'}$ such that $t, t' \in [1992, 2020]$ and $t' \geq t$.

Returning to Table 1, the bottom rows of each table increase the minimum time horizon for computing the tax rate estimates $\tau_I^{t,t'}$ by restricting attention to the (t, t') pairs with at least five, ten, fifteen, or twenty years separate t and t' inclusively, respectively. For example, for the "At least 5 years" row, I include all (t, t') pairs such that $t, t' \in [1992, 2020]$ and $t' \geq t+4$. The median rates remain quite stable as one increases the minimum time horizon. Across all rows, the median nominal rate lies in the range [9.6%, 9.8%]. When restricting to horizons of at least twenty years, the median nominal rate as well as the mean nominal rate is 9.6%, with a minimum of 8.7% and a maximum of 11.6%. Likewise, the median real rate across all rows lies in the range [11.9%, 12.5%]. When restricting to horizons of at least twenty years, the median real rate is 11.9% while the mean is 12.2%, the minimum is 10.7%, and the maximum is 16.8%.

As an example of a specific (t, t') pair, consider the (2010, 2020) pair covering recent years. Over the 2010-2020 period, I estimate the average federal individual tax rate $\tau_I^{2010,2020}$ to have been 8.6% nominal and 10.5% real.[14] These estimates are approximately one percentage point below the respective medians reported above, statistically due at least in part to low post-Great-Recession asset prices at the begnning of the time period, followed by a subsequent sustained asset price recovery.

4.3 Alternative Estimates

Figure 1 displays the results of various alternative specifications. In a first alternative specification, I add the denominator's state and local tax term to the numerator in order to estimate an observed all-in U.S. tax rate. This alternative yields a 12.2% nominal rate and a 15.1% real rate.

Next, I return to the baseline specification and add foreign individual tax credits (computed from the

[14] The original version of this paper Leiserson and Yagan (2021) reported the estimate for the pair (2010, 2018), where 2018 was the latest year available at the time. Over the 2010-2018 period, I estimate the average federal individual tax rate $\tau_I^{2010,2018}$ to have been 8.0% nominal and 9.6% real. The 8.0% nominal rate is slightly lower than the originally reported 8.2% rate because I expanded the number of SCF waves utilized for computing the adjustment factor, which slightly reduced the adjustment factor from 0.63 to 0.61.

same SOI data in the same way as federal individual income tax) to both the numerator and denominator in order to estimate an observed federal-plus-foreign tax rate. This alternative yields a 10.2% nominal rate and a 12.7% real rate.

Next, I return to the baseline specification and add charitable deductions (computed from the same SOI data in the same way as state and local tax deductions) to the denominator in order to better approximate Haig-Simons income. The tax code excludes most charitable giving from taxable income, but charitable giving can be considered a form of consumption and therefore part of Haig-Simons income. This alternative yields a 9.2% nominal rate and an 11.3% real rate.

Next, I combine the above three amendments together in order to estimate an observed all-in U.S. plus foreign tax rate on a more inclusive estimate of Haig-Simons. Doing so yields a 12.2% nominal rate and a 15.0% real rate.

Next, I return to the baseline specification and vary the 0.61 adjustment factor. Recall from the previous section that, under the extreme alternative assumption that all of the highest-reported-income families are excluded from the SCF, one would obtain an adjustment factor of 0.41. The alternative adjustment factor of 0.41 yields a nominal rate of 6.7% and a real rate of 8.4%. At the other extreme, the maximum adjustment factor is one, which would imply counterfactually that the 400 wealthiest families are also the 400 highest-reported-income families. The alternative adjustment factor of one yields a nominal rate of 14.6% and a real rate of 17.9%.

Finally, I return to the baseline specification and vary the growth in top-400 wealth. Smith, Zidar, and Zwick (2023, "SZZ") estimate alternative growth rates in the aggregate wealth of the top 0.001% wealthiest families (approximately the top 1500 families) than Forbes estimates for the top 400 families.[15] For the final alternative specification, I multiply the wealth change term $\text{WEALTH}_{t'}^{W,1,400} - \text{WEALTH}_{t-1}^{W,1,400}$ in the tax rate denominator formula with the ratio of SZZ top-0.001% wealth percentage growth from $t-1$ to t divided by Forbes percentage growth from $t-1$ to t. Doing so happens to yield no change from the baseline to one decimal point of significant digits: a 9.6% nominal rate and a 12.0% real rate.[16]

[15] The SZZ series stops in 2016. I project forward the SZZ to 2020 by growing the 2016 SZZ aggregate by Forbes growth, multiplied by the ratio of SZZ growth to Forbes growth from 2009 to 2016.

[16] SZZ estimate top wealth growth that is similar to SCF-plus-Forbes-based estimates (see, e.g., their Figure 1B). Empirically, I find that mean year-over-year growth 1991-2016 in the Forbes 400 aggregate is 9.5%, while year-over-year growth 1991-2016 in the SZZ top 0.001% aggregate is 10.0%. The top 0.001% of the population comprises an ever-rising number of families as the U.S. population grows, but the vast majority of top 0.001% wealth is estimated to be held by the top 400. Tax rate estimates $\tau_I^{t,t'}$ do differ between the baseline method and SZZ-adjusted method for various (t, t') pairs, but the medians happen to be identical up to one decimal point.

5 Conclusion

This paper estimated that the average federal individual income tax rate on a conservative estimate of the Haig-Simons income of the 400 wealthiest Americans was 9.6% in nominal terms and was 12.0% when adjusting for inflation. This paper did so by triangulating across three publicly available data sources: IRS Statistics of Income aggregates, the Survey of Consumer Finances, and the Forbes magazine list of the 400 wealthiest Americans. Important priorities for future work are to directly measure taxes and Haig-Simons income at the individual level in administrative data, as well as to pair individual income tax rate estimates with effective corporate income tax rate estimates in order to produce all-in income tax rate estimates.

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TABLE 1
Baseline Estimates of the Average Federal Individual Income Tax Rate 1992-2020: 9.6% Nominal and 12.0% Real

	Number of average tax rate estimates	Median (baseline)	Mean	25th percentile	75th percentile	10th percentile	90th percentile	Minimum	Maximum	Standard deviation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. Nominal										
All start year and end year pairs (baseline)	435	9.6%	8.9%	8.6%	11.3%	5.5%	14.4%	-741.0%	682.2%	51.3%
At least five years between start and end	325	9.7%	7.4%	9.0%	11.2%	8.0%	13.8%	-741.0%	48.6%	43.7%
At least ten years between start and end	210	9.7%	10.5%	9.3%	10.6%	8.8%	12.1%	7.4%	33.1%	2.8%
At least fifteen years between start and end	120	9.8%	10.1%	9.4%	10.6%	9.2%	11.4%	8.7%	13.0%	0.9%
At least twenty years between start and end	55	9.6%	9.6%	9.3%	9.8%	9.1%	10.3%	8.7%	11.6%	0.6%
B. Real (inflation-adjusted)										
All start year and end year pairs (baseline)	435	12.0%	15.1%	10.4%	14.4%	5.6%	20.3%	-267.5%	996.4%	58.7%
At least five years between start and end	325	12.1%	14.8%	10.9%	14.3%	9.4%	19.4%	-192.7%	527.9%	36.2%
At least ten years between start and end	210	12.3%	16.8%	11.6%	13.8%	10.9%	17.6%	8.6%	527.9%	36.6%
At least fifteen years between start and end	120	12.5%	13.0%	11.7%	13.5%	11.4%	15.8%	10.7%	19.9%	1.8%
At least twenty years between start and end	55	11.9%	12.2%	11.5%	12.3%	11.4%	13.4%	10.7%	16.8%	1.2%

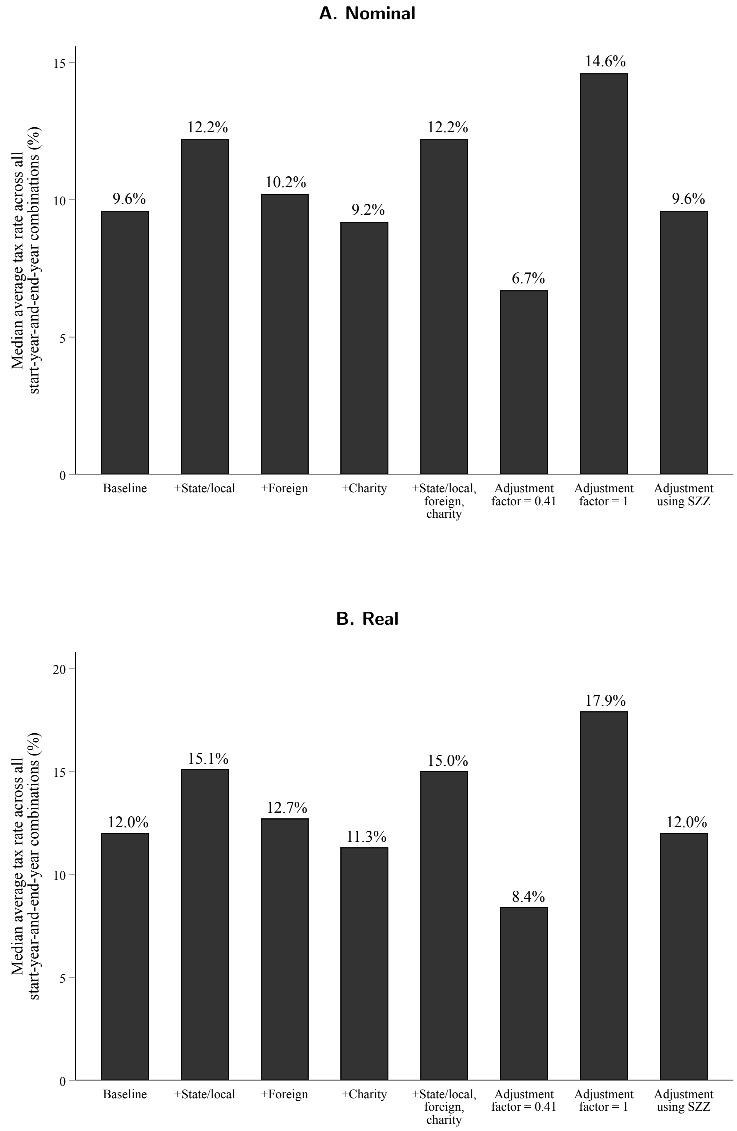
Notes – This table presents the paper's baseline estimates (Equation 5) of the average tax rate on the top 400 wealthiest American families over the 1992-2020 period: 9.6% nominal (Panel A column 2 row 1) and 12.0% real (Panel B column 2 row 1), along with other sample moments. Panel A presents nominal estimates while Panel B presents real (inflation-adjusted) estimates. The available data range from 1992 to 2020. Asset prices and therefore wealth changes are volatile. As a result, the average federal individual income tax rate (Equation 1) is sensitive to start and end years. To reduce sensitivity to start and end years, the first row of each panel computes an average tax rate estimate across all 435 pairs of start and end years. Column 2 of the first row lists the median across all 435 estimates (Equation 5), while the other columns list other sample moments. The subsequent rows restrict the number of pairs under consideration by requiring a minimum of five, ten, fifteen, or twenty years between start year and end year. For short horizons, tax rate estimates can be negative or exceed one (see columns 8 and 9) due to volatile asset prices, which motivates Equation 5's use of the median for the baseline estimates. Within each panel, the median estimate changes relatively little across rows.

TABLE 2
Illustration of Sensitivity of Tax Rate Estimates to Boundary Years

Start year (t)	End year (t')	Nominal average federal income tax rate ($\tau_I^{t,t'}$)	Real average federal income tax rate ($\tau_I^{t,t'}$)
(1)	(2)	(3)	(4)
1992	1992	19.2%	32.6%
1992	1993	13.8%	19.6%
1992	1994	13.0%	18.1%
1992	1995	10.8%	14.0%
1992	1996	8.6%	10.5%
1992	1997	6.5%	7.5%
1992	1998	6.2%	7.1%
1992	1999	4.7%	5.2%
1992	2000	4.9%	5.4%
1992	2001	7.4%	8.6%
1992	2002	9.2%	11.0%
1992	2003	8.9%	10.7%
1992	2004	9.3%	11.4%
1992	2005	9.0%	11.2%
1992	2006	10.1%	12.9%
1992	2007	9.0%	11.2%
1992	2008	9.6%	12.0%
1992	2009	11.5%	14.5%
1992	2010	11.4%	14.4%
1992	2011	10.7%	13.5%
1992	2012	10.3%	13.0%
1992	2013	9.2%	11.6%
1992	2014	8.8%	11.0%
1992	2015	9.4%	11.6%
1992	2016	9.7%	12.1%
1992	2017	9.4%	11.7%
1992	2018	9.4%	11.7%
1992	2019	9.7%	12.1%
1992	2020	9.6%	12.0%

Notes – This table illustrates the sensitivity of average tax rate estimates to boundary years by estimating Equation (1) for the start year of 1992 and with various end years 1992-2020. Column 3 lists nominal rates while column 4 lists real (inflation-adjusted) rates. The table illustrates that estimates are relatively high for end years that lie during and immediately after recessions (such as 2001 and 2009) and are relatively stable over long horizons (i.e., the bottom half of the table). The values in column 3 are twenty-nine of the 435 values underlying Table 1A row 1. The values in column 4 are twenty-nine of the 435 values underlying Table 1B row 1.

FIGURE 1: Alternative Estimates



Notes: This figure presents permutations to the baseline estimates listed in Table 1. Panel A presents nominal estimates. Panel B presents real (inflation-adjusted) estimates. In each panel, the Baseline bar reproduces the estimate listed in column 2 of the first row of the corresponding panel of Table 1. See the notes to that table for the baseline method. The remaining bars devaite from the baseline method by altering the numerator and/or denominator of the average tax equation (Equation 1). The "+State/local" bar adds estimated state and local taxes ($\text{STATETAX}_s^{W,1,400}$) to the baseline numerator. The "+Foreign" bar adds estimated foreign tax credits to the baseline numerator and denominator. The "+Charity" bar adds estimating charitable deductions to the baseline denominator. The "+State/local, foreign, charity" bar combines all three of the above numerator and denominator amendments to the baseline. The "Adjustment factor = 0.41" bar uses an adjustment factor of 0.41 instead of 0.61 when estimating the tax terms of the Equation 1. The "Adjustment factor = 1" bar uses an adjustment factor of 1 instead of 0.61. The "Adjustment using SZZ" adjusts the $\text{WEALTH}_{t'}^{W,1,400} - \text{WEALTH}_{t-1}^{W,1,400}$ component of the baseline denominator by the the ratio of Smith, Zidar, and Zwick (2023) top-0.001% wealth percentage growth from $t-1$ to t divided by Forbes percentage growth from $t-1$ to t.