

**Finance and Economics Discussion Series  
Divisions of Research & Statistics and Monetary Affairs  
Federal Reserve Board, Washington, D.C.**

**A Wealth of Information: Augmenting the Survey of Consumer  
Finances to Characterize the Full U.S. Wealth Distribution**

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**2021-053**

Please cite this paper as:

Bricker, Jesse, Sarena Goodman, Kevin B. Moore, and Alice Henriques Volz (2021).  
“A Wealth of Information: Augmenting the Survey of Consumer Finances to Char-  
acterize the Full U.S. Wealth Distribution,” Finance and Economics Discussion Se-  
ries 2021-053. Washington: Board of Governors of the Federal Reserve System,  
<https://doi.org/10.17016/FEDS.2021.053>.

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# **A Wealth of Information: Augmenting the Survey of Consumer Finances to Characterize the Full U.S. Wealth Distribution\***

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June 2021

## **Abstract**

We use the Survey of Consumer Finances (SCF) to advance U.S. wealth analysis along several dimensions. We develop a comprehensive framework that modifies the SCF to recover the wealth distribution over families, tax units, and individuals from 1989 to 2019. We show that, by ignoring unequal holdings within families, existing estimates considerably understate U.S. inequality across individuals. We find wealth concentration rose through the recent economic recovery, which differs from leading models that capitalize income into wealth even after aligning conceptual differences. We illustrate that private businesses are a growing impediment to accurately modeling wealth from income.

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## I. Introduction

Understanding how economic growth diffuses across the population is central to sound policymaking. However, recent efforts to characterize the wealth distribution in the United States disagree on the degree of inequality and its contour, particularly since the Financial Crisis (Bricker et al., 2016; Saez and Zucman, 2016; Piketty, Saez, and Zucman, 2018). This spirited discourse regarding the depth of the Crisis and its aftershocks continues amid another economic downturn that has been concentrated in particular segments of the population and resulted in substantial policy response, increasing the urgency for a more robust and complete picture of differential experiences of economic conditions.

In pursuit of these questions, the Survey of Consumer Finances (SCF), a detailed survey of U.S. family finances, is a natural starting point. The SCF is the primary data source for many studies on related topics (e.g. Wolff, 1998, 2017; Bricker et al., 2016; Kuhn, Schularick, and Steins, 2017). But, the base SCF data are incomplete, as they exclude some segments of the population and some components of wealth. Further, results organized at the family level may conflate changes in family composition with changes in the wealth distribution.

This short paper advances the discourse on wealth inequality along several dimensions. After presenting new evidence that validates the SCF's representativeness and the accuracy of self-reported sensitive financial information it collects, we propose a comprehensive framework to overcome its limitations in estimating the U.S. wealth distribution.<sup>1</sup> We then construct distributional estimates over alternate units of analysis—families, tax units, and individuals—within a single data source for the first time. The resulting estimates provide the most complete depiction of U.S. wealth inequality during the period of the modern SCF (1989-2019) to date and the first description of the evolution of the wealth

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<sup>1</sup> This framework draws from work valuing defined benefit pensions (Sabelhaus and Volz, 2019) and accounting for high wealth families the SCF may not sample (Bricker, Hansen, and Volz, 2019). An integrated framework to measure the wealth distribution has not been published in an academic outlet, though two non-peer reviewed FEDS Notes (Bricker and Volz, 2020, Bricker et al., 2020) include initial efforts. Further innovations to 1) incorporate SCF household adults with independent finances—e.g., roommates, adult children, or parents—who are typically excluded from published statistics and 2) alter the unit of analysis—including to the individual level—are novel to this work.

distribution since 2016, covering the tail-end of the longest economic expansion on record.<sup>2</sup> They indicate that the share of wealth held by the top percent of the distribution gradually increased after 1989, leveled off through the Financial Crisis, rose thereafter, and peaked well into the ensuing recovery. Modifying the wealth definition, coverage, and unit of analysis does not affect this trend.

To develop distributions over individuals, we estimate wealth allocations *within* U.S. families for the first time. This analysis produces the new facts that wealth is, on average, unequally held within U.S. couples—women hold less than 40 percent—but that it has become slightly more equitably held over time. The resulting distributional estimates move beyond the (untested) standard assumption that married U.S. tax filers split household resources equally, advancing a long-run objective of the Distributional National Accounts (DINA) project (Piketty, Saez, and Zucman, 2018; Saez and Zucman, 2020; Alvaredo et al., 2016). Analogous distributions formed from U.S. tax data using this assumption overstate female wealth holdings, echoing recent evidence from French data (Fremeaux and Leturcq, 2020), and understate the top 1 percent’s wealth share by 1–2 percentage points (p.p.).

Recent efforts to “capitalize” income tax records into wealth (Saez and Zucman, 2020; Smith, Zidar, Zwick, 2020—hereafter, SZ20 and SZZ20) generally disagree on the path of wealth concentration since the Financial Crisis, but both indicate it has been curiously stable in recent years, a pattern that is very much at odds with our findings. These models map a given type of income into the likely asset that generates it, but each impose different rules for a few key asset classes that are more tenuously linked to income observed on a tax form. These approaches also target different wealth concepts under a different unit of analysis than we do, leaving open the possibility that these choices are material to the path of inequality that emerges.<sup>3</sup> Our setting grants necessary flexibility to show these choices largely cannot reconcile our findings with either SZ20 or SZZ20, suggesting these models are missing structural change in the relationship between income and wealth around the Crisis. Indeed, we show the SCF’s internal

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<sup>2</sup> Saez and Zucman (2020a, 2020b) include projections for the 2017–19 period.

<sup>3</sup> Each set of model-based estimates matches aspects of a researcher-adjusted SCF, suggesting such choices could be material. This uncertainty underscores the need for clear guidance for modifying the SCF data.

capitalization model—which relies on the same tax records as both SZ20 and SZZ20 and has long been used to form its oversample of wealthy households—struggles to rank wealth for the upper reaches of the distribution over the same periods as the leading models seem to. We surmise that the increasing importance and complexity of private business assets is an impediment to recovering reliable distributional estimates from tax records and offer our modified SCF as a resource to modelers for benchmarking these assets going forward.

## **II. Measuring the Wealth Distribution with the SCF**

The SCF is a nationally representative, cross-sectional survey of U.S. households that is uniquely positioned to characterize the wealth distribution. The SCF combines a wealthy oversample with a geographic sample and collects a comprehensive snapshot of household assets, liabilities, income, and demographics. The SCF is conducted triennially and, in 2019, surveyed about 6,000 households, with 1,500 from the oversample.

The SCF selects its wealthy oversample using two methods, both of which rely on modeling wealth from administrative records based on income tax data (Appendix A). The first method is a “capitalization model,” which imposes structure on how income observed on tax forms relates to wealth following an approach similar to SZ20 and SZZ20 but with less nuance.<sup>4</sup> The second is a “correlation model” that empirically estimates the relationship between income and wealth from families in the previous survey, allowing flexibility for structural change in this relationship. The two methods are used in conjunction, but the correlation model appears to be more reliable (Figure A.1; Section IV.ii).

The SCF achieves a representative snapshot of the upper reaches of the wealth distribution by strategically selecting families and ensuring sufficient response across the distribution. Families are

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<sup>4</sup> In general, SZ20 and SZZ20 distribute household wealth from the same aggregates in the Financial Accounts of the United States (FA) using observed asset-based income in tax records but make different assumptions about key model inputs: assumed rates of return on interest-bearing assets for the wealthy, the allocation of noncorporate business wealth, and the treatment of billionaire equity. The SCF model uses market rates of return without forcing aggregates to sum to FA totals. See Board of Governors of the Federal Reserve System (2020), Statistical Release Z.1, “Financial Accounts of the United States,” <https://www.federalreserve.gov/releases/z1> for the FA data, and Bricker, Henriques, and Moore (2017) for more information on the SCF sampling process.

ranked according to expected wealth from the two sampling models and then divided into seven mutually exclusive strata: middle class families in the lower strata and billionaires in the highest stratum. For each stratum, the number of completed interviews must surpass a statistically determined threshold before the data are complete. And, while not a requirement, nonresponse along the wealth continuum within each stratum appears to be random in each SCF. For example, the distributions of expected wealth—from each model—among respondents and nonrespondents in 2019 roughly overlap in each stratum, even at the very top of the wealth distribution (Figure A.2).

Apart from adequate coverage of the wealth distribution, another potential concern is the accuracy of self-reported financial information in the SCF. While there is no administrative data source against which to compare wealth measures, the SCF aggregates line up closely with the Financial Accounts of the United States (FA) estimates of aggregate household wealth.<sup>5</sup> Further, total income and capital income match IRS published statistics, including for the top tenth of the income distribution (Figure A.3), evidence SCF respondents report their finances accurately.

While these attributes distinguish the SCF as the best available data source for measuring wealth in the United States, an unadjusted SCF cannot accurately capture the complete distribution.<sup>6</sup> Our framework systematically overcomes the SCF's limitations in pursuit of this distribution, drawing lessons from several lines of inquiry: (1) how to value defined benefit (DB) pensions (Sabelhaus and Volz, 2021), (2) how to account for high wealth families the SCF are precluded from sampling (Bricker, Hansen, and Volz, 2019), and (3) novel work on how to incorporate SCF household adults with independent finances—e.g., roommates, adult children, parents—who are typically excluded from published statistics.

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<sup>5</sup> This comparison requires alignment of the two data sources with respect to components of wealth and some of the accounting. The Distributional Financial Accounts (DFAs) are a recent effort to align these data and estimate high frequency distributional statistics by distributing FA aggregates from the observed distribution of assets and debt in the SCF. Because of decisions required to align the SCF and FA, the DFAs do not match distributions from the base SCF or those presented here, although trends should be similar. Private business valuations drive most of the difference, as the DFAs use a mix of book and market values—as opposed to market values in the SCF—which decreases concentration among the top percent of families approximately 1 p.p. (Batty et al., 2020). See Batty et al. (2019) for details on the DFAs. Individual-level estimates from the DFAs are not available.

<sup>6</sup> Administrative records from the U.S. estate tax (at death) were once quite useful for wealth analysis (e.g., Lampman, 1962; Kopczuk and Saez, 2004) but have become less so as filing thresholds have increased.

Figure 1 presents the estimated share of wealth held by the top percent of families over time from the SCF, incrementally making these adjustments. (The figure includes alternative adjustments that SZ20 and SZZ20 propose for benchmarking their estimates.) Broadly speaking, the required modifications to the SCF alter the contour of this measure of inequality only slightly and have a much larger impact on its level. Over the 1989–2019 period, the share of wealth held by the wealthiest families has risen. Zooming in on the last two decades, this rise was gradual through the Financial Crisis and more accelerated afterward through 2016. Between 2016 and 2019, concentration essentially stabilized, indicating economic growth over this period spread to larger segments of the distribution.<sup>7</sup>

i. DB Pensions

The standard SCF measure of wealth reflects “marketable” wealth—referred to as “Bulletin” wealth hereafter—which is the difference between the market value of assets and debts owned by a family. This measure treats household retirement assets unevenly, as it includes assets held in defined contribution (DC) accounts but not legal claims on DB pension assets.<sup>8</sup> Of the two, only DC plans have a market value, though both provide future income for covered families. DB pension assets are substantial—representing almost 15 percent of household assets in the FA in recent years—and still widely held, with more than one-quarter of working families aged 35 to 64 covered by a DB pension.

We use the methodology in Sabelhaus and Volz (2021) to distribute aggregate DB pension assets in the FA across covered families, which relies on detailed information the SCF collects about DB plan coverage from current and past jobs, as well as wages and expected annuity income from past DB plans.<sup>9</sup> Adding DB pension assets increases wealth across the distribution, with families in the upper-middle part

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<sup>7</sup> Though the stock market saw gains over this window, a large share of wealth at the top is held in private equity, which may not track public equities. Confidence intervals, shown later, could support increased or decreased concentration.

<sup>8</sup> DB pensions, often called “traditional pensions,” are managed by employers—with assets held in reserve to pay future benefits—so employees typically have access to information about future benefits but not account values. In contrast, employees can manage key details of DC pensions—401(k) and similar plans—including funding and asset allocation. IRA accounts are managed by the individuals that own them.

<sup>9</sup> Adding the \$19 trillion in asset reserves to fund DB pension obligations from the 2019:Q3 FA increases 2019 SCF aggregate household wealth by 15 percent. This stock of household DB pension wealth is the accumulated benefit obligations (ABO) of pension plans, which include both funded and unfunded obligations.

of the distribution seeing the largest increase. Estimated wealth concentration falls 5-6 p.p. each year relative to the Bulletin measure, in line with previous work (Bricker et al., 2016; Sabelhaus and Volz, 2019).

Across distributional estimates, there is disagreement regarding the inclusion of *unfunded* DB pensions: SZ20 exclude them, while SZZ20 include them. A plan's funding does not alter a participant's legal claim to benefits, so our view is that unfunded plans should be included.<sup>10</sup> As DB plans are disproportionately held by otherwise less-wealthy families, excluding unfunded obligations favors finding more inequality in the distribution.

Finally, future Social Security payments are excluded from wealth calculations for all three sets of distributional estimates. Even though Social Security is another important source of retirement-age consumption funding on which many families depend, current and future beneficiaries have no legal claims to these payments.

ii. Wealth coverage

Certain types of families are omitted from the published SCF wealth estimates, and their exclusion leads to an incomplete characterization of the wealth distribution.

First, the SCF sampling frame by design excludes families in the *Forbes* 400—a list published by *Forbes* magazine of (some of) the wealthiest U.S. families—out of concerns that they could be identifiable in the public-use microdata.<sup>11</sup> We follow a method described in Bricker, Hansen, and Volz (2019) to include the wealth of these families without double counting. In 2019, including these families increases aggregate household wealth by \$2.65 trillion, as about \$300 billion of *Forbes* wealth was already represented by SCF families who have private wealth equal to some *Forbes* families. The increase in the share of wealth held by the wealthiest one percent of families is about 1.5 p.p. after this adjustment but varies across years with the extent to which their wealth was covered by the SCF.

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<sup>10</sup> Almost all of the underfunding is in government pension plans, and the risk of default by the government is low.

<sup>11</sup> Bricker, Hansen, and Volz (2019), Vermeulen (2018), and Kennickell (1999) show that any under-coverage in the SCF does not arise until the extreme top of the distribution, as the wealthiest SCF families have wealth comparable to the lower end of the *Forbes* 400.

Second, the unit of observation in the SCF is a family, which includes all persons that share finances within a household.<sup>12</sup> Published SCF statistics exclude the finances of household members who are financially independent from this unit. The survey collects only limited information on these individuals, with assets and debts aggregated across all financially independent household members. Most of these household members have relatively little wealth, and their inclusion is not material to estimates of family-based estimates of concentration.<sup>13</sup> However, their inclusion is important when recasting the SCF data in alternate units in Section III and helps align the SCF with published population estimates.

Overall, moving from Bulletin wealth to the comprehensive wealth measure decreases concentration 4-5 p.p. each year but does not change the time trend. The adjustments proposed by SZ20 and SZZ20 both overstate concentration among the wealthiest families, though due to the exclusion of unfunded DB pensions, SZ20's more dramatically so.

### **III. Corresponding the Wealth Distribution to Other Units**

Comparisons between existing distributional estimates are complicated by differences in the unit of observation in each data source (Bricker et al., 2016; SZ20). Based on data elements unique to the SCF, this section develops procedures to correspond households (including financial independents) as the basis of analysis into tax units and individuals. Altering the unit influences the estimated level of inequality, with the SCF's visibility into individual asset ownership important for moving to person-level estimates.

#### **i. Tax Units**

The unit of observation in the tax data is a tax unit, which is composed of all persons that are interdependent with respect to tax law. Any distinction between members of an SCF family and a tax unit more so reflects administrative convenience than the underlying financial relationship.<sup>14</sup> A tax unit often

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<sup>12</sup> The SCF family, also called the primary economic unit (PEU), includes the economically dominant person or couple within a household and all persons in the household that financially depend on the economically dominant person or couple.

<sup>13</sup> For this calculation, the wealth of household members outside the PEU is brought into the PEU, with the population held constant for ease of comparison with other estimates in the figure.

<sup>14</sup> That said, several important policies, particularly those concerning taxes, are administered by tax unit, making estimates at this level convenient from a policy standpoint.

includes the full set of individuals that compose an SCF family but can include a subset under certain circumstances, such as unmarried cohabitation. Notably, the organization of assets on tax forms may not be representative of true ownership: a co-owned house may appear on just one individual's return. In contrast, the SCF captures all resources a family owns. Thus, relative to tax units, distributional estimates derived from SCF families will more reliably connect an individual to her full set of resources.

To organize SCF families into tax units, we use survey responses pertaining to tax filing status, relationship to the reference person, and marital history. In the 2019 SCF, the 128 million SCF families are split into 143 million tax units. Adding SCF household adults with independent finances—e.g., roommates, adult children, parents—yields a total of 167 million tax units in the 2019 SCF, comparable to the number of tax units estimated in the DINA project (Piketty, Saez, and Zucman, 2018).<sup>15</sup> The share of families split into tax units decreases as wealth increases—with around a 15 percent split among those in the bottom half of the distribution, 7 percent among those in the 50<sup>th</sup>-90<sup>th</sup> percentiles, and 5 percent among those in the top 10 percent.

## ii. Individuals

Even though many types of resources are shared within households, it is most straightforward to interpret and compare wealth ranked over the adult population. Indeed, the main estimates in SZ20, SZZ20, and the international DINA project are expressed at this level. The tax data, however, lack reliable guideposts to divide resources within tax units and thus require an assumption to allocate wealth for tax units composed of more than one adult. Because the majority of wealth is held by couples—80 percent in our data—the rule used to divide assets in these instances can be material to the distribution that results. Short of a better answer, distributional wealth estimates based on U.S. tax data are all formed under the (untested) assumption that the resources of a couple that files taxes together are equally owned.

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<sup>15</sup> Both the figures here and in DINA include tax units who do not actually file taxes. For this correspondence, the financially independent adults in the SCF data—those that reside in the SCF household but whose finances are not interdependent with the primary economic unit (PEU)—are each treated as a single tax unit. Our estimate of tax units in the 2019 SCF that file a return (156 million in 2018 income tax year) is close to the number measured by IRS (154 million in 2018 tax year). Our estimated number of filers plus non-filers is about 167 million, in line with the DINA project, which estimates about 171 million filers and non-filers—in 2018.

The SCF uniquely identifies the individual owner of many important assets—liquid assets, retirement and pension plans, and business assets—within households. About 60 percent of assets held by couples can be allocated to either the household head or his/her spouse or partner with this information. The remaining assets are mostly housing—which is typically jointly owned—and directly-held equities and bonds, which, as in the capitalization models, we assume are equally held.<sup>16</sup> When considering all families, including non-couples, 70 percent of aggregate assets can be allocated using this information.

Table 1 decomposes wealth by gender and family structure over time. Couples have held a roughly steady 80 percent share of the nation’s wealth, with single men and women splitting the remainder about equally. Within couples, men tend to hold the majority of assets, about 60 percent in 2019. This 60-40 male-female split is roughly stable across the distribution (not shown). That said, wealth within couples has slowly equalized over time due to narrowing of the large gender disparity in pension assets.

Pensions are the only broad asset category that have become more equally held within couples during this period. This equalization likely reflects the longer-term rise in women’s labor force participation and trends in pension offerings by occupation, which differentially affect men and women. While wealth from DB and DC pensions has increased over time for both coupled men and women, the gender gap in DB assets has narrowed due to falling DB coverage for men on their currently held job (as opposed to past jobs) since 2001, likely reflecting reduced male employment opportunities over this period (Autor, Dorn, and Hansen, 2016). Nonetheless, coupled men are still more likely to have DB coverage from a past job and continue to hold the vast majority of pension assets. In fact, although pensions have become more equally held, they remain the most unequally held of all the broad asset categories.

### iii. The Wealth Distribution under Alternate Units

The extent to which wealth is concentrated at the top varies considerably with the choice of unit of observation (Figure 2). Recasting our family-level dataset into a tax unit dataset substantially increases

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<sup>16</sup> The assets that are equally split—housing, public equity, and other assets—comprise the majority of wealth held by couples in the bottom 50 percent; thus, this assumption bears most heavily on allocations within this segment. Our allocation may be conservative, as allocating directly-held equities using relative earnings within couples produces a more unequal household split.

measured wealth inequality—about 3 p.p. in recent survey years—as the likelihood an SCF family comprises two tax units decreases over the distribution.<sup>17</sup> Wealth inequality measured over individuals is generally more in line with the family-based measure. Splitting couples can impart downward pressure on wealth concentration, as single families tend to have less wealth than couples, but splitting pension and private business assets of couples imparts upward pressure, as they are unevenly held in couples. On balance, inequality over individuals is just slightly above the family-level measure in the preferred “SCF split” measure, which allocates assets to the head and spouse using ownership information in the SCF (described above).<sup>18</sup> Over the 30 years spanning the modern SCF, the wealthiest percent of individuals increased their share of the nation’s wealth by about 8 p.p. to 34 percent in 2019.<sup>19</sup> The corresponding estimates formed under an equal split assumption—as in SZZ20 and SZ20—ignore any intrahousehold inequities and understate concentration by about 1-2 p.p. annually.<sup>20</sup> This all said, recasting our data into other units does not measurably change the estimated path of inequality.

#### **IV. Comparing estimates of wealth concentration**

Understanding when and why estimates of wealth concentration diverge is important if they are to be relied on to formulate policy. Figures 3 and 4 compare our estimates to those from SZ20 and SZZ20 for the top 1 percent of wealth holders and the top 0.1 percent of wealth holders, respectively. The most recent estimates for these models rely on administrative tax data through 2016, though SZ20 include projections through 2019. To facilitate interpretation, we include 95 percent confidence intervals for our estimates, which are unavailable for the capitalized estimates.<sup>21</sup>

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<sup>17</sup> This mechanical increase is similar to that from financially independent adults, who tend to have lower wealth.

<sup>18</sup> Some adults in the SCF family for whom little asset information is known are excluded. Assuming they own no wealth, including them adds about 0.5 p.p. to person-level estimates of concentration among the top percent.

<sup>19</sup> Estimated wealth shares among the top 10 and bottom 90 percent of individuals have steadily increased and decreased, respectively, comparable to the capitalized estimates (Appendix B).

<sup>20</sup> Frémeaux and Leturcq (2020) show that accounting for intrahousehold holdings similarly influences distributional wealth estimates in France. They also document an increasing individualization of wealth within couples, but private pensions—one of the largest assets held individually in the U.S—do not have a direct counterpart in France.

<sup>21</sup> Statistical variability is driven by sampling and imputation; thus, the confidence interval captures the expected range of estimates if different families were sampled and plausible values imputed. The unavailability of standard errors for the capitalized estimates is an important but largely ignored limitation of these methods.

In all three estimates, concentration among the wealthiest percent of individuals increased about 5 percentage points between 1989 and the onset of the Financial Crisis (Figure 3, top panel). Since the Financial Crisis, the estimates have been out of sync. Our estimates stabilize during the Crisis, then steadily increase during the recovery and reach a peak over the 2016-19 period. (The decline between 2016 and 2019 is not statistically significant.) Concentration in SZ20 has the opposite trend: rising rapidly during the Financial Crisis and through 2012, and stabilizing thereafter, albeit at a remarkably high level. Concentration in SZZ20 remained fairly flat over the recovery and expansion. While the level differences in estimates fluctuate, ours is always below SZ20 and either above or in line with SZZ20. Our 2016 estimate is, however, much closer to SZ20 than SZZ20.

With respect to concentration among the top tenth of a percent of individuals, SZ20 and SZZ20 both find faster growth prior to the Financial Crisis than we do (Figure 4, top panel). Afterwards, the differences in contour highly mimic those in the top percent of the distribution. In levels, the range of findings for a given year is tighter, though our estimates are again more in line with SZZ20 than with SZ20. That said, there are two noteworthy deviations from our findings for the broader group above: our estimates are below both estimates over the 2001-2013 period, and our 2016 estimate is much closer to SZZ20 than SZ20. Overall, while all 3 sets of estimates indicate individuals at the very top of the distribution have driven increased concentration, the contribution by the “rest of the 1 percent” is larger in ours than in SZ20 or SZZ20.

i. Aligning measures

The set of assets composing a person’s wealth—the “wealth concept”—varies across methodologies, as do the procedures used to form person-level estimates.<sup>22</sup> These differences may help generate the differences in the top panel of the figures.

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<sup>22</sup> Our concept includes the vast majority of asset categories in the FA, whereby term life insurance (less than 2 percent of aggregate household assets) is the largest exception. SZ20 and SZZ20 exclude larger categories, with SZ20 excluding unfunded DB pensions (4.7 percent of assets) and both excluding consumer durables (4.5 percent of assets).

Aligning our choices with SZZ20—that is, removing consumer durables and splitting household resources evenly—on net, reduces wealth concentration among the top percent only marginally, leaving our estimates well above theirs (Figure 3, middle panel). Aligning with SZ20—that is, removing unfunded DB pensions in addition to the SZZ20 adjustments—bumps our estimates up substantially and brings our recent period estimates in line with theirs (bottom panel). For the top tenth of the distribution, the SZZ20 adjustments again reduce concentration, which brings our 2016 estimate almost completely in line with theirs but pushes our 2001-2013 estimates even further away (Figure 4, middle panel). The SZ20 adjustments only slightly raise our estimates, bringing them closer (bottom panel).

Importantly, all of the estimates derived from the observed wealth data in the SCF continue to indicate a recent rise in concentration that is not apparent in either set of model-based estimates. The next section links these differences to growing challenges in inferring wealth from income reported on tax records.

ii. What can the SCF data say about the capitalization models?

Capitalization models have a long track record of ably predicting wealth by relying on assumed correlations between wealth and different types of income (Greenberg, 1986; Kennickell and Frankel, 1995).

In contrast, wealth estimates formed from the SCF are free of such assumptions and point to a nuanced correspondence between income and wealth.<sup>23</sup> Of the wealthiest 1 percent of tax units in 2019, only 40 to 50 percent also fall in the top 1 percent of income (Figure C.1). (This finding illustrates that, with respect to optimal policy, targeting the highest earning families will not reach many of those with the most resources.) Between 1989 and 2019, overlap between high-wealth and high-income tax units varies and is relatively low around the Financial Crisis, when SZZ20 and SZ20's estimates begin to deviate considerably from each other and our estimates.

Modeling wealth from income is relatively straightforward for some asset categories. However, for others—equity assets, fixed income assets, and private business assets—the models rely more heavily on

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<sup>23</sup> For this reason, both SZ20 and SZZ20 use the SCF to help distribute housing and pension assets and to discipline fixed income asset rates of return and, in SZZ20, public equity assets.

assumptions that vary significantly between models (Saez and Zucman, 2020b). These three categories compose between 80 and 85 percent of the balance sheets of the wealthiest households, and an inappropriate mapping of their values is certainly large enough to drive the discrepancies above. Indeed, the deviations between wealth portfolios in SZ20—which make such data available—and those derived here as well as in estate tax data, family office data, Swedish data, and Norwegian data (Bricker and Volz, 2020) are concentrated in these categories. SZ20’s portfolio skews to interest-bearing assets and public equities, while ours is dominated by private noncorporate businesses (Figure C.2).<sup>24</sup>

Capitalization models are most likely to go awry in areas where there is ambiguity between income observed on tax records and its source, and within these categories, pass-through businesses (S corporations, partnerships, limited liability companies, and sole proprietorships) have introduced increasing ambiguity. First, a substantial amount of pass-through income is neither reported on tax returns nor detected in audits, leading to disproportionate underreporting of income—as much as 35 percent—at the top of the distribution (Guyton et al., 2021). Second, income from pass-throughs can flow to several different categories on an owner’s tax return—ordinary business income, interest income, dividends, and capital gains—most of which could also originate from non-business assets. Drawing from aggregated partnership and S Corp business tax filings, more than 30 percent of aggregate interest income and capital gains income reported on individual tax returns originates from a pass-through business, up from 12 percent in 1994 (SZ20). Finally, partnerships—the largest and fastest growing type of pass-through business—can have extremely opaque ownership structures. An ambitious research effort was able to link just 80 percent of such income to its individual owner in just one tax year (Cooper et al., 2016). Under current reporting requirements, it does not seem possible to accurately value partnership interests from the tax data.

Currently, pass-through businesses generate more than half of all business income (Cooper et al., 2016), and pass-through ownership and income are both highly concentrated at the top of the

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<sup>24</sup> Some of this deviation reflects differences in the classification of certain types of businesses—most notably, noncorporate financial firms.

distribution—much more than even other capital income. While both capitalization models have become more refined and exacting with each iteration (Saez and Zucman, 2016; SZ20, Smith, Zidar, and Zwick, 2019; SZZ20), neither of the most recent vintages has a comprehensive framework to reliably link business assets to the variety of income sources they can produce *and* accommodate periods of economic transition, when businesses often shift their cash-flow strategies.<sup>25</sup>

Possibly for all these reasons, of the two models the SCF uses to form its wealthy oversample—described in Section II—the capitalization model is less reliable for identifying wealthy families, especially toward the top of the distribution. The Spearman rank-order correlation between the observed and predicted wealth distribution is systematically higher for the correlation model, and the gap in performance between models is more pronounced for the top 0.1 percent of families and in the 2010 survey year (Figure A.1). Notably, both models perform better for the full distribution than the very top, highlighting the difficulty in predicting wealth from income in this segment more generally.

All in all, these dynamics between income and wealth could explain why a capitalization model that successfully predicts wealth in one environment quickly loses traction in another. Indeed, the model-based estimates align with ours for most of the distribution except for the very top (Bricker et al., 2020; Appendix B), where businesses are most prevalent and the income-wealth correlation is blurriest. Unfortunately, it is precisely this upper segment of the distribution on which recent studies using capitalization models focus. Going forward, in addition to matching the trends we estimate, the models need to be better able to anticipate businesses maneuvering around regulations that affect either their income reporting or their taxation, such as the Tax Cuts and Jobs Act (TCJA). Aligning to the SCF—as is done for pensions and housing, two other assets that are hard to discern from tax data—may help.

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<sup>25</sup> Aggregating partnership return data published by the IRS Statistics of Income, one observes a major shift in income flows during the Crisis, with the share paid out as interest income peaking for both financial and nonfinancial partnerships in 2008 and 2009, and the share as capital gains sliding from a local peak of 20 percent in 2007 to a negligible share in 2009. These dynamics are not visible in SZ20’s portfolio. And while SZZ20 do not publish trends in their portfolio, they attempt to sidestep some of this concern by estimating business wealth from a combination of sales, profits, and assets. Still, their method does not account for the fact that a business’ interest income (for example) may be capitalized into interest-bearing assets as well.

## V. Conclusion

Our analysis takes measurable steps toward settling the somewhat contentious discourse regarding the path of wealth inequality in the United States over the past couple decades. Our methodology delivers a full wealth distribution from the SCF that is on even footing with other leading estimates and demonstrates that concentration among the upper reaches of the wealth distribution was little changed during the Financial Crisis but rose through most of the economic recovery, indicating that the wealthiest saw a disproportionate share of economic growth during this time.

The fact that these findings are at odds with those produced by the capitalization methodologies implies there is considerable work to be done before policymakers can rely on model-based estimates. In accordance with burgeoning work demonstrating the visibility into the structure of U.S. businesses is increasingly poor, sound estimation of U.S. wealth offers yet another rationale to improve business' reporting to the IRS and other government entities. Certainly until then, our findings support the use of household survey data to form distributional estimates of wealth.

Separately, our efforts to more systematically allocate wealth within households advances several objectives. First, we deliver an informed parsing of intrahousehold resources to users of DINA and U.S. income tax data, wherein males own the majority of a couple's assets. Second, we remove a potential source of discrepancy by constructing estimates in units consistent with tax data, and, even so, trend differences remain. Third, we demonstrate that the assumption standard to these methodologies—that joint tax filers split household assets equally—nontrivially understates U.S. wealth inequality.

## References

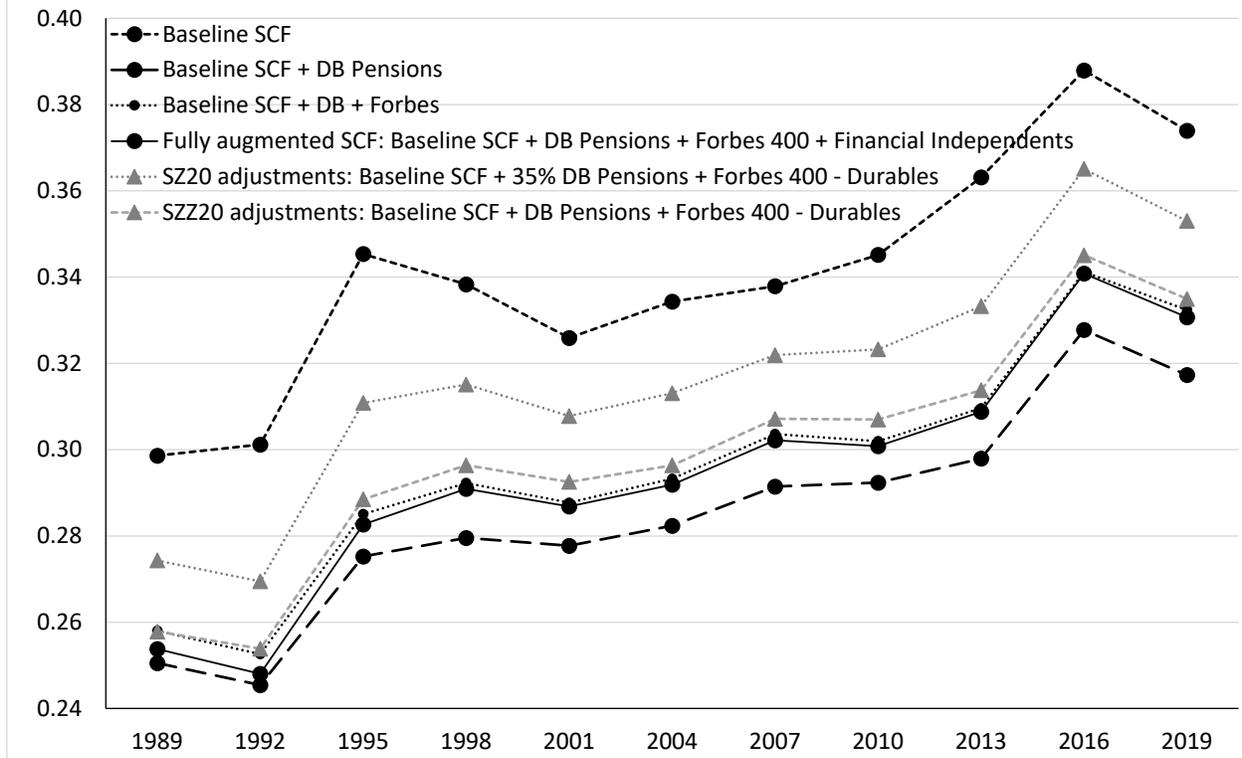
- Alvaredo, Facundo, Anthony Atkinson, Lucas Chancel, Thomas Piketty, Emmanuel Saez, and Gabriel Zucman (2016). “Distributional National Accounts (DINA) Guidelines: Concepts and Methods used in WID.world,” WID.world working paper series, No. 2016/1.
- Auten, Gerald, and David Splinter (2020). “Income Inequality in the United States: Using Tax Data to Measure Long-term Trends,” mimeo.
- Autor, David, David Dorn, and Gordon Hanson (2016). “The China Shock: Learning from Labor-Market Adjustment to Large Changes in Trade,” *Annual Review of Economics*, Vol. 8, pp. 205-240.
- Batty, Michael, Jesse Bricker, Joseph Briggs, Elizabeth Holmquist, Susan McIntosh, Kevin Moore, Eric Nielsen, Sarah Reber, Molly Shatto, Kamila Sommer, Tom Sweeney, and Alice Volz (2019). “Introducing the Distributional Financial Accounts of the United States,” FEDS Paper No. 2019-017.
- Bastani, Spencer, and Daniel Waldenstrom (2019). “Salience of Inherited Wealth and the Support for Inheritance Taxation,” CESifo Working Paper No. 7482.
- Bhutta, Neil, Jesse Bricker, Andrew C. Chang, Lisa J. Dettling, Sarena Goodman, Joanne W. Hsu, Kevin B. Moore, Sarah Reber, Alice Henriques Volz, and Richard A. Windle (2020). “Changes in U.S. Family Finances from 2016 to 2019: Evidence from the Survey of Consumer Finances,” *Federal Reserve Bulletin*, September, Vol. 106, No. 5.
- Bhutta, Neil, Andrew C. Chang, Lisa J. Dettling, and Joanne W. Hsu (2020). “Disparities in Wealth by Race and Ethnicity in the 2019 Survey of Consumer Finances,” FEDS Notes. Washington: Board of Governors of the Federal Reserve System, September 28, 2020, <https://doi.org/10.17016/2380-7172.2797>.
- Board of Governors of the Federal Reserve System (2020). Statistical Release Z.1, “Financial Accounts of the United States,” <https://www.federalreserve.gov/releases/z1>.
- Bricker, Jesse, Sarena Goodman, Kevin B. Moore, and Alice Henriques Volz (2020). “Wealth and Income Concentration in the SCF: 1989–2019,” FEDS Notes. Washington: Board of Governors of the Federal Reserve System, September 28, 2020, <https://doi.org/10.17016/2380-7172.2795>.
- Bricker, Jesse, Alice Henriques, Jacob Krimmel, and John Sabelhaus (2016). “Measuring Income and Wealth at the Top Using Administrative and Survey Data,” *Brookings Papers on Economic Analysis*, Spring.
- Bricker, Jesse, Alice Henriques, and Kevin B. Moore (2017). “Updates to the Sampling of Wealthy Families in the Survey of Consumer Finances,” FEDS Working Paper No. 2017-114.
- Bricker, Jesse, Alice Henriques, and Peter Hansen (2018). “How Much Has Wealth Concentration Grown in the United States? A Re-examination of Data from 2001-2013,” FEDS Working Paper No. 2018-024.

- Bricker, Jesse, Peter Hansen, and Alice Henriques Volz (2019). “Wealth Concentration in the U.S. after Augmenting the Upper Tail of the Survey of Consumer Finances,” *Economic Letters* Vol 184.
- Chetty, Raj, Michael Stepner, Sarah Abraham, Shelby Lin, Benjamin Scuderi, Nicholas Turner, Augustin Bergeron, and David Cutler (2016). “The Association Between Income and Life Expectancy in the United States, 2001-2014.” *JAMA*, 315(16):1750–1766.
- Cooper, Michael, John McClelland, James Pearce, Richard Prisinzano, Joseph Sullivan, Danny Yagan, Owen Zidar, and Eric Zwick (2016), “Business in the United States: Who Owns It, and How Much Tax Do They Pay?” in *Tax Policy and the Economy*, Volume 30, Brown.
- Feiveson, Laura, and John Sabelhaus (2018). “How Does Intergenerational Wealth Transmission Affect Wealth Concentration?” FEDS Paper No. 2018-06-01.
- Kennickell, Arthur (1999). “Using income to predict wealth.” Technical report, Board of Governors of the Federal Reserve System (U.S.).
- Kopczuk, Wojciech, and Emmanuel Saez (2004). “Top wealth shares in the United States, 1916-2000: Evidence from estate tax returns,” *National Tax Journal*, 47(2):445–487.
- Kuhn, Moritz, Moritz Schularick, and Ulrike I. Steins. (2017) "Income and Wealth Inequality in America." *Journal of Political Economy*, Vol. 128, No. 9, pp. 3469-3519.
- Lampman, R. J. (1962). “The Share of Top Wealth-Holders in National Wealth, 1922-56.” NBER Books.
- Piketty, Thomas, and Emmanuel Saez (2003). “Income Inequality in the United States, 1913-1998,” *Quarterly Journal of Economics*, vol. 118, no. 1: 1-39.
- Piketty, Thomas, Emmanuel Saez, and Gabriel Zucman (2018). “Distributional National Accounts: Methods and Estimates for the United States,” *Quarterly Journal of Economics*, vol. 133, no. 2: 553-609.
- Robbins, Jacob (2018). “Capital gains and the distribution of income in the United States,” mimeo.
- Sabelhaus, John, and Alice Henriques Volz (2019). “Are Disappearing Employer Pensions Contributing to Rising Wealth Inequality?” FEDS Notes, February 1, 2019.
- Sabelhaus, John, and Alice Henriques Volz (2020). “Social Security Wealth, Inequality, and Lifecycle Saving,” NBER Working Paper 27110.
- Saez, Emmanuel, and Gabriel Zucman (2016). “Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax Data,” *Quarterly Journal of Economics*, vol. 131, no. 2, pp. 519-578.
- Saez, Emmanuel, and Gabriel Zucman (2019). “Progressive Wealth Taxation,” *Brookings Papers on Economic Analysis*, Fall.
- Saez, Emmanuel, and Gabriel Zucman (2020a). “The Rise of Income and Wealth Inequality in America: Evidence from Distributional Macroeconomic Accounts,” *Journal of Economic Perspectives*.

- Saez, Emmanuel, and Gabriel Zucman (2020b). “Trends in US Income and Wealth Inequality: Revising After the Revisionists,” NBER Working Paper 27921.
- Smith, Matthew, Owen Zidar, and Eric Zwick (2019). “Top Wealth in the United States: New Estimates and Implications for Taxing the Rich.” Mimeo.
- Smith, Matthew, Owen Zidar, and Eric Zwick (2020). “Top Wealth in the United States: New Estimates and Implications for Taxing the Rich.” Mimeo.
- Vermuelen, Philip (2018). “How fat is the top tail of the wealth distribution?” *The Review of Income and Wealth*, 64(2):357–387.
- Wolff, Edward (1998) “Recent Trends in the Size Distribution of Household Wealth,” *Journal of Economic Perspectives*, Vol. 12, No. 3, pp. 131-150.
- Wolff, Edward (2017) *A Century of Wealth in America*, Harvard University Press: Cambridge, MA

Figure 1: U.S. Wealth Concentration in the Survey of Consumer Finances  
Varying Concept and Coverage

Share of wealth held by top one percent of families



The figure graphs estimated wealth concentration among the wealthiest one percent of U.S. families from the Survey of Consumer Finances (SCF) between 1989 and 2019, incrementally adjusting the SCF as described in the text. The short-dashed black line displays estimates from the base SCF. The long-dashed black line adds wealth from defined benefit (DB) pension assets to the base SCF. The dotted black line adds *Forbes* 400 families and DB pension assets to the base SCF. The solid black line is estimated concentration from the “fully augmented” SCF, which adds wealth from adult financial independents in the same household, *Forbes* 400 families, and DB pension assets to the base SCF. The grey dotted and dashed lines replicate adjustments to the SCF proposed by Saez and Zucman (2020a)—labeled SZZ20—and Smith, Zidar, and Zwick (2020)—labeled SZZ20—respectively. Source: Authors’ calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances.

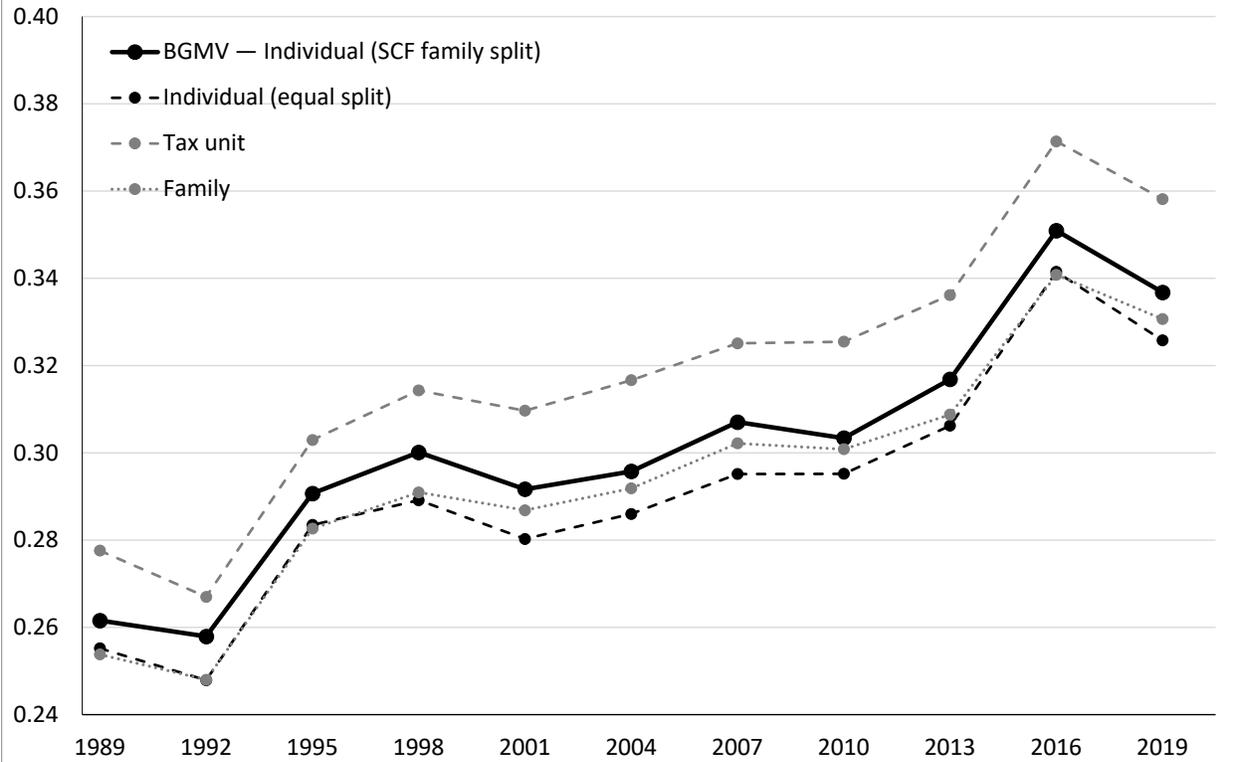
Table 1: U.S. Wealth by Gender and Family Structure

	Share of U.S. wealth by family type			Male share of wealth in U.S. couples Overall and by major asset type							Male share of U.S. wealth
	Single men	Single women	Couples	Overall	Pension	Fixed income	Business	Other	<i>Directly held stock</i>	<i>Housing</i>	
1989	0.09	0.11	0.80	0.62	0.85	0.50	0.65	0.52	<i>0.50</i>	<i>0.50</i>	0.59
1992	0.10	0.13	0.77	0.64	0.81	0.51	0.67	0.51	<i>0.50</i>	<i>0.50</i>	0.59
1995	0.10	0.13	0.77	0.62	0.79	0.50	0.64	0.51	<i>0.50</i>	<i>0.50</i>	0.58
1998	0.09	0.12	0.78	0.64	0.83	0.50	0.68	0.50	<i>0.50</i>	<i>0.50</i>	0.59
2001	0.09	0.09	0.82	0.63	0.80	0.51	0.67	0.51	<i>0.50</i>	<i>0.50</i>	0.60
2004	0.10	0.11	0.79	0.62	0.77	0.51	0.67	0.51	<i>0.50</i>	<i>0.50</i>	0.59
2007	0.09	0.12	0.79	0.62	0.77	0.51	0.68	0.50	<i>0.50</i>	<i>0.50</i>	0.58
2010	0.09	0.11	0.80	0.62	0.76	0.51	0.65	0.50	<i>0.50</i>	<i>0.50</i>	0.59
2013	0.09	0.10	0.81	0.62	0.75	0.51	0.66	0.50	<i>0.50</i>	<i>0.50</i>	0.59
2016	0.10	0.10	0.80	0.61	0.72	0.51	0.68	0.46	<i>0.50</i>	<i>0.50</i>	0.59
2019	0.09	0.10	0.81	0.61	0.71	0.51	0.67	0.46	<i>0.50</i>	<i>0.50</i>	0.58

The table displays estimated wealth shares from the fully augmented Survey of Consumer Finances (SCF), as defined in Figure 1, between 1989 and 2019. The left panel displays the share of wealth held by different types of families (single men, single women, and couples, respectively). The middle panel displays male wealth shares within couples, overall and for major asset types. Ownership for the italicized categories—directly held stock and housing—is not observed in the SCF and is assumed to be joint. The right panel displays the male share of wealth for the population. The estimates in the table include financially independent members of households but exclude the wealth of adults that are financially dependent on an SCF family but are neither the household head nor his partner. Source: Authors' calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances.

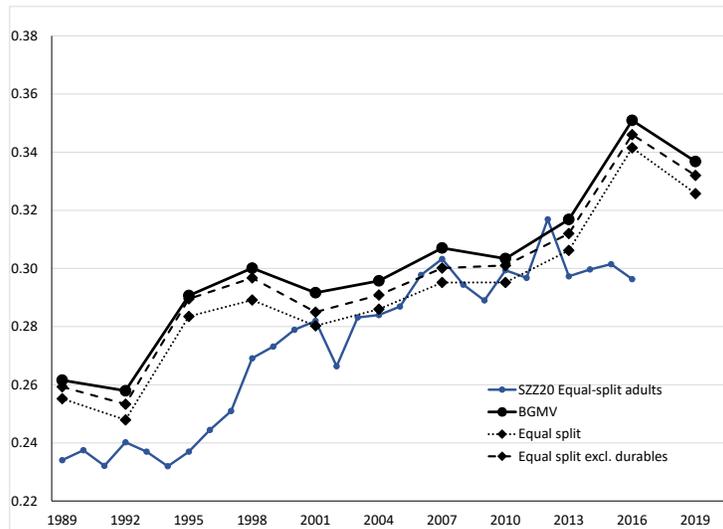
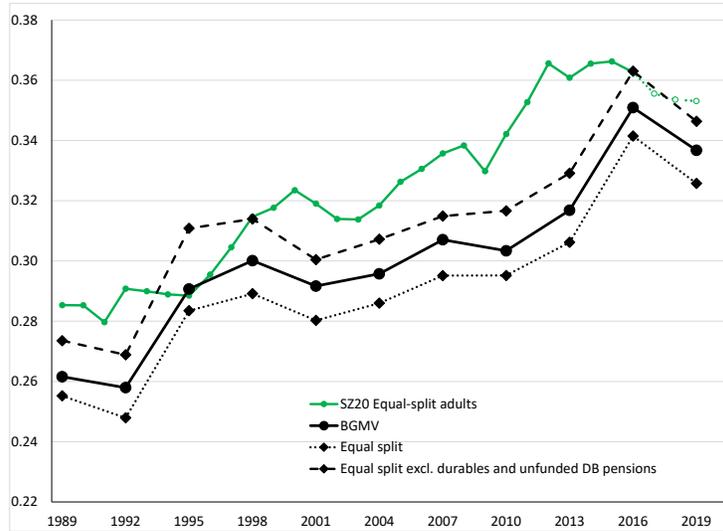
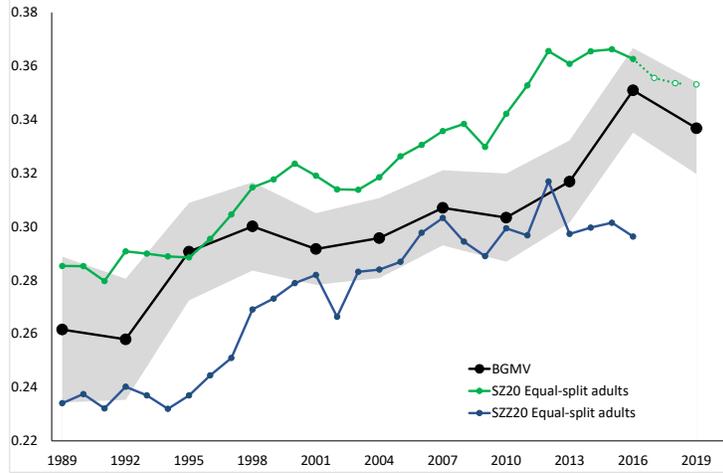
Figure 2: U.S. Wealth Concentration in the Survey of Consumer Finances  
 Varying Unit of Analysis

Share of wealth held by top one percent of distribution



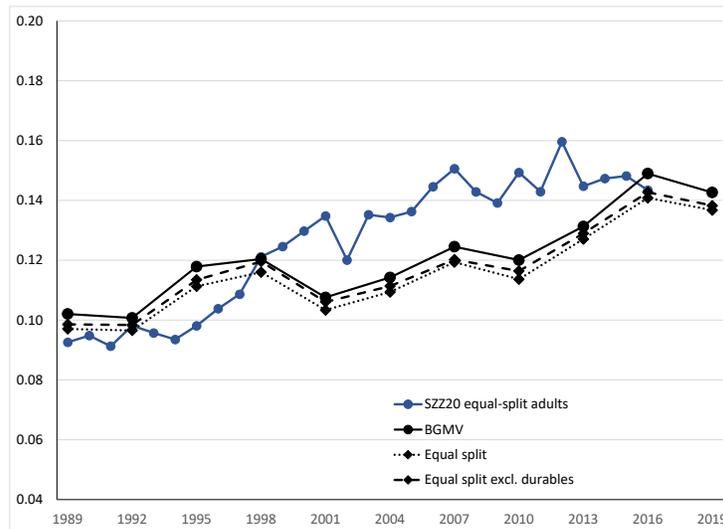
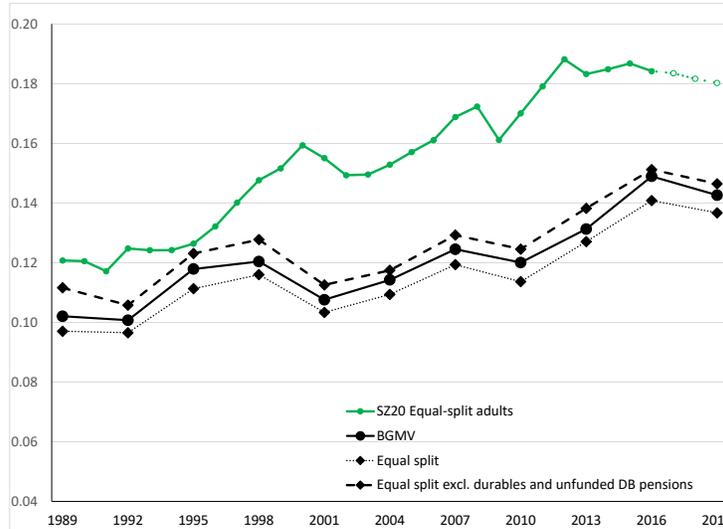
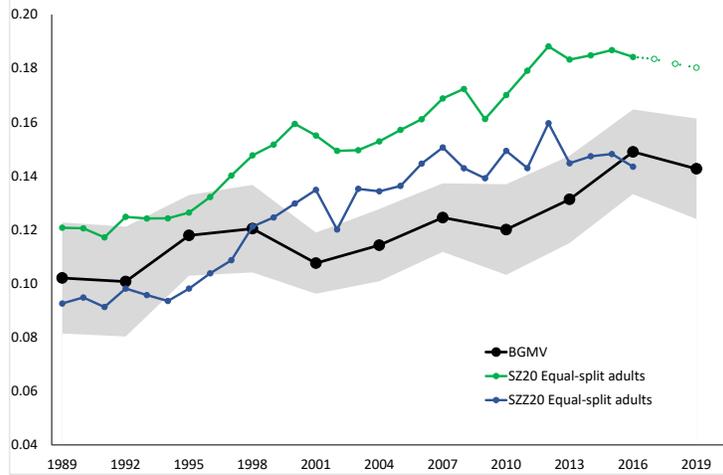
The figure graphs estimated wealth concentration among the top one percent of the distribution from the fully augmented Survey of Consumer Finances (SCF), as defined in Figure 1, between 1989 and 2019, recasting the SCF data into alternate units of analysis. The dotted grey line depicts concentration among the top percent of families, the unit of observation in the SCF (but including financially independent members of the household), and the dashed grey line among the top percent of tax units. The black lines depict concentration among the top percent of individuals, whereby the solid black line—BGMV—splits wealth within couples leveraging the detailed asset ownership information in the SCF and the dashed black line follows current standard practice and splits wealth equally within couples. Source: Authors' calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances.

Figure 3: Reconciling Estimates of U.S. Wealth Concentration  
Share of wealth held by top one percent of individuals



The figure graphs estimated wealth concentration among the wealthiest one percent of individuals from the fully augmented Survey of Consumer Finances (SCF), as defined in Figure 1—labeled BGMV—and the capitalization models proposed by Saez and Zucman (2020a)—labeled SZ20—and Smith, Zidar, and Zwick (2020)—labeled SZZ20—between 1989 and 2019. The top panel depicts the main estimates from each, the middle panel incrementally conceptually aligns our estimates with SZ20 (splitting wealth equally within couples and removing unfunded DB and consumer durable assets, respectively), and the bottom panel incrementally conceptually aligns our estimates with SZZ20 (splitting wealth equally within couples and removing consumer durable assets, respectively). Our estimates are plotted in black, SZ20's in green, and SZZ20's in blue. The shaded region around the solid black line in the top panel represents the 95 percent confidence interval for the BGMV estimates. Source: Authors' calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances; Saez and Zucman (2020a).

Figure 4: Reconciling Estimates of U.S. Wealth Concentration  
Share of wealth held by top 0.1 percent of individuals



The figure graphs estimated wealth concentration among the wealthiest 0.1 percent of individuals from the fully augmented Survey of Consumer Finances (SCF), as defined in Figure 1—labeled BGMV—and the capitalization models proposed by Saez and Zucman (2020a)—labeled SZ20—and Smith, Zidar, and Zwick (2020)—labeled SZZ20— between 1989 and 2019. The top panel depicts the main estimates from each, the middle panel incrementally conceptually aligns our estimates with SZ20 (splitting wealth equally within couples and removing unfunded DB and consumer durable assets, respectively), and the bottom panel incrementally conceptually aligns our estimates with SZZ20 (splitting wealth equally within couples and removing consumer durable assets, respectively). Our estimates are plotted in black, SZ20's in green, and SZZ20's in blue. The shaded region around the solid black line in the top panel represents the 95 percent confidence interval for the BGMV estimates. Source: Authors' calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances; Saez and Zucman (2020a).

## Appendix A. SCF sampling and validation

The Survey of Consumer Finances (SCF) combines a geographically stratified and nationally representative area probability (“AP”) sample with a list (“LS”) sample, an oversample of households that are likely to be wealthy. The AP sample is drawn by NORC at the University of Chicago and provides a nationally-representative sample of families.<sup>1</sup> The SCF oversamples the top of the wealth distribution by modeling wealth using administrative data derived from income tax records, and by verifying that the top is represented using targeted response rates in wealth strata formed from these models, described below.

There is no administrative data system in the U.S. that yields a cross-section of household wealth. Thus, the list sample depends on inferring wealth from administrative records derived from income tax returns—the Individual and Sole Proprietor (INSOLE) data file maintained by SOI (Statistics of Income, 2012).<sup>2</sup> The INSOLE file is a sample of tax filings from the IRS administrative tax data, statistically edited for quality by SOI. In the list sampling process, wealth is inferred from these income records through two models that relate wealth to income. From 2001 on, the SCF list sample has been drawn using multiple years of income for the returns in the frame.

### i. Sampling models

The SCF sampling strategy uses two methods of predicting wealth from income. The process of selecting the list sample has evolved since the current SCF began in 1989, as more refined models for selecting wealthy respondents have been introduced, including moving from cross-section to panel-based administrative records in order to better control for transitory income fluctuations (Kennickell, 2005; Kennickell, 1998). In the 2019 SCF, for example, the income is a three year panel of the 2016 INSOLE file, and average income passed through the model is defined:  $\overline{income}_i^{k,2016-14} = 0.5 \times income_i^{k,2016} + 0.3 \times income_i^{k,2015} + 0.2 \times income_i^{k,2014}$  for each type of income  $k$  and tax unit  $i$ .

The first method of predicting wealth from income is a “capitalization model,” generated by inflating asset-based income in each tax record by an asset-specific rate of return, and then by adding a predicted housing value (Greenwood, 1983).

The general form of the 2019 SCF capitalization model is:

$$\widehat{wealth}_i^{cap} = \widehat{house}_i + \sum_{\forall k} [\overline{income}_i^{k,2016-14} / r^k],$$

where there are  $i=1 \dots N$  tax units,  $K$  types of income and  $r_k$  is the rate of return on the  $k$ -th type of income, and rates of return are based on recent market rates. There are six types of income in the SCF model:

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<sup>1</sup> See Tourangeau, et al. (1993), and O’Muircheartaigh et al. (2002) for more information on the NORC samples.

<sup>2</sup> The INSOLE file consists of a sample of individuals and sole proprietorship tax filings from the IRS administrative tax data, statistically edited for quality by SOI.

taxable interest, non-taxable interest, dividend income, rents and royalties (in absolute value), business, farm, and estate income (in absolute value), and capital gains (in absolute value). The income fed into the model is a weighted average of three years of income, as using multiple years of income data to identify wealthy individuals helps to smooth over the effects of transitory income fluctuations that are especially prevalent for capital incomes and at the top of the distribution.

The second method of predicting wealth from income uses the empirical correlation between wealth collected in the SCF and income from the administrative sampling data. The basis for this “empirical correlation model” is a regression of observed SCF wealth from the most recent SCF on the administrative income used to generate the SCF list sample for that survey year. For example, in selecting the 2019 SCF, the data used are:

$$\ln(SCF\ wealth_i^{2016}) = \ln(\overline{Income}_i^{2014-11})\beta + \varepsilon_i.$$

The matrix of sampling income for the previous SCF ( $\overline{Income}_i^{2014-11}$ ) consists of more than 30 logged income variables and a dummy indicating the presence of such income for that tax unit, plus some basic demographic data. The  $\hat{\beta}$  from this regression model is then applied to the 2019 SCF administrative sampling data to obtain a predicted wealth index for the “correlation” model:

$$\widehat{wealth}_i^{Corr} = f(\overline{Income}_i^{k,2016-14}; \hat{\beta}).$$

In contrast to the capitalization model, key differences with the empirical correlation model are that it allows a variety of income variables that are not necessarily based on a physical asset and allows rates of return to vary across different types of families.

The capitalization and empirical correlation models generate two independent sets of rankings—or wealth “indices”—so that each tax record has two rankings. Ultimately the information from both is used to generate an overall wealth ranking from a blended index. Once ordered by wealth, the records are organized into seven sampling strata, and randomly sampled within each strata. Within each stratum, the SCF keeps interviewing until a minimum number of households respond.

## ii. Sampling model performance

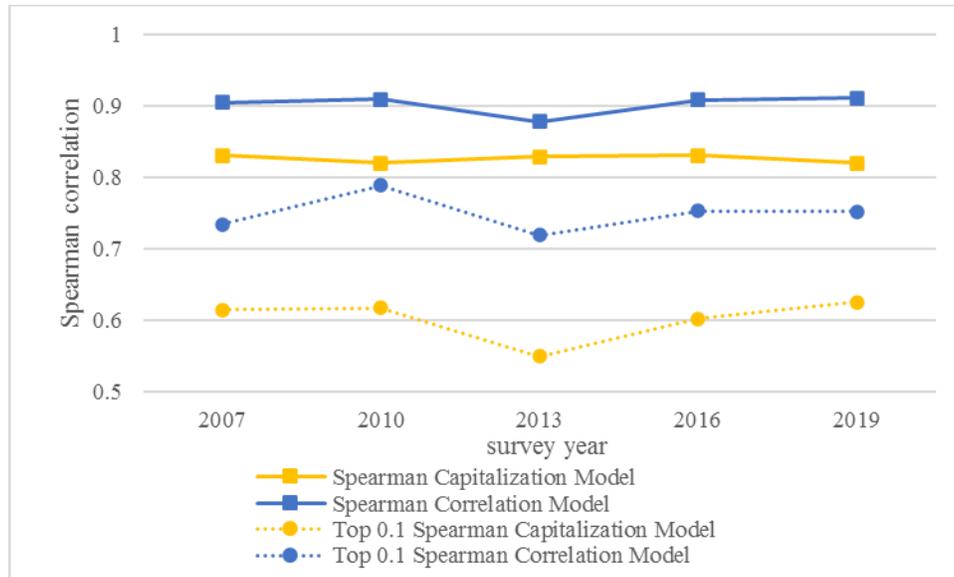
Can the wealth models predict which tax filer is wealthy? Using a Spearman rank correlation, we compare wealth rankings from the SCF to predicted wealth from each sampling model for the list sample respondents (figure A.1). The Spearman rank correlation using the capitalization model (solid yellow line) is much lower than the correlation model (solid blue line), indicating that the correlation model, on average, better predicts wealth rankings.

Restricting attention to the top few strata, which approximates the top 0.1 percent of the wealth distribution, the correlation model does a much better job than the capitalization model. Among families

in this segment, the Spearman correlation is about 0.6 for the capitalization model in recent years (dotted yellow line) and about 0.75 for the correlation model (dotted blue line). Further, in 2010, the degree to which the correlation model outperforms the capitalization model increases.

Finally, the fact that the correlations for both models are higher for the overall list sample than at the very top of the distribution speaks to the difficulty modeling wealth from income in this segment.

**Figure A.1: Spearman rank correlations between observed and modeled wealth of SCF respondents**



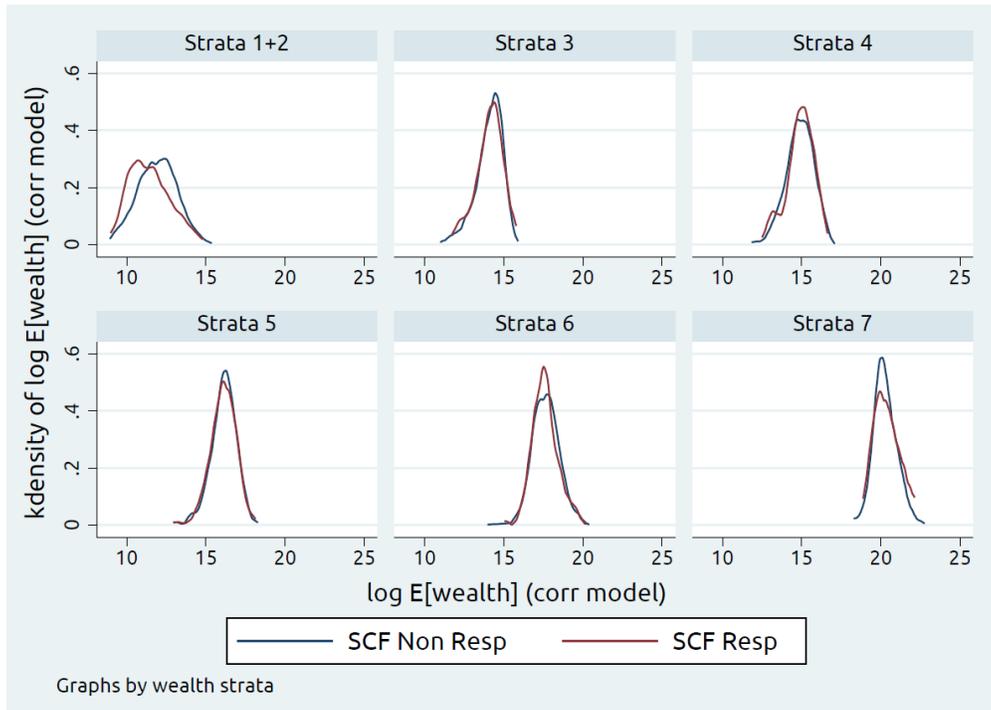
Note: this figure describes the Spearman rank correlation between wealth observed in the SCF and the wealth predicted under sampling models for SCF families selected in the wealthy oversample. The two models used in the oversample are a “correlation model” and a “capitalization model,” and the figure shows that the “correlation model” is generally more highly correlated with SCF wealth rankings, especially for the wealthiest families. Source: Authors’ calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, and U.S. Internal Revenue Service, Statistics of Income Division, INSOLE File.

### iii. Representativeness of SCF respondents

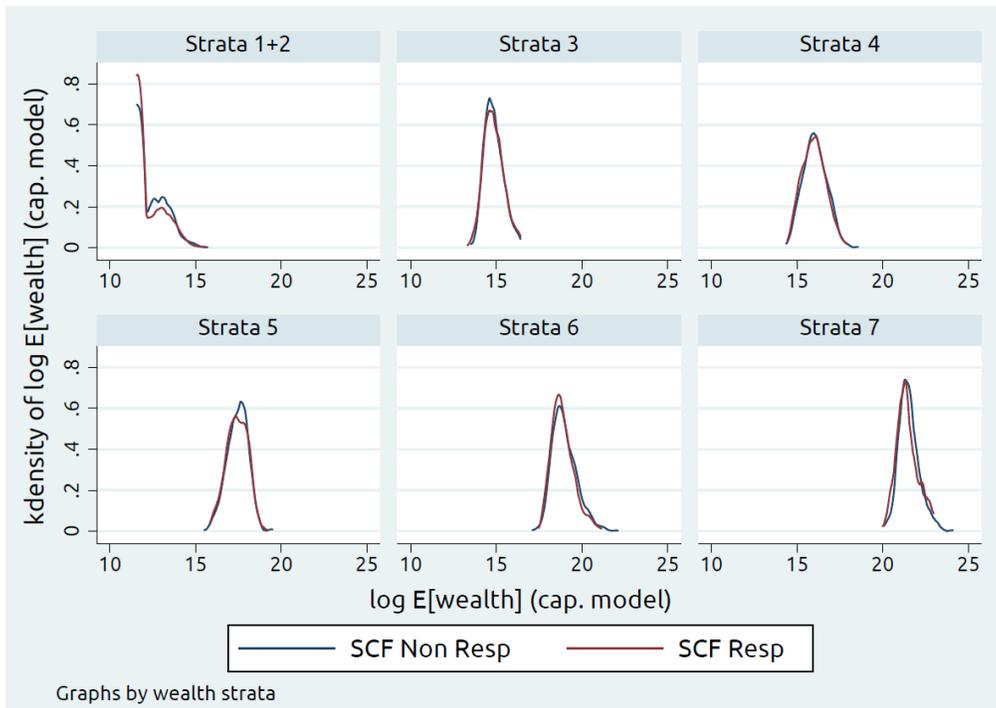
The sampling strategy of the SCF ensures that families across the upper reaches of the wealth distribution will be sampled and participate. We can further investigate the representativeness of the upper tail in the SCF by comparing predicted wealth under each sampling model among families that responded to the SCF and those that were sampled and did not respond. Figure A.2 compares the distributions of predicted wealth for respondents and nonrespondents in each sampling strata. The set of respondents in each stratum resemble the set of nonrespondents, implying that, even within thin sampling strata, nonresponse by wealthy oversampled families is ignorable.

**Figure A.2: Modeled wealth from income tax data: 2016 SCF respondents, nonrespondents**

Panel A: Correlation model



Panel B. Capitalization model



Note: this figure shows the distribution of expected wealth—described with a kernel density—of sampled SCF respondents and nonrespondents, grouped by sampling strata. Visually, the distribution of respondents (red lines) and nonrespondents wealth (blue lines) appears similar, and Kolmogorov-Smirnov tests fail to reject the null of equality of distribution, indicating that the set of SCF respondents can represent the nonrespondents in this

dimension. This figure also shows that the set of SCF respondents comes from across the wealth distribution, as each strata has increasing expected wealth. Source: Authors' calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, and U.S. Internal Revenue Service, Statistics of Income Division, INSOLE File.

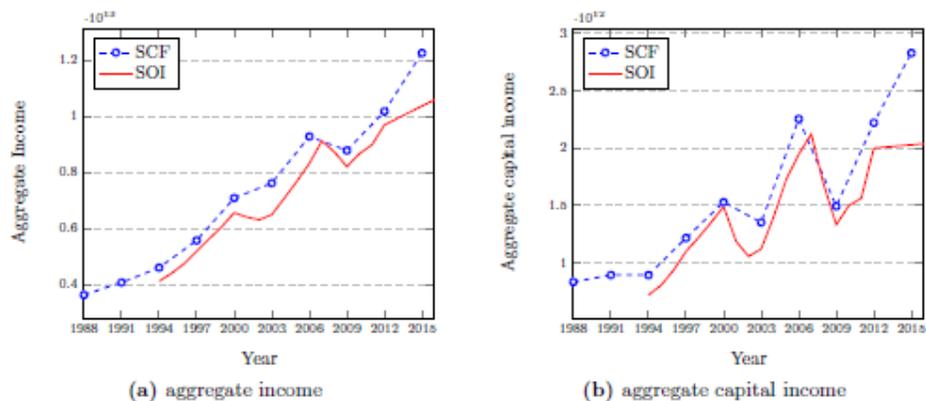
iv. Accuracy of self-reported income in the SCF

Administrative income tax data are subject to mandatory reporting and are thus useful for benchmarking income data from surveys. Below, we compare total income—namely, wages, capital income (from taxable and non-taxable interest, dividends, capital gains, plus business income from both Schedule C and Schedule E), pensions (Social Security, DB and DC payouts), and unemployment—and capital income in the SCF to public-use SOI data, augmented to match INSOLE aggregates (Saez 2016).<sup>3</sup>

We make two simple adjustments to the income tax data for this comparison. First, we include an estimate for non-filers and, second, assume that nearly all high-earning couples file jointly. Figure A.3 shows that total income and capital income aggregates generally are similar in both level and time trend across the two data sources, including when restricting to the top 0.1 percent of families.<sup>4</sup>

**Figure A.3: Aggregate income in SCF and income tax data**

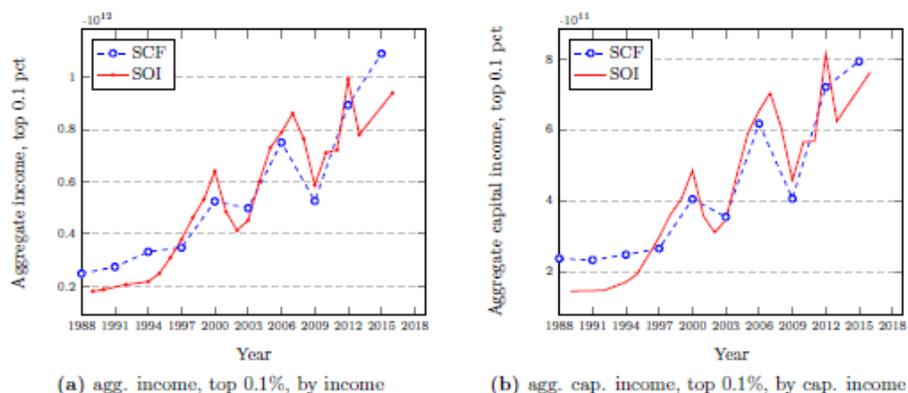
Panel A. Total income and capital income



Panel B. Total income and capital income of top 0.1% of income distribution

<sup>3</sup> We thank Emmanuel Saez for providing these data.

<sup>4</sup> Our last year of SOI income data is for tax year 2015 (that is, the 2016 SCF), so we cannot compare the recently-released 2018 income (from the 2019 SCF) to recent vintages of SOI data. While the two sources diverge a bit in 2015, published aggregates by SOI line up well for 2018.



Note: panel A of this figure shows aggregate total and capital income in the SCF and administrative tax data, where total and capital income are defined in the text. Panel B shows aggregate total income and capital income of the top 0.1 percent as ranked by (a) total income and (b) by capital income. Source: Authors' calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances, and U.S. Internal Revenue Service, Statistics of Income Division, Individual Public Use Tax File.

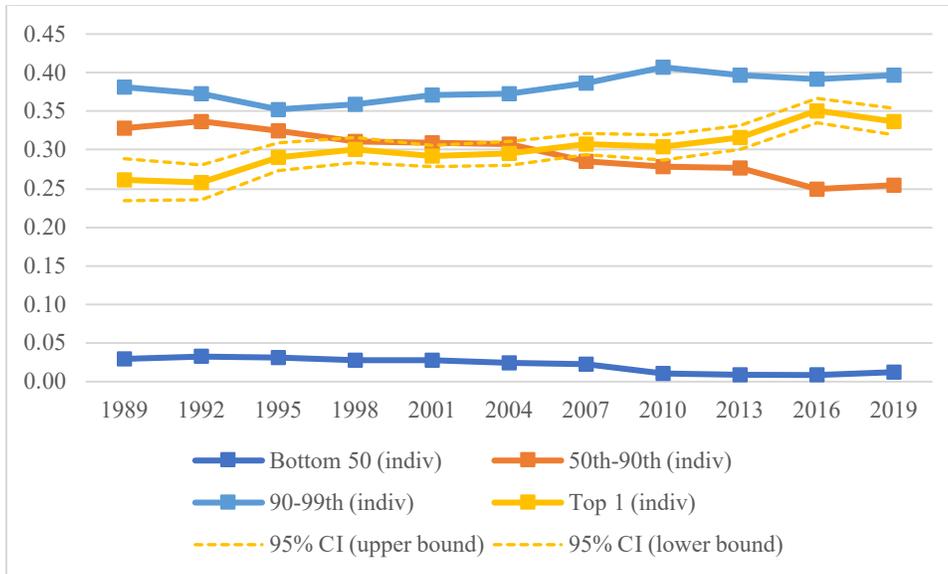
### Appendix B. Rest of the distribution

Figure B.1 describes the distribution of wealth across four wealth groups: the least wealthy 50 percent of individuals (“bottom 50”), the 50<sup>th</sup>-90<sup>th</sup> percent, the 90-99<sup>th</sup> percent, and the wealthiest 1 percent (top 1) of individuals. The wealth concept is the fully augmented measure from the main paper—including DB pensions, *Forbes* 400 families, and financially independent adults—and defined at the individual level.

The share of wealth held by each of the four wealth groups exhibited small changes between 2016 and 2019. Half of the statistically insignificant decline in the share of wealth held by the top 1 percent discussed in the main text was picked up by the Next 9 wealth group. As a result, the top 10 percent of individuals held about the same share of wealth in 2019 (73.3 percent) as they did in 2016 (74.2 percent). The other half shifted to the 50<sup>th</sup>-90<sup>th</sup> percent, whose wealth share increased from 24.9 to 25.5 percent. The Bottom 50 group held about the same share of U.S household wealth in 2019 as they did in 2016.

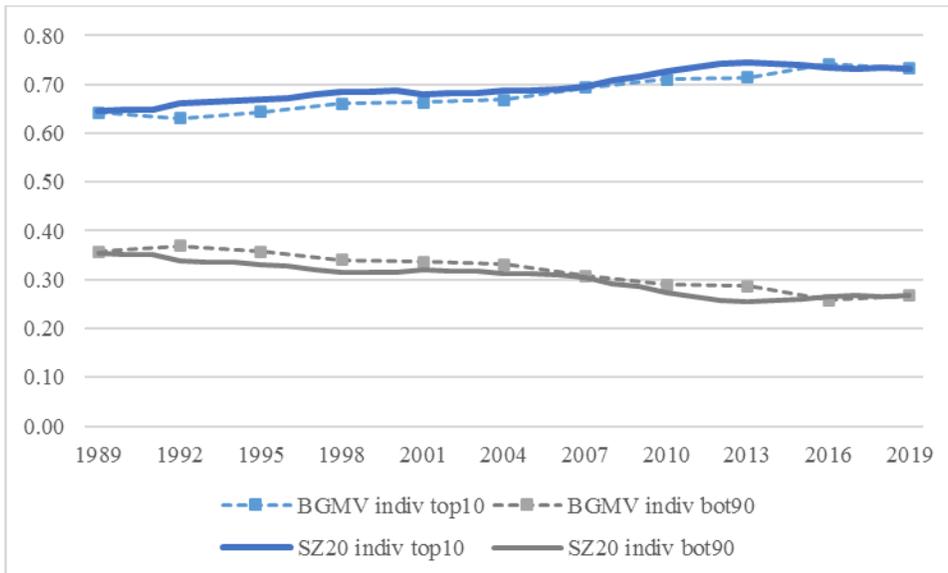
Looking over the longer 1989-2019 period, individuals outside of the top 10 have seen a steady decline in their share of wealth in both the individual-level estimates shown here and those shown in SZ20 (Figure B.2) and SZZ20 (figure 10 in SZZ20, who do not make the underlying data available).

### Figure B.1: Share of wealth held across the wealth distribution by individuals



Note: this figure shows the share of wealth held by individuals in the BGMV estimates during the 1989-2019 period. The dashed lines indicate a 95% confidence interval surrounding the estimate of the share of wealth held by the wealthiest 1 percent. Source: Authors' calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances.

**Figure B.2: Share of wealth held across the distribution by individuals in BGMV and SZ20**



Note: this figure shows the share of wealth held by the top 10 percent and bottom 90 percent of individuals in the BGMV and SZ20 estimates. Trends and levels are broadly consistent with each other, helping to show that most of the discrepancies between the BGMV and SZ20 estimates occur at the top of the wealth distribution. Source: Authors' calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances; appendix figure 1 from Saez and Zucman (2020b).

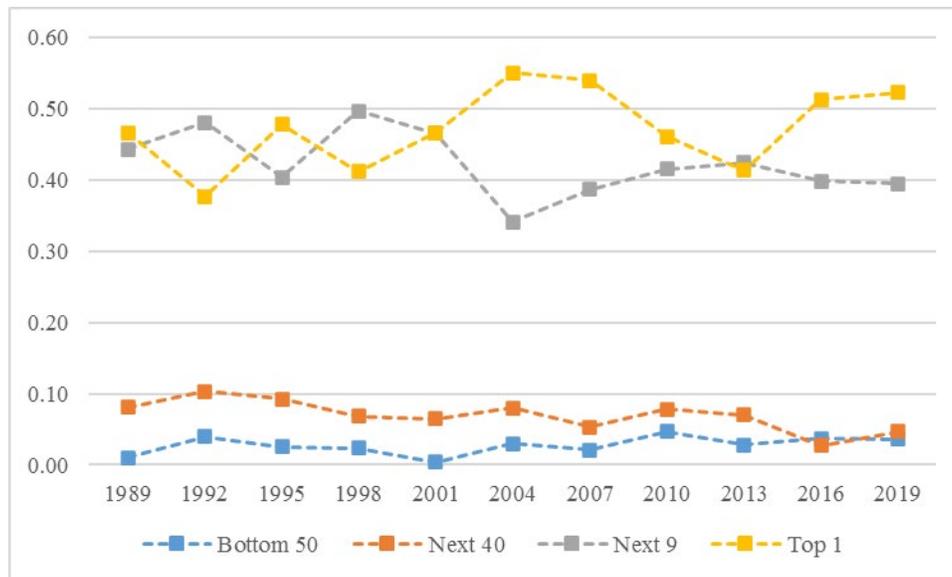
## Appendix C. Income, wealth, and portfolios

### i. Income-wealth relationship

The separate observations of wealth and income in the SCF microdata are useful for illustrating the strength of the relationship between the two measures of economic well-being, speaking to assumptions baked into the capitalization method. Figure C.1 graphs the income distribution for the wealthiest 1 percent of tax units over the 1989-2019 period. While most of the wealthiest tax units are also near the top of the income distribution, a majority of these households do not earn in the top percent—the share is usually between 40 and 50 percent.

Looking over the time series, the degree of overlap between high wealth and high income was relatively low around the Financial Crisis, when estimates of wealth concentration in SZZ20 and SZ20 begin to deviate considerably from each other and our estimates.

**Figure C.1: Income distribution for wealthiest 1 percent, 1989-2019 SCF**



Note: this figure describes the income distribution of the wealthiest 1 percent of SCF tax units in the 1989-2019 surveys. The yellow line, for example, shows that the share of the wealthiest 1 percent that are also in the top 1 percent of the income distribution ranges from about 38 percent (in the 1992 SCF) to about 55 percent (in the 2004 SCF). The share of the wealthiest 1 percent that are in the 90-99<sup>th</sup> percent of the income distribution (the “Next 9” percent) ranges between 34 percent (2004 SCF) and 50 percent (1998 SCF), and has been closer to 40 percent in recent years. Source: Authors’ calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances.

ii. Wealthy portfolios in BGMV and SZ20

Portfolios for the wealthiest 0.1 percent of individuals from SZ20 (appendix figure 24 in SZ20) and our main estimates are presented in the top and bottom panel, respectively, of Figure C.2.<sup>5</sup>

<sup>5</sup> Forbes families in our data are assumed to have the wealth composition of the SZ20 wealthiest 0.1 percent.

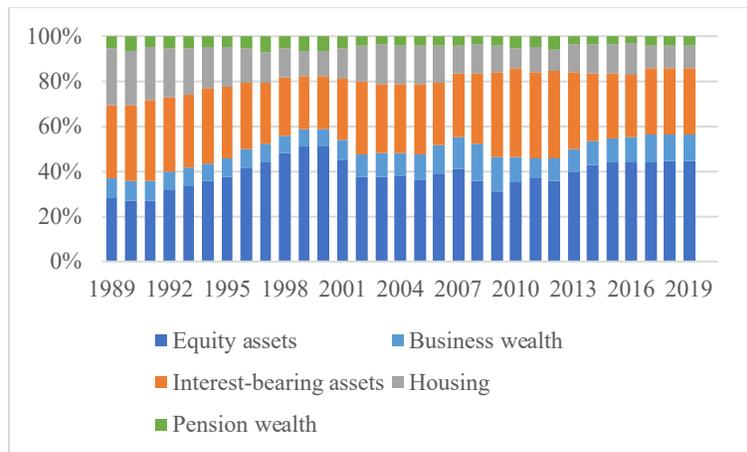
In the aftermath of the Financial Crisis, both public and private business asset prices increased, and these assets have helped boost the share of wealth held by the wealthiest 0.1 percent of individuals. Our estimated wealthy portfolio mirror aspects of the SZ20 wealthy portfolios post-Crisis. In both our and SZ20’s wealthy balance sheet, equity asset prices—whether private or public equity—have helped boost wealth concentration post-Crisis.

But the SZ20 wealthy portfolio implies heavy portfolio rebalancing in and around the Financial Crisis that is not seen in our estimates. SZ20’s wealthy realigned their portfolios from 2009-2012, shifting away from equities and moving into fixed assets. In fact, they re-aligned so much that their share of overall assets increased 2009-2012 because the value of those safe assets became more valuable than the risky assets they moved away from. The wealthy then rebalance—in a one-for-one fashion—into equities 2013-2016. Absent that 2009-2012 rebalancing and surge in value in safe assets, the wealth concentration trend in SZ20 would mirror ours in and around the Financial Crisis.

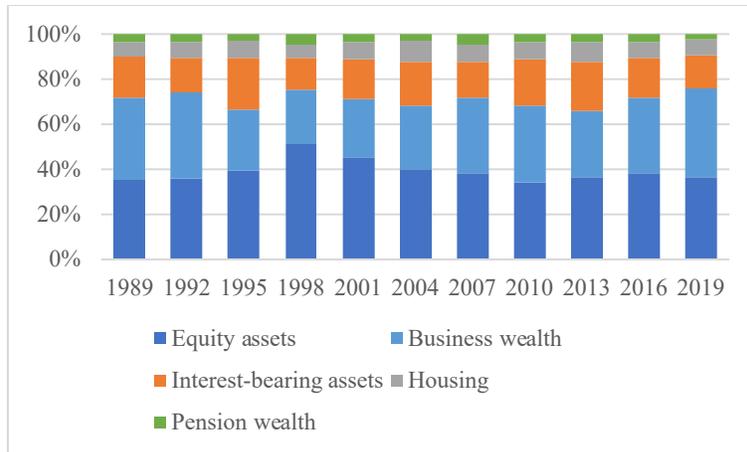
Comparing our estimates with SZZ20, wealthy portfolios are nearly identical in 2016—the one year available in SZZ20. Both are similar to wealthy portfolios around the world (Bricker and Volz, 2020).

**Figure C.2: Wealthy portfolios**

Panel A: SZ20



Panel B: BGMV



Note: this figure shows the portfolio of the wealthiest 0.1 percent of individuals estimated by SZ20 (top panel) and BGMV (bottom panel). Equity assets include both public and private C and S Corporations (directly-held), and business wealth includes all other forms of private business equity. Pension wealth includes all assets in DB and DC pension plans and in IRAs. Interest-bearing assets include checking and savings accounts and directly-held bonds. In the BGMV estimates, we assume that the Forbes families have the portfolio of the top 0.1% in the SZ20 portfolio. Source: Authors' calculations using Board of Governors of the Federal Reserve System (U.S.), Survey of Consumer Finances; figure 24 from Saez and Zucman (2020b).