Wealth Inequality and Return Heterogeneity during the COVID-19 Pandemic*

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Abstract

Wealth inequality in the U.S., measured by the top 1% wealth share, experienced dramatic changes in the first year of the COVID-19 pandemic. Economic theory suggests that the key to understanding wealth inequality is heterogeneity in the return to net worth across households. To understand the dynamics of wealth inequality during the COVID-19 pandemic, we develop a novel methodology that allows us to estimate the returns to net worth for different groups of households at relatively high frequency. We show that portfolio heterogeneity and asset price movements are the main determinants of wealth returns and inequality, whereas saving-rate heterogeneity and within-class return differences played a minor role. As the stock market continued to outperform the housing market, the return of the wealthy has risen faster than that of other households, reinforcing the wealth concentration at the top. We also document a widening racial return gap between white and black households later in the pandemic. Nearly all of the racial differences in the wealth return, however, are explained by the differences in wealth, not by race itself. Whereas the previous literature has evaluated return heterogeneity and its implications for long-run wealth inequality in low-frequency data, our analysis suggests that return heterogeneity together with large asset price movements is also key to understanding short-run dynamics in wealth inequality.

Keywords: COVID-19, wealth inequality, asset prices, returns to wealth, heterogeneity, racial wealth gap.

JEL Codes: D31, E21, G11, G51.

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1 Introduction

Wealth inequality in the U.S. measured by the top 1% wealth share experienced dramatic changes in the first year of the COVID-19 pandemic. According to the Federal Reserve Board's distributional financial accounts (DFA), this share fell sharply at the beginning of the pandemic from 31% to 29.9% (the largest quarterly decline since 2008Q4), rebounded quickly in the following months, and continued to increase. By the end of March 2021, it reached 32.1%, the highest since the DFA data started in 1989.[1] These movements are in sharp contrast to those in the previous two recessions, when the top wealth share had fallen for several years before slowly returning to the pre-recession levels (Figure 1).

While the existing literature has largely focused on the long-run change in the wealth distribution and wealth inequality, understanding their short-term fluctuations is crucial from a policy point of view. First, stabilization policies designed to support consumer spending and labor markets during recessions need to take into account household wealth, which matters for the marginal propensity to consume and the elasticity of labor supply (Ganong et al. (2020)). Second, policies aiming to address income inequality in the short run may have unintended effects on wealth inequality. Low interest rates, for example, help raise the employment and income of disadvantaged workers, but may amplify wealth inequality by inflating asset prices (Bartscher et al. (2021)). Third, even transitory shocks can have persistent effects on wealth inequality because wealth is a slowly moving variable that accumulates the effects of past shocks (Bayer et al. (2020)).

Economic theory suggests that the key to understanding wealth inequality is the difference in the returns to wealth across households (Benhabib et al. (2011); Benhabib et al. (2019); Gabaix et al. (2016)). Intuitively, if wealthier households earn higher returns, all else equal, their net worth will grow at a faster rate, further pushing up their share of aggregate wealth and wealth concentration. Traditionally, the empirical literature has focused on using low-frequency data to assess the degree of heterogeneity in wealth returns and its implications

[1] Due to the lack of high-quality administrative data for U.S. household wealth, various attempts have been made to measure the wealth distribution. Alternative measures of top wealth shares based on household surveys (Kuhn et al. (2020)) or income-tax records (Saez and Zucman (2016); Smith et al. (2020); Mian et al. (2020)), however, have lower frequencies and are unavailable in real time.

for wealth inequality in the long run (Fagereng et al. (2020); Bach et al. (2020); Cao and Luo (2017); Xavier (2021)). The recent heterogeneous-agent macroeconomic literature has stressed the importance of asset price changes in shaping wealth inequality in short and medium terms (Hubmer et al. (2021); Fagereng et al. (2019)).

In this paper, we focus on the COVID-19 pandemic period, when economic activity and asset prices experienced substantial movements, to address four main questions: (i) how returns to wealth evolved during the COVID-19 pandemic for households in different parts of the wealth distribution, (ii) what accounted for return heterogeneity over this period, (iii) to what extent return heterogeneity, as opposed to saving-rate heterogeneity, accounted for the change in wealth inequality during this time, and (iv) how returns to wealth evolved for different racial groups, such as white and black households, during the pandemic and whether the racial gap in the wealth returns merely reflects differences in wealth.

The ideal data for addressing these questions would contain information on households' wealth holdings of various assets and debt, as well as the associated flow income and payments in real time. Such data are not available for the United States.[2] We develop a novel methodology that uses the Survey of Consumer Finances (SCF) and real-time aggregate financial and economic data to measure the return to net worth at monthly frequency for different groups of households. The return to net worth is the weighted average of the returns to individual wealth components. The SCF data contain information that can be used to construct the weights (i.e., portfolio shares) and the returns to individual wealth components before the pandemic at the household-group level. The real-time aggregate data, on the other hand, can be used to infer the changes in the returns to individual wealth components over the course of the pandemic. With these two sources of data, our approach provides estimates of the wealth returns nearly in real time while preserving return heterogeneity across household groups.

We start by presenting two key findings on the returns to U.S. household wealth during

[2]Household surveys such as the Panel Study of Income Dynamics (PSID) and the Survey of Consumer Finances (SCF) contain comprehensive information on household wealth, but are available only every two or three years and with significant delay in data releases. Alternative data on bank account balances (e.g., checking/savings accounts and credit cards) only have information on liquid assets and credit-card debt (e.g. Ganong et al. (2020)), which as we show in Section 3 account for a small fraction of overall household wealth.

the COVID-19 pandemic. First, the average return to net worth (over 12 months) fell sharply in the first two months of the pandemic to approximately 0% (from 8.0% in February 2020), rebounded quickly in 2020Q2, and continued to rise. By February 2021, the average return to net worth is estimated to reach 13.1%. Second, we find substantial heterogeneity in the return to net worth during this period. Households at the top of the wealth distribution experienced steeper initial declines in their returns, resulting in a narrower or even negative return gap between the wealthy and other households. Later in the pandemic, however, this return gap increased and exceeded the pre-pandemic level. By February 2021, for example, the top 1% households earned an annual return of 17.3%, in contrast to an 11.2% return earned by the bottom 99% households. This implies a return gap of 6.1 percentage points (pp), which is 2.4 pp higher than the pre-pandemic gap. The widening of the return gap is consistent with rising wealth inequality.

What caused variation in the wealth return over time and across households? By construction, changes in the wealth return are determined by portfolios (i.e., shares of wealth invested in individual components before the pandemic) and changes in the returns to individual wealth components during the pandemic. For the average household, the primary residence, public equities and private businesses account for the largest shares of wealth, making their corresponding returns the key determinants of the return to net worth. We show that the initial decline in the average wealth return was almost entirely driven by the decline in the returns on stocks and private businesses, whereas the later recovery was driven by rising returns on residential properties in addition to the rebound of stock and private-business returns.

At the disaggregate level, returns evolved differently across households due to systematic differences in portfolios. Households at the top 1% of the wealth distribution, for example, hold two-thirds of their wealth in stocks and private businesses. As a result, their returns to net worth closely followed equity returns, which fell sharply early in the pandemic but surged later. In the lower quantiles of the wealth distribution, housing accounts for most of the wealth. As the return on housing stayed flat early in the pandemic and rose subsequently, the wealth returns of households in the middle and bottom parts of the wealth distribution (roughly below the 80th percentile) mirrored this path. Using counterfactual analysis, we

show that, given asset price movements, portfolio heterogeneity is the major source of cross-sectional variation in the wealth return, not return heterogeneity within narrow asset (debt) classes.

Having examined the role of household portfolios in explaining heterogeneity in wealth returns, we turn to the role of asset price movements in driving this heterogeneity during the pandemic. Through a series of counterfactual analyses, we show that changes in equity (both public and private) and house price growth explained almost all variation in the return gap between the top 1% and bottom 99% households (a measure of return heterogeneity). Fluctuations in equity price growth alone can generate the V-shape dynamics of the return gap but tend to overstate its level later in the pandemic. In contrast, higher house price growth later in the pandemic pushed down the return gap, but it alone explains little of the time variation in the return gap. Our results also suggest that the return gap widens when the equity market outperforms the housing market, and vice versa. We estimate that a 18 pp difference between annual equity price growth and annual house price growth as observed in early 2021 is associated with a 3 pp difference in the wealth return between the top 1% and bottom 99% of the wealth distribution. Moreover, the spread between equity price growth and house price growth can explain 99% of variation in the monthly return gap during the two recent recession episodes. These results highlight the importance of asset price movements in shaping return heterogeneity and wealth inequality in the short run.

So far we have abstracted from another potential determinant of wealth accumulation, notably, the saving rate, defined as the ratio of labor income net of consumption and taxes over initial wealth (also referred to as the active saving rate in the literature). Differences in the saving rate may amplify or offset differences in the wealth return, changing the rates at which households accumulate their wealth and hence wealth inequality. How important is return heterogeneity in explaining shifts in wealth inequality during the COVID-19 pandemic, compared to saving-rate heterogeneity? To answer this question, we estimate the saving rates for households in different parts of the wealth distribution during the pandemic. We show that heterogeneity in the wealth return alone helps to predict the top wealth share well, whereas the prediction based on saving-rate heterogeneity alone fails to capture key features of the top wealth share over this period. Consistent with Bach et al. (2020) and Fagereng

et al. (2019), our results indicate a relatively small net effect of labor income, consumption and fiscal transfers in shaping wealth inequality.

In the last part of the paper, we use our methodology to examine racial disparities in the wealth return during the COVID-19 pandemic. While both white and black households saw higher returns on their wealth one year after the pandemic, the gap between their returns ultimately increased, despite an initial decline. Unlike white households, black households have larger shares of their wealth in housing, lower shares in equities, and higher debt-to-asset ratios. This portfolio composition together with asset price movements during the pandemic largely explains the evolution of the racial return gap, not unlike the return gap between wealthy and other households. This observation raises the question of whether race has an additional effect on the wealth return, if we control for households' wealth status or portfolio differences. Through a multivariable nonparametric analysis using estimated returns at the household level, we show that nearly all of the racial difference in the wealth return was driven by differences in wealth and portfolios, rather than by race itself.

Related Literature. Our paper is closely related to the literature on rising wealth inequality in the United States and its causes. The key mechanism proposed in the literature is heterogeneity in the return to wealth (Benhabib et al. (2011); Benhabib et al. (2019, 2017); Gabaix et al. (2016); Hubmer et al. (2021); Cao and Luo (2017)). Evidence based on low-frequency data has provided empirical support for this mechanism (Fagereng et al. (2020); Bach et al. (2020); Cao and Luo (2017); Xavier (2021)). Another strand of the literature stresses the importance of changing asset prices in shaping wealth and inequality dynamics (Kuhn et al. (2020); Fagereng et al. (2019); Hubmer et al. (2021); Wolff (2017); Mian et al. (2020)). Our paper contributes to these strands of the literature by using a novel methodology to investigate wealth returns during the COVID-19 pandemic when asset prices and top wealth shares experienced substantial fluctuations, helping us to understand short-run dynamics in wealth inequality.

Our analysis also contributes to the recent discussion on racial disparities in wealth and their policy implications (Bartscher et al. (2021); Ganong et al. (2020); Boerma and Karabarbounis (2021); Gerardi et al. (2020)). We show that the racial return gap has

widened compared to the pre-pandemic level and that differences in the wealth returns across racial groups reflect differences in wealth. This suggests that, by raising the wealth returns of black households, policies that encourage these households to invest in riskier but higher-return assets (Boerma and Karabarbounis (2021)), that help them to refinance or restructure their debt (Gerardi et al. (2020)), and that provide support to minority and disadvantaged neighborhoods (Kermani and Wong (2021)) may help reduce racial inequality in wealth.

On the methodological front, our work is in the tradition of exploiting household survey data to understand wealth inequality and return heterogeneity (Kuhn et al. (2020); Wolff (2017); Xavier (2021); Cao and Luo (2017)). Our contribution is that we develop a novel method that combines low-frequency survey data with real-time financial and economic data to estimate returns at relatively high frequency. This helps policymakers to understand the sources of wealth inequality nearly in real time, which is particularly useful during times such as the COVID-19 pandemic and the Great Recession.

Finally, our paper adds to a very recent but burgeoning literature that addresses questions about the responses of household consumption, employment and income during the COVID-19 pandemic (e.g., Baker et al. (2020); Chetty et al. (2020); Cajner et al. (2020); Cox et al. (2020)). U.S. consumption rebounded quickly after the initial decline and has grown steadily since then. While most of the discussion in the literature and among policymakers has centered on the impact of fiscal stimulus, our analysis suggests that high returns to household wealth during the pandemic may have also supported the consumption recovery. The link between household wealth and consumption has been well understood in the literature (e.g., Case et al. (2005, 2013); Mian and Sufi (2011, 2014); Mian et al. (2013); Guren et al. (2021); Di Maggio et al. (2020)).

The remainder of this paper is organized as follows. Section 2 describes the data and methodology. Section 3 provides a detailed analysis of wealth returns during the COVID-19 pandemic, contrasted to the Great Recession episode. Section 4 assesses the role of asset price changes in explaining return variation over time and across households. Section 5 presents the estimates of the saving rates and quantifies the extent to which return heterogeneity

alone accounted for changes in wealth inequality during the pandemic. Section 6 examines racial disparities in wealth returns. Section 7 concludes.

2 Data and Methodology

2.1 Survey of Consumer Finances (SCF)

We use the SCF data to measure wealth portfolios at the onset of the COVID-19 pandemic and the Great Recession. The survey is essentially a triennial cross-sectional survey with 6,500 families interviewed in the latest 2019 wave. The data contain information on households' balance sheets, income, pensions and demographic characteristics, providing the most comprehensive view of U.S. wealth held at the household level.

We follow Bhutta et al. (2020) in defining asset and debt categories. Assets consist of financial and non-financial components. The former can be grouped into: (i) cash equivalents (i.e., assets earning zero returns, such as checking accounts and prepaid cards), (ii) interest-earning assets (which also include bonds indirectly held through savings accounts, mutual funds, retirement accounts, annuities, trusts, and managed investment accounts), (iii) directly and indirectly held stocks, and (iv) other financial assets. The non-financial assets include (i) primary residences, (ii) non-primary residential properties, (iii) non-residential real estate equity, (iv) private corporate and noncorporate businesses, (v) vehicles, and (vi) other non-financial assets. Total debt consists of (i) that secured by the primary residence, (ii) that secured by other residential properties, (iii) credit card debt, (iv) educational loans, (v) vehicle loans, and (vi) other debt.

Next, we describe how we estimate the returns to individual wealth components, which are then aggregated to the return to net worth. Our methodology requires two consecutive SCF surveys for each episode. We use the 2016 and 2019 waves for the COVID-19-pandemic episode and the 2004 and 2007 waves for the Great Recession.

2.2 Measuring Returns to Wealth and Wealth Components

Let $a_{j,i,t}$ and $d_{k,i,t}$ denote the value of asset j and the outstanding balance of debt k held by household i (or household group i) at the beginning of period t. Given J assets and K debt

categories, i's total assets are $a_{i,t} = \sum_{j=1}^{J} a_{j,i,t}$, total debt $d_{i,t} = \sum_{k=1}^{K} d_{k,i,t}$, and net worth $w_{i,t} = a_{i,t} - d_{i,t}$. Let $r^A_{j,i,t}$ and $r^D_{k,i,t}$ denote the household's (or the group's) return on asset j and debt k in period t, respectively. It is straightforward to show that the return on net worth, $r_{i,t}$, is the weighted average of the returns on individual wealth components,

$$r_{i,t} = \sum_{j=1}^{J} \theta^A_{j,i,t} \times r^A_{j,i,t} - \sum_{k=1}^{K} \theta^D_{k,i,t} \times r^D_{k,i,t}, \tag{1}$$

where the weight is the share of wealth invested in an asset or debt category, e.g., $\theta^A_{j,i,t} = \frac{a_{j,i,t}}{w_{i,t}}$ and $\theta^D_{k,i,t} = \frac{d_{k,i,t}}{w_{i,t}}$.[3]

Before describing how we measure the weights and the returns to individual wealth components, we point out two caveats of our analysis. First, due to the SCF's non-panel structure, we follow the literature in considering returns of synthetic household groups (see e.g., Saez and Zucman (2016); Kuhn et al. (2020); Mian et al. (2020)). This means households in a group may not be the same over time because of mobility. Second, since we do not observe realized capital incomes or gains during the pandemic at the household (or group) level, we infer their changes based on the growth rates of their aggregate counterparts. Our estimated wealth returns hence are consistent with the average realized wealth returns.

Measuring weights. We use appropriately aggregated values of assets and debt of each household group before the COVID-19 pandemic to construct the shares of the group's wealth invested in various components. This gives the initial wealth composition, based on which the return to the initial wealth (over the next 12 months) can be constructed. The 2019 SCF data are used to measure the wealth composition before the pandemic, as information in that survey was collected mostly in 2019Q2, fairly close to the start of the pandemic.[4]

We use external evidence to show that wealth portfolios were stable in the year before the pandemic, allowing us to use the single cross section from the 2019 SCF data to construct returns to net worth in the first year of the pandemic. Specifically, we compare portfolios implied by the SCF data with those implied by the DFA data that are available at quarterly

[3]We follow Fagereng et al. (2020) in using shares of gross wealth (total assets) as the weights. This approach makes a difference only for households at the bottom quintile of the wealth distribution. Using shares of gross wealth avoids assigning positive returns or extremely large returns to these households.

[4]The 2019 SCF interviews began in April 2019 and extended to March 2020. Although information on the number of interviews completed each month is unavailable, studies on previous SCF waves show that most interviews were completed in the first 12 weeks.

frequency (but have less detailed information), after reconciling differences in the wealth categories from the two data sources (see Appendix A for a detailed description). Figure 2 shows that the average portfolio in the SCF is similar to that in the DFA for 2019Q2.[5] More importantly, the DFA portfolio varied little between 2019Q1 and 2019Q4, suggesting the stability of the average wealth portfolio in the year before the pandemic.

In Appendix A, we provide two additional sets of evidence showing the stability of the wealth composition. First, we show that wealth portfolios are stable for households in different parts of the wealth distribution, i.e., bottom 50%, next 40%, next 9% and top 1%, before the pandemic (Figure A1). Second, even during the pandemic, the wealth composition remains stable at the aggregate and disaggregate levels (Figure A2). The only noticeable change is in the top 1% households' holdings of corporate equities, which fell slightly in 2020Q1 compared to 2019Q4, likely due to the initial decline in equity prices, but bounced back in the following quarter.

Measuring returns to individual wealth components. As is standard in the literature, the return on a specific asset, j, takes the form of

$$r_{j,i,t} = \frac{y_{j,i,t}}{a_{j,i,t}} + g_{j,i,t}, \tag{2}$$

where the first term on the RHS is the yield, defined as the ratio of flow income generated from the asset in period t (e.g., interest income, dividends, profits, rental income, etc.) over the asset value at the beginning of the period. The second term is the capital gain of the asset in period t. Equation (2) also applies to measuring the return on debt, where the yield is the ratio of the interest payment over the initial debt balance, and the capital gain is zero.

We measure the yield and capital gain over 12 months at the monthly frequency. To estimate the yield of an asset (debt) in a specific month during the pandemic, we take a two-step procedure. In the first step, we construct the annualized yield of the asset (debt) between 2017 and 2019 for each household group, using the SCF data and the method of Fagereng et al. (2020) that accounts for net investments in the asset (debt) between the two survey years.[6] In the second step, we infer the changes of the group-specific yields

[5]The systematic differences between SCF and DFA portfolios are driven by the measurement differences between the SCF data and the U.S. financial account data (Batty et al. (2021a); Henriques and Hsu (2014)).

[6]Specifically, we divide the flow income of the asset between 2017 and 2019 by the sum of the asset's 2016 value and its average net inflows during this period. Without this adjustment, the estimated return

during the pandemic based on the changes of their aggregate counterpart. For example, in estimating the stock yield, the first step produces household-group-specific annualized stock yields before the pandemic. In the second step, we use monthly data on the value and dividend of the S&P 500 index to construct the aggregate stock yield. We then multiply the pre-pandemic household-group-level stock yields from the first step by the growth rate of the aggregate stock yield from 2019Q2 to the month of interest. This approach allows us to obtain heterogeneous stock yields in real time. In Appendix B, we describe in detail how we implement the two-step procedure for each type of asset and debt.

To estimate the capital gain of an asset during the COVID-19 pandemic, we mainly rely on changes in asset price indices. We outline the estimation procedure for four types of assets. First, we use the 12-month growth rate of the Russell 3000 broad-market index at the monthly frequency to approximate the capital gains of stocks.[7] Second, we use the 12-month growth rate of the CoreLogic Home Price Index (HPI) to approximate the capital gains of primary and non-primary residential properties. The advantage of the CoreLogic HPI is that it has tier-specific price indices, allowing us to estimate the price growth of a home based on its value relative to the national median (e.g., below 0.75, 0.75-1, 1-1.25, and above 1.25). Third, for private corporate businesses (i.e., S and C corporations), we use 12-month growth of the Russell 2000 index to approximate their capital gains.[8] To account for the heterogeneous impact of the pandemic on businesses in different industries, in Appendix D.1, we provide additional analysis that uses industry-specific equity returns in place of the Russell 2000 index. For non-corporate businesses owned by proprietors, we follow Fagereng et al. (2020) in using retained profits as a fraction of the adjusted asset value as a measure of the capital gains (see Appendix B), as information on the valuation of this type of business

would be biased, especially when the beginning-of-period asset is small and income is mostly generated from new investments. See Appendix B for detailed descriptions of the adjustments made for each asset (debt).

[7]The Russell 3000 index tracks the performance of the 3,000 largest U.S. traded stocks, which collectively account for 98% of U.S. incorporated equities, whereas the S&P 500 index tracks the largest 500 publicly traded companies, accounting for 80% of U.S. stocks. We choose the Russell 3000 index to construct stock capital gains because it offers a broader coverage of the overall stock market compared to other commonly used indices. In constructing the aggregate stock yield, however, we instead use the S&P 500 data, because dividend data are not available for the Russell 3000 index.

[8]The Russell 2000 index measures the performance of the 2,000 smaller companies in the Russell 3000 index. It has been a key source series used by the Federal Reserve Board in estimating the value of closely held corporate equities in the U.S. financial accounts.

is not available.

3 Return to Wealth during the COVID-19 Pandemic

This section presents our estimates of the returns to wealth and wealth components during the COVID-19 pandemic. We first characterize the evolution of these returns for the average household, and then turn to heterogeneity across households in different parts of the wealth distribution. The patterns observed are in sharp contrast to those during the Great Recession. We also show that, given asset price movements, differences in household portfolios are the key to understanding heterogeneity in the return to wealth.

3.1 Returns to Wealth in the First Year of COVID-19: How Do They Compare to 2007-2009?

Panel (a) of Figure 3 shows the average return to net worth during the first year of the pandemic at the monthly frequency. In March 2020, when a national emergency was declared, the return plummeted from 8% to almost 0%. After falling further in April, it started to rebound. By October 2020, it had already returned to the pre-pandemic level. In February 2021, it reached 13.1%, the highest since the pandemic. To put this magnitude into historical context, it is almost twice as large as the average annual return between 1990 and 2019, which is 6.8%, according to the estimate of Xavier (2021).

Figure 4 sheds light on the driving forces behind these movements. As shown in panel (a), the wealth portfolio of the average household mainly consisted of the primary residence (26%), stocks (23%) and private businesses (19%). In the first two months of the pandemic, the stock return fell sharply from 19% to -6%. So did the return on private businesses, from 10% to -3% (see panels b and c). These two components together accounted for almost the entire initial decline of the wealth return. This downward movement quickly reversed after May 2020, partially due to the recovery of stock and private-business returns and partially due to the rising return on primary residences (panel d). In Appendix Figure C1 (top panel), we plot the complete time-series profiles of these three returns during the pandemic, illustrating their role in shaping the path of the average wealth return over this period.

How do the dynamics of the wealth return during the COVID-19 pandemic compare to the Great Recession? Panel (b) of Figure 3 shows that the decline during the Great Recession was more persistent (starting from late 2007 to early 2009) and that the cumulative decline, about 15 pp, was more severe in the Great Recession, almost double that during the pandemic. The persistent and severe decline of the wealth return in 2007-2009 was caused by the simultaneous collapse of the stock market and the housing market, as shown in Appendix Figure C1 (lower panel). Only by the end of 2009, had the wealth return recovered to the pre-recession level of 3%.

3.2 Return Heterogeneity across Wealth Distribution

The average wealth returns in Figure 3 mask substantial heterogeneity across households. Two sources of heterogeneity can account for the cross-sectional differences in wealth returns. One is portfolio heterogeneity and the other is return heterogeneity within narrow wealth categories. In this subsection, we first illustrate these two sources of heterogeneity before turning to the estimated returns by wealth group. In the next subsection, we conduct counterfactual analysis to assess the importance of each source in explaining the cross-sectional differences in wealth returns.

Figure 5 shows heterogeneity in the asset and debt portfolios across the wealth distribution. At the lower end of the distribution, primary residences and vehicles account for the largest shares of assets (panel a). Moreover, these households have very high debt-to-asset ratios (e.g., 156% at the bottom quintile), with a large fraction of their debt (e.g., educational loans and consumer loans) not secured by any collateral (panel b). Together, the negative return from owning vehicles, high debt-to-asset ratios, and higher costs of unsecured debt lead to a substantially lower wealth return for these households.[9] In the middle part of the distribution, the primary residence is the single most important wealth component (about two-thirds of the total assets), and debt mainly consists of first-lien mortgages. At the top

[9]In our baseline estimation, we use a user-cost model for estimating the return on vehicles. The resulting capital gain is negative, reflecting depreciation of the replacement value of the vehicle (consistent with how consumer durable goods' value is measured in the U.S. financial accounts). During the COVID-19 pandemic, however, used car prices surged (Figure D4), resulting in positive capital gains. In Appendix D.2, we re-estimate wealth returns by allowing changes in used car prices to enter the capital gains of vehicles, and we show that our baseline estimates are barely affected, due to the small share of vehicles in total assets.

of the distribution, the debt-to-asset ratio is very low (e.g., 2% for the top percentile), while assets are more diversified, with stocks and private businesses taking increasingly larger shares. For the top 1% households, stocks and private businesses account for 26% and 38% of the total assets, respectively, whereas the primary residence accounts for only 9%.

The second source of return heterogeneity arises from differences in the return within specific asset or debt categories. Figure 6 shows within-category return differences for six major wealth components in February 2021. We find that, with one exception, returns on individual wealth categories increase in wealth. The cross-sectional difference is particularly large for private businesses and non-primary residential properties. The only exception is the primary residence, the return on which declines in wealth. This pattern is due to higher price appreciation of homes at lower tiers, which normally happens in economic expansions.[10] These within-category return differences imply that even if households were to have the same portfolio, their wealth returns may still differ.

The two sources of heterogeneity give rise to the cross-sectional differences in wealth returns during the pandemic, as shown in Figure 7. Two observations are readily apparent. First, the initial decline of the wealth return is uneven. Households at the top of the wealth distribution experienced steeper initial declines than other households (panel a). As a result, the return gap between the top 1% and bottom 99% households fell sharply and even turned negative (panel b). Second, the subsequent recovery of the wealth return is uneven. Wealthier households saw stronger increases in their returns after 2020Q2. By February 2021, the top 1% households earned an annual return of 17.3%, in contrast to an 11.2% return earned by the bottom 99%. This implies a return gap of 6.1 pp, exceeding the pre-pandemic gap by 2.4 pp. To determine which source of heterogeneity is more important in driving these patterns, we conduct counterfactual analysis in Section 3.3.

The evolution of the group-level returns during the pandemic, again, looks very different from that in the Great Recession (see Appendix Figure C2). As all households saw persistent and severe decline in their returns since late 2007, the return gap stayed flat for some time

[10]Tier-specific house price growth also has an effect on the return of non-primary residential properties (mostly rental housing). The yield of these assets is strictly increasing in wealth. However, since less wealthy households are more likely to own starter homes as their rental properties, higher price growth of these homes tends to flatten the overall return on rental housing along the wealth dimension.

before plummeting in late 2008, when the stock market crashed. The gap remained low (around 2 pp) until mid-2009 before starting to recover. The falling wealth-return gap during the Great Recession is consistent with declining wealth inequality over that period.

3.3 Portfolio Heterogeneity vs. Within-Class Return Heterogeneity

To assess the relative importance of the two sources of heterogeneity, we conduct two counterfactual analyses similar to Xavier (2021). In the first analysis, we construct the counterfactual wealth return for each group in each month that allows for portfolio heterogeneity but not within-class return heterogeneity, i.e., we assign the average return on a specific asset (debt) category in a given month to all household groups, but maintain the groups' own portfolio allocation. In the second analysis, we construct the counterfactual returns that allow for within-class return heterogeneity but not portfolio heterogeneity. For this purpose, we assign the portfolio of the average household to all household groups, but maintain the groups' own returns on specific wealth categories. In each analysis, we measure return heterogeneity at a specific point in time by the return gap between the top 1% and bottom 99% households.

Figure 8 shows the actual and counterfactual return gaps for each analysis. Panel (a) suggests that portfolio heterogeneity alone largely captures cross-sectional differences in the wealth return. In contrast, within-class return heterogeneity alone does not explain much variation in the wealth return across households or over time (panel b). The mean squared prediction error from the first counterfactual analysis is only 7% of that from the second analysis, suggesting a relatively more important role of portfolio heterogeneity in explaining cross-sectional differences in the wealth return.

In the above counterfactual analyses, we allow asset price growth to change as observed in the data. If we shut down the asset price growth channel by holding equity and house price growth constant at their pre-pandemic levels, portfolio differences remain the major source of heterogeneity in the wealth return, although, in that case, time variation in the wealth return gap largely dissipates. We next examine the role of changing asset price growth in shaping wealth returns and inequality.

4 Asset Prices, Wealth Inequality and Return Heterogeneity

The recent literature has stressed the link between asset prices and wealth inequality. Kuhn et al. (2020), for example, estimate a positive (negative) relationship between rising stock (house) prices and the top wealth share in the historical data, referring to it as "the race between the stock market and the housing market". We confirm that this relationship holds during the COVID-19 pandemic. More importantly, we show that asset prices affect wealth inequality mainly through their impacts on the wealth return, which we quantify. We proceed as follows. First, we show analytically that changes in the top wealth share are closely related to return heterogeneity (measured by the return gap). Second, through a series of counterfactual analyses, we examine what the return gap and the top wealth share would have been if asset price growth had stayed at the pre-pandemic level. Third, we estimate the impact of asset price growth on the return gap using regressions.

4.1 Wealth Inequality and Return Heterogeneity

To relate the top wealth share to return heterogeneity (measured by the return gap between the top 1% and bottom 99% households), we start with the following wealth accumulation equation,

$$w_{i,t+1} = w_{i,t}(1 + r_{i,t}) + y_{i,t} - c_{i,t}, \tag{3}$$

where $w_{i,t}$ is the net worth of households in wealth fractile i at the beginning of period t. $r_{i,t}$ is the return on net worth in period t. $y_{i,t}$ is labor income plus transfers minus taxes. $c_{i,t}$ is consumption. Let $S_{i,t} \equiv y_{i,t} - c_{i,t}$ denote saving in period t, and $s_{i,t} \equiv \frac{S_{i,t}}{w_{i,t}}$ the saving rate as in Bach et al. (2020). Equation (3) can be written as

$$w_{i,t+1} = w_{i,t}(1 + r_{i,t} + s_{i,t}). \tag{4}$$

Let $\phi_{1,t}$ and $\phi_{99,t}$ denote the top 1% and bottom 99% wealth shares at the beginning of period t. It follows immediately that

$$\phi_{1,t} \equiv \frac{w_{1,t}}{w_{1,t} + w_{99,t}} = \left(1 + \frac{\phi_{99,t}}{\phi_{1,t}}\right)^{-1}. \tag{5}$$

Using equations (4) and (5), the top 1% wealth share at the beginning of period $t+1$ is

$$\phi_{1,t+1} = \left(1 + \frac{\phi_{99,t}}{\phi_{1,t}} \times \frac{1 + r_{99,t} + s_{99,t}}{1 + r_{1,t} + s_{1,t}}\right)^{-1}. \tag{6}$$

Equations (5) and (6) imply that, given $\phi_{1,t}$ and $\phi_{99,t}$, the top wealth share increases if $r_{1,t} + s_{1,t} > r_{99,t} + s_{99,t}$.[11] As we show in Section 5, heterogeneity in the saving rate, $s_{i,t}$, only plays a minor role relative to heterogeneity in the wealth return, especially during periods of substantial asset price movements. This supports the importance of the return gap, i.e., $r_{1,t} - r_{99,t}$ in determining the change in wealth inequality. Next, we relate asset price changes to the return gap and wealth inequality.

4.2 Asset Prices and Return Heterogeneity

Asset price movements can affect wealth returns differently across households due to systematic differences in portfolios. Higher equity price growth, for example, raises the return of the wealthy more than other households', widening the return gap. Higher house price growth, on the other hand, raises the return of less wealthy households and pushes down the return gap. Appendix Figure C3 illustrates the dramatic changes of equity price growth (i.e., stock price growth and private-corporate valuation growth) and house price growth during the COVID-19 pandemic and the Great Recession.

We conduct a counterfactual analysis to evaluate the role of asset price changes in shaping the average wealth return and the return gap. The upper panels of Figure 9 show counterfactuals that hold equity and house price growth constant at their pre-pandemic levels (i.e., February 2020). This essentially removes all time variation in the wealth return and the return gap. This result is not surprising, as changes in the counterfactual returns are only driven by changes in the yields of individual wealth components, which experienced little variation during the pandemic. Note that the counterfactual return gap is still positive (mainly driven by portfolio heterogeneity), implying that the top wealth share would have increased relative to a year ago, even in the absence of the COVID-19 shock.

The middle panels of Figure 9 show counterfactuals holding house price growth constant. The results suggest that changes in equity price growth alone can capture the dynamics of the wealth return and the return gap.[12] The actual average wealth return is slightly higher

[11] We assume $r_{i,t} + s_{i,t} > -1$ for $i \in \{1, 99\}$, which holds in the data.

[12] The modest impact of fluctuating house price growth on the average wealth return is explained by two facts. First, residential housing accounts for a relatively small share in the average household's portfolio (approximately 32%). Second, house price growth stayed unchanged early in the pandemic and increased gradually and moderately (compared to equity price growth) later in the pandemic.

than the counterfactual after 2020Q2 due to the rise in house price growth. However, the actual return gap is lower than the counterfactual, exactly when the house price growth started to rise. This suggests that higher house price growth helps to narrow the return gap.

The lower panels of Figure 9 show the counterfactuals holding equity price growth constant. Unlike equity price growth, house price growth alone explains little time variation in the average wealth return or the return gap, but higher house price growth would have pushed down the return gap had equity price growth stayed constant. We find similar patterns when applying these counterfactual analyses to the Great Recession episode (see Appendix Figure C4). In Section 4.3, we provide formal regression analysis to quantify the relationship between asset price changes and the return gap.

What would wealth inequality have been, had asset price growth stayed constant at the pre-pandemic levels? In Figure 10, we construct counterfactual top wealth shares by replacing the actual returns in equation (6) with the counterfactual returns that hold asset price growth constant. Absent changes in equity and house price growth (the orange line), the top wealth share would have increased moderately in 2020 and declined in 2021Q1.[13] With observed house price growth (the green line), this pattern would not have changed much, and inequality would have been lower due to rising housing returns. With observed equity price growth (the red line), the predicted top wealth share captures the dynamics of the actual share, although wealth inequality is slightly overstated later in the pandemic. These patterns suggest that, given portfolio heterogeneity, changing asset price growth is the key to understanding short-run wealth inequality dynamics.

4.3 The Impact of Asset Price Changes on the Return Gap

We now examine the determinants of the return gap between the top 1% and bottom 99% households during the COVID-19 pandemic and the Great Recession. The regressions pool monthly return-gap estimates together and include a dummy for the COVID-19 episode to account for the possible shifts in the levels of these variables. Table 1 shows the results.

Column (1) regresses the return gap on the average returns on stocks, primary residences

[13]The moderate increase of the predicted share in 2020 is explained by the cross-sectional difference in the wealth return (due to portfolio heterogeneity). The drop in 2021Q1 is due to the low level of the top wealth share in 2020Q1.

and private businesses. The R^2 is close to 1, suggesting that returns on these three assets explain nearly all variation in the return gap. This also implies that returns on other wealth components or within-class return differences played a minor role in explaining variation in return heterogeneity. We find that a one standard-deviation increase in the stock return (21%) and in the private-business return (7%) raises the return gap by 1.5 pp and 2.1 pp, respectively, whereas a one standard deviation increase in the housing return (10%) reduces the gap by 3.2 pp. Column (2) relates the return gap to the spread between stock and housing returns, as well as the spread between private business and housing returns. The return gap rises as each of these spreads widens.

Since variation in housing and equity returns is mainly driven by the corresponding asset price movements, in column (3), we estimate the impacts of stock and house price growth, as well as the growth of private-corporate valuations, on the return gap.[14] Consistent with Kuhn et al. (2020), higher equity price growth raises the return gap, whereas higher house price growth pushes it down. Since asset prices tend to move together, we estimate the impact of equity and house price growth using their spreads in column (4), which supports the finding in column (2). Finally, we construct a spread between weighted equity price growth (using the shares of stocks and private businesses in the aggregate total assets as the weights) and house price growth to capture the joint impact of asset price growth. It shows that a 18 pp difference between the weighted equity price growth and house price growth, as observed in February 2021, is associated with a 3 pp difference in the wealth return between the top 1% and bottom 99% households.

5 Heterogeneity in Saving Rates during the Covid-19 Pandemic

So far we have abstracted from another potential determinant of wealth accumulation, notably, the saving rate. According to equation (6), saving-rate heterogeneity may amplify or offset return heterogeneity, affecting the dynamics of the top wealth share. How important is return heterogeneity in explaining wealth inequality during the pandemic, compared to

[14]The stock price growth, private-corporate valuation growth, and house price growth are measured by the 12-month percent changes of the Russell 3000 index, the Russell 2000 index, and the CoreLogic national home price index, respectively.

saving-rate heterogeneity?

To address this question, we first construct group-specific saving rates using our estimated returns and the gross growth rates of wealth from the DFA data. We then adapt the approach of Bach et al. (2020) to construct predicted top wealth shares that feature either return heterogeneity or saving-rate heterogeneity, but not both. Specifically, the top 1% wealth share with only return heterogeneity is

$$\phi_{1,t+1} = \left(1 + \frac{\phi_{99,t}}{\phi_{1,t}} \times \frac{1 + r_{99,t} + \bar{s}_t}{1 + r_{1,t} + \bar{s}_t}\right)^{-1},$$

where $\bar{s}_t$ is the average saving rate (i.e., the growth rate of aggregate wealth minus the average wealth return). The top 1% wealth share with only saving-return heterogeneity is

$$\phi_{1,t+1} = \left(1 + \frac{\phi_{99,t}}{\phi_{1,t}} \times \frac{1 + \bar{r}_t + s_{99,t}}{1 + \bar{r}_t + s_{1,t}}\right)^{-1},$$

where $\bar{r}_t$ is the average wealth return.

Figure 11 shows the actual and predicted top 1% wealth shares. With only return heterogeneity, the predicted share declines initially and rises subsequently, resembling the actual top wealth share. In terms of the fit, the predicted share tends to be higher before 2020Q3. This is because, early in the pandemic, returns were low and the saving rate of the wealthy was lower than other households'.[15] As the wealthy earned higher returns later in the pandemic, their saving rates also increased, bringing the predicted top 1% wealth share closer to the actual one.

Heterogeneity in the saving rate, however, appears to be less important in predicting the top wealth share, especially when returns are high. This is supported by examining the predicted top 1% wealth share based on saving-rate heterogeneity only. The prediction fails to capture the initial decline or the subsequent increases in the actual share. The mean squared prediction error for the saving-rate heterogeneity exercise is 7 times as large as the return-heterogeneity exercise, suggesting a higher prediction power of return heterogeneity for changes in wealth inequality. Our results are consistent with Bach et al. (2020), who using detailed Swedish wealth data established that other potential drivers of wealth, such as

[15] This difference in the saving rate is partially explained by the distribution of large-scale fiscal stimuli during the pandemic and the fact that these stimuli were received mostly by households outside of the top 1% wealth distribution.

consumption, labor income and transfers, have a small net effect on top wealth shares.[16] This pattern during the COVID-19 pandemic in the U.S. is also confirmed by the scenario analysis of Batty et al. (2021b), who concluded that the increase in savings during the pandemic was overshadowed by large price increases in assets that are heavily skewed toward the wealthy, and that the increase in savings remains small compared to the level of wealth.

6 Racial Gap in Wealth Returns during the COVID-19 Pandemic

There has been increasing interest among researchers and policymakers in understanding racial disparities in wealth. In the 2019 SCF data, the median (mean) wealth of black households is $20,730 ($139,800), in sharp contrast to that of white households, $181,400 ($951,350).[17] Understanding the causes of these disparities is important for evaluating fiscal and monetary policies that intend to reduce the racial wealth gap (Bartscher et al. (2021); Boerma and Karabarbounis (2021); Kermani and Wong (2021); Gerardi et al. (2020)). Given the importance of returns in shaping wealth inequality, we use our methods to examine the return gap between white and black households during the COVID-19 pandemic in Section 6.1. As we show, this racial return gap evolved similarly to the return gap between wealthy and other households. This raises the question of whether the return gap merely reflects differences in wealth or it exists even after controlling for wealth status. We answer this question in Section 6.2 through a multivariable nonparametric analysis of return heterogeneity.

[16] Note that our and Bach et al's definition of the saving rate does not capture incomes generated from assets (e.g., interest and dividend income, business profits, and rental income) which are reflected in the rate of return. This definition, therefore, differs from the personal saving rate published by the BEA, even after adjusting for the wealth-to-income ratio. In additional analysis, we estimate the saving rate consistent with the BEA definition (i.e., letting the rate of return only capture capital gains of assets) and show that our estimate is similar to the one published by the BEA (which shows excess household savings during the pandemic), providing external validation to our procedure.

[17] Recent studies have documented the persistent racial wealth gap in the U.S. that dates back to at least the 1950s (Kuhn et al. (2020)). One explanation is century-long exclusions of black households from labor and capital markets, which leave black households more pessimistic about risky investments (Boerma and Karabarbounis (2021)).

6.1 Racial Disparities in Portfolios and Returns

We start by showing the differences in the portfolios of white and black households. Panel (a) of Figure 12 shows that white households hold a substantially higher fraction of their assets in public and private equities (44% compared to 20% for black households), while the primary residence is the major asset in black households' portfolio (44% compared to 24% for white households). Based on our earlier analysis, this implies that when the equity market outperforms the housing market, white households tend to earn higher returns, widening the racial return gap. Another noticeable difference is the higher holdings by black households of consumer durables, and in particular, of vehicles (7% compared to 3% for white households), which alone reduces their wealth return by about 0.4 pp.

Panel (b) shows striking differences in the debt holdings of black and white households. First, black households have higher debt-to-asset ratios (30% compared to 11% for white households). Second, black households have a larger fraction of their debt not secured by primary residences (41% compared to 28% for white households), suggesting higher average costs of debt. Indeed, our estimates for the average debt costs are 5.6% for black households and 4.9% for white households. These differences in debt holdings further contribute to the lower wealth returns of black households.

Figure 13 shows the estimated wealth returns for the two racial groups, as well as the racial return gap. The wealth returns resemble those of wealthy and other households as shown in Figure 7. The wealth return of white households temporarily fell below that of black households early in the pandemic, when stock and private-business returns plunged. As the stock market recovered, the return of white households rose, and so did the racial return gap. In February 2021, the wealth return of white households reached 13.2%, whereas it was 8.4% for black households. The evolution of the racial return gap over this period was also consistent with the change in the wealth share of white households. The patterns in Figure 13 raise the question of whether the observed return differences between black and white households merely reflect the differences in wealth, which we turn to next.

6.2 A Multivariable Nonparametric Analysis

Isolating racial return heterogeneity from other dimensions of heterogeneity requires a multiple regression analysis. For this purpose, we modify our previous methodology and estimate returns at the household level. We then employ a nonparametric analysis that relates household-level returns to a set of household characteristics. This allows us to control for other factors driving return heterogeneity, such as wealth, education, age, home ownership, etc. We focus on annual returns at the end of the first year of the pandemic (i.e., February 2021), when the unconditional racial return gap was the largest since the pandemic.

The modified methodology differs from our earlier synthetic-group approach in estimating the yield component. Rather than using information from two consecutive surveys, which is infeasible at the household level, we estimate the yield of an asset (debt) using SCF 2019 data by (i) dividing the flow income (payment) in 2018 by the asset (debt) value in 2019, and (ii) applying the growth factor implied by the aggregate yield of the asset (debt) as described in Section 3.

As discussed earlier, this procedure may introduce bias due to net asset investments in between survey years. One way to validate this approach is to apply it to computing the returns of household groups (as those in Section 3) and compare the results from the two approaches. We show in Appendix Figure D6 that this method generates very similar wealth returns to our earlier approach at the household-group level. For each wealth category, the median of the household-level return is also close to the corresponding aggregate return.

Given household-level returns, r_i, we estimate the following multiple linear regression specification

$$r_i = \sum_d \sum_g \beta_g^d \mathbb{I}\left(X_i^d \in g\right) + \sum_j \gamma_j \theta_{j,i} + \varepsilon_i,$$

where $\mathbb{I}\left(X_i^d \in g\right)$ is a dummy equal to 1 if dimension d (race, wealth, education, age, home ownership) falls in bin g for household i. $\theta_{j,i}$ is the share of i's wealth invested in category j. By allowing for a large set of bins, five for wealth (0-50%, 50-90%, 90-95%, 95-99% and top 1%), five for education (less than high school, high school, some college, college degree

and higher than college), six for age (younger than 30, 30-40, 40-50, 50-60, 60-70 and older than 70), four for race (white, black, Hispanic and others) and three for home ownership (renters, mortgagors and outright homeowners), our analysis is nonparametric. We follow Pence (2015) in computing the bootstrapped standard errors that take into account the imputation uncertainty and the sampling variance of the SCF data.

Table 2 shows the results. Columns (1) and (2) present return differences across wealth status and racial groups using simple linear regressions. Consistent with the earlier results (Figures 7 and 13), wealth returns in the initial year of the pandemic were higher among wealthier households and white households. The return gap is 15.8 pp between the top 1% and bottom 50% households and is 4.5 pp between white and black households. Including wealth and racial characteristics in the same regression as in column (3) does not change return differences in wealth, but reduces the racial differences, suggesting that the unconditional racial differences mask differences in wealth. In column (4), we include other household characteristics and fail to find any significant racial heterogeneity in the return.

In columns (5)-(7), we control for household portfolio differences by including shares of wealth invested in individual components. This identifies return heterogeneity arising from within-class return differences. Again, we do not see any significant heterogeneity across racial groups. Our results suggest that nearly all of the racial differences in the wealth return were driven by differences in wealth and portfolios, rather than race itself.[18]

On the other hand, heterogeneity in the wealth dimension remains significant. The return of the top 1% is 2 pp higher than the bottom 50% (columns 5 and 6). An interesting question, however, is why returns of households in the 50%-95% of the wealth distribution appear to be lower than the bottom 50%. As discussed earlier, this is due to higher price appreciation of homes at lower tiers. Given the importance of housing at the lower end of the wealth distribution, removing housing return heterogeneity would lead to returns increasing in wealth. To see this, we construct a different version of the wealth return that assigns the

[18]We also estimated the specification in column (5) of Table 2 for possible racial heterogeneity in the returns to specific wealth categories. We find that (i) black households paid significantly higher average interest rates on their debt, and that (ii) their returns on primary residence are significantly higher during the COVID-19 pandemic. The first finding is consistent with the composition of their debt portfolio that tilts toward more expensive debt, and the fact that black borrowers face challenges refinancing (Gerardi et al. (2020)). The second finding may be explained by black households' ownership of lower-tiered homes.

average house price growth to all households. Column (7) shows that this alternative wealth return monotonically increases in wealth. The finding that returns to net worth are positively correlated with wealth is a robust feature of the data and is consistent with previous studies using non-U.S. data (e.g., Fagereng et al. (2020) and Bach et al. (2020)).

7 Conclusion

Wealth inequality in the U.S., measured by the top 1% wealth share, experienced dramatic changes in the first year of the COVID-19 pandemic. Economic theory suggests that the key to understanding wealth inequality is heterogeneity in the wealth return across households. Traditionally, this view has been examined using low-frequency data. To understand the dynamics of wealth inequality during the COVID-19 pandemic, we develop a novel methodology that estimates the wealth return for different groups of households at monthly frequency. Our analysis shows that the return to net worth increases with wealth, and that this heterogeneity together with substantial asset price movements is the key to understanding wealth inequality in the short term.

Our contributions to the literature are threefold. First, we provide a detailed analysis of the wealth return, return heterogeneity and inequality during the COVID-19 pandemic, contrasted to the Great Recession. This helps policymakers to understand the sources of short-run dynamics of wealth inequality in nearly real time, which is particularly useful as real-time data on household capital income are unavailable for the United States.

Second, through a series of counterfactual analyses, we show that portfolio heterogeneity and asset price movements are the main determinants of wealth returns and inequality, whereas saving-rate heterogeneity and return differences within narrow asset (debt) classes played a minor role. As the stock market continued to outperform the housing market, the return of the wealthy has risen faster than that of other households, reinforcing the wealth concentration at the top. We provide estimates for the impact of asset price growth on the divergence of wealth returns between wealthy and other households.

Third, we contribute to the recent discussion on racial disparities in wealth by showing that the racial wealth-return gap has widened later in the pandemic, indicating worsening

racial inequality in wealth. The racial differences in the wealth return, however, are explained by the differences in wealth, not by race itself. Our analysis suggests that policies that encourage black households to invest in riskier but higher-return assets, that help black households to refinance or restructure their debt, or that provide support to minority and disadvantaged neighborhoods may help reduce racial inequality in wealth.

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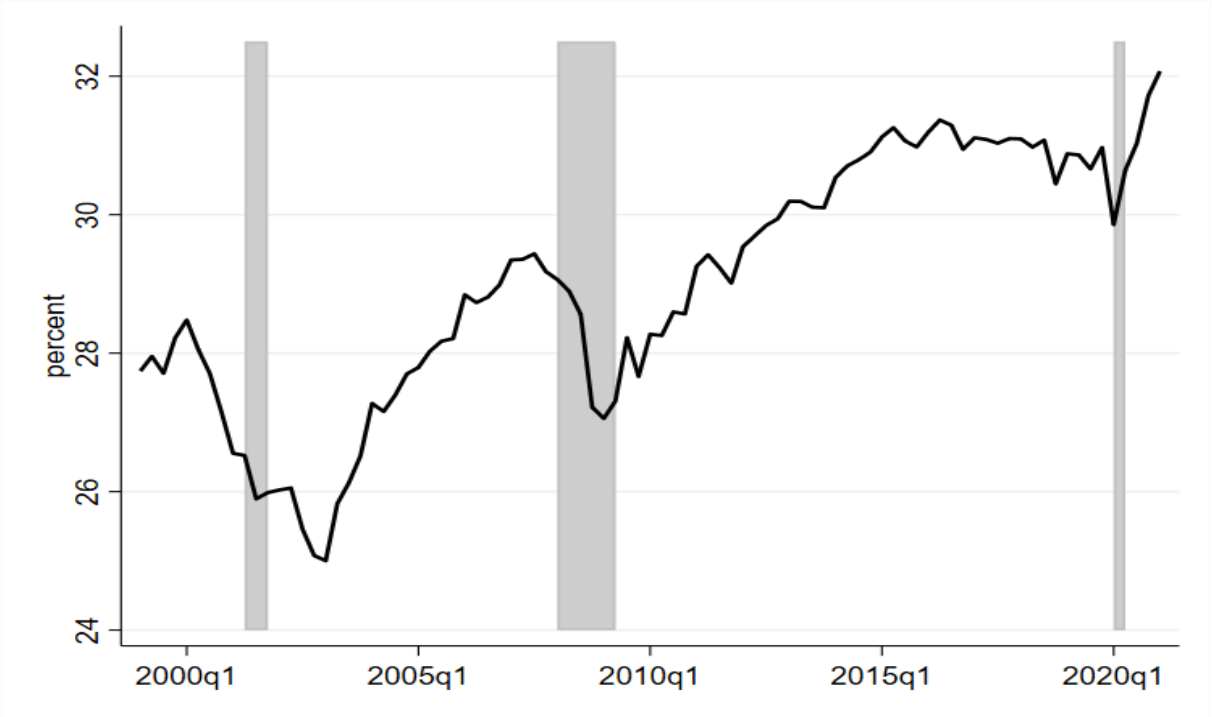
Figure 1: Top 1% wealth share in the United States, 1999Q1-2021Q1

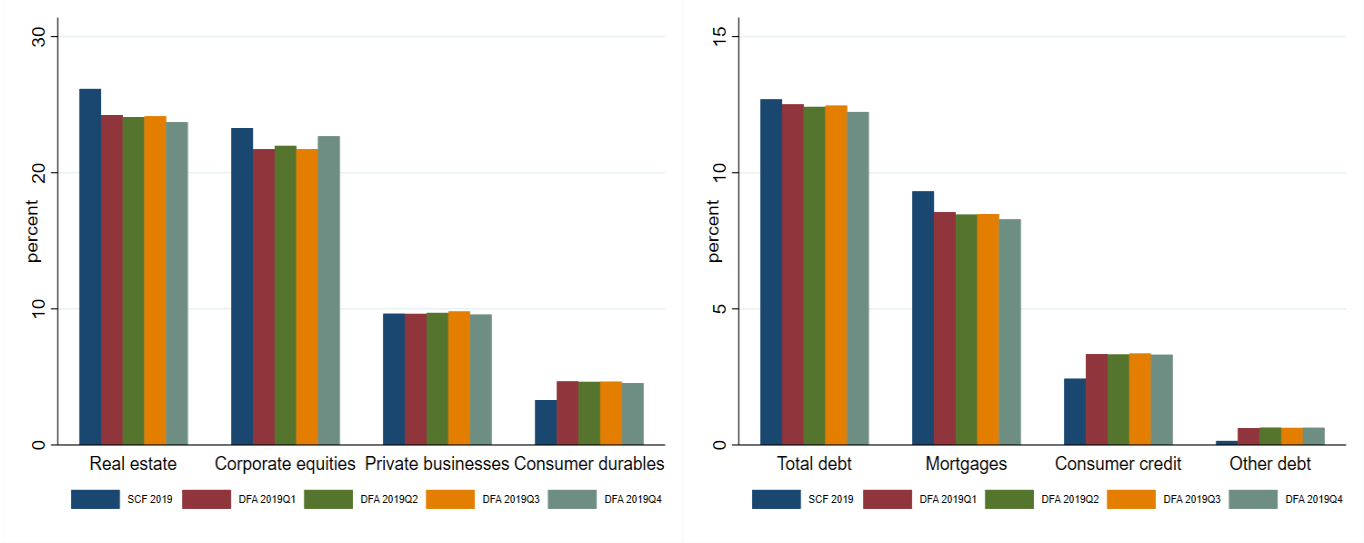


Source: Distributional Financial Accounts (DFA), Federal Reserve Board. Notes: Shaded bars indicate NBER recession dates.

Figure 2: Household portfolios in SCF and DFA, 2019

(a) Assets

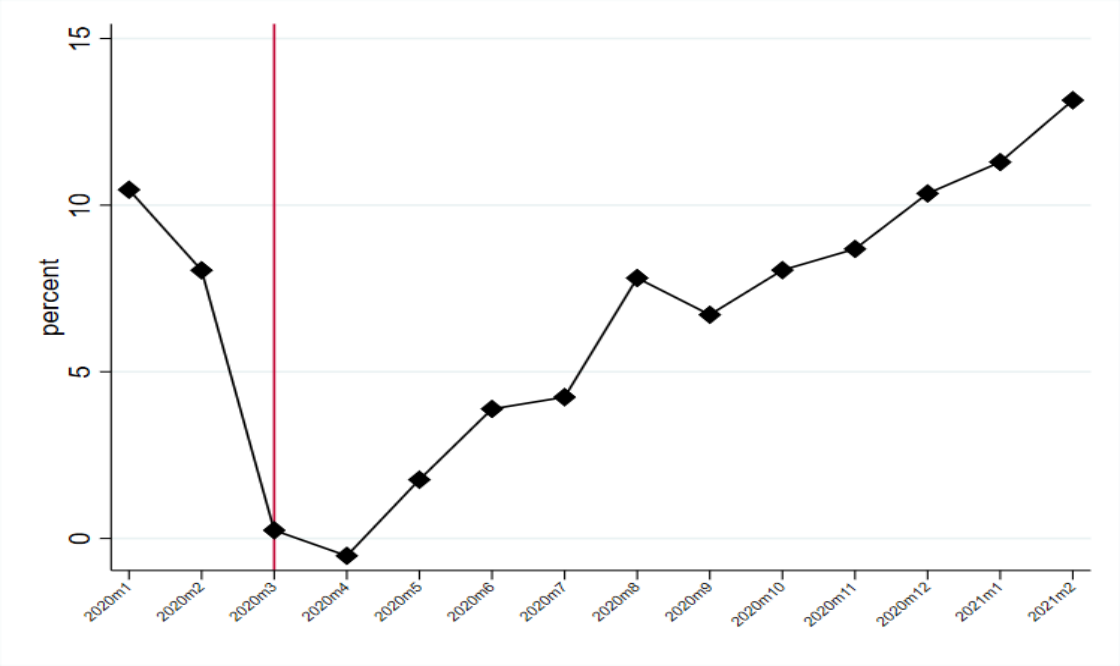
(b) Debt (% of total assets)



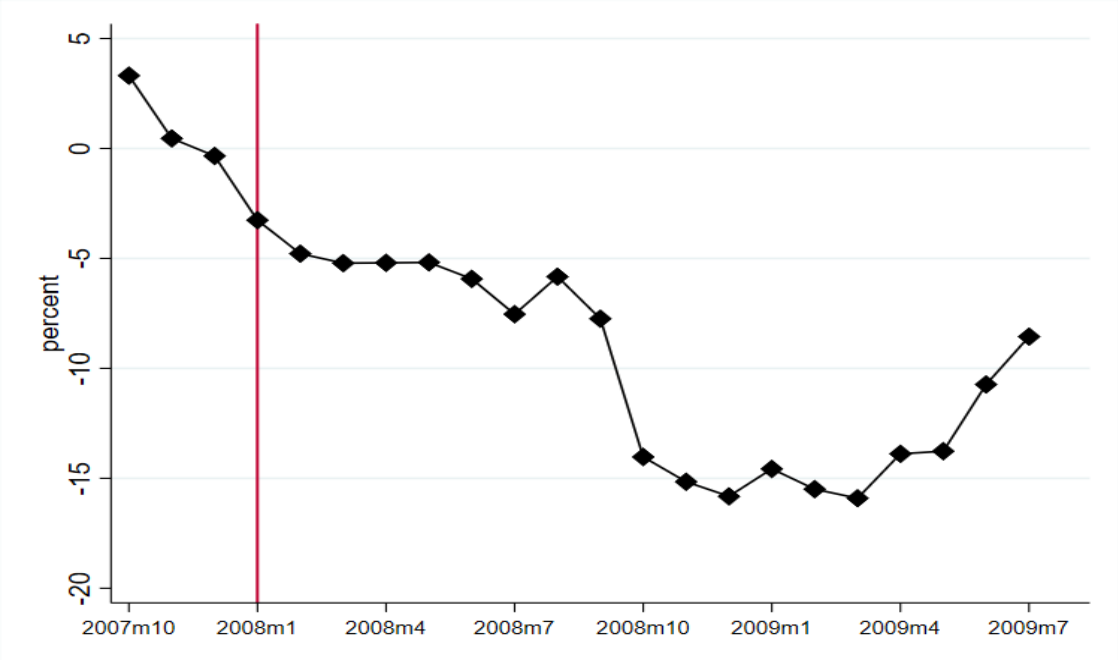
Notes: The SCF categories are constructed to be consistent with those in the DFA. See Appendix A for the comparison at the disaggregate wealth level.

Figure 3: Returns to household wealth in two episodes

(a) COVID-19



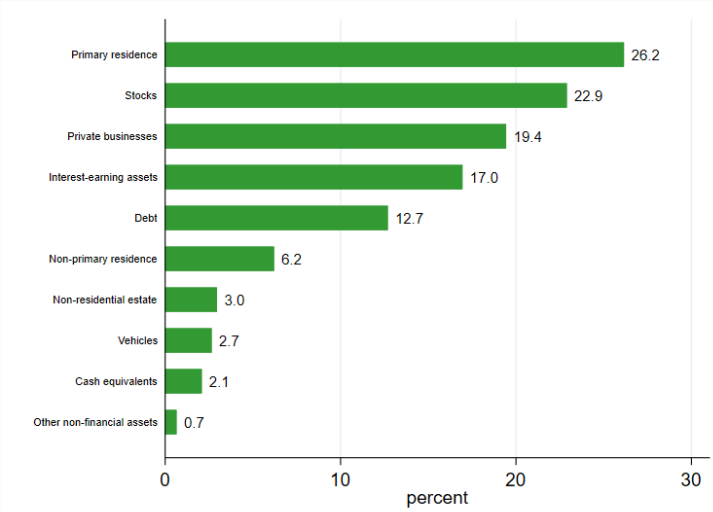
(b) Great Recession



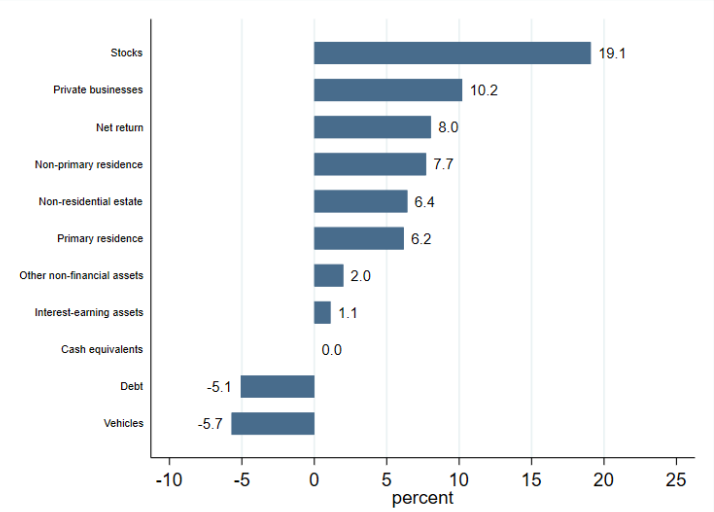
Notes: See Section 2.2 and Appendix B for detailed descriptions of the estimation method.

Figure 4: Household portfolio composition and wealth returns during COVID-19

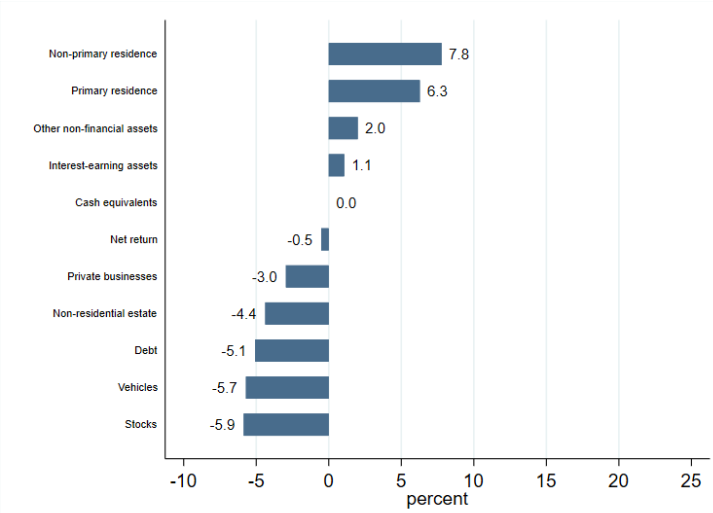
(a) Household portfolio, 2019



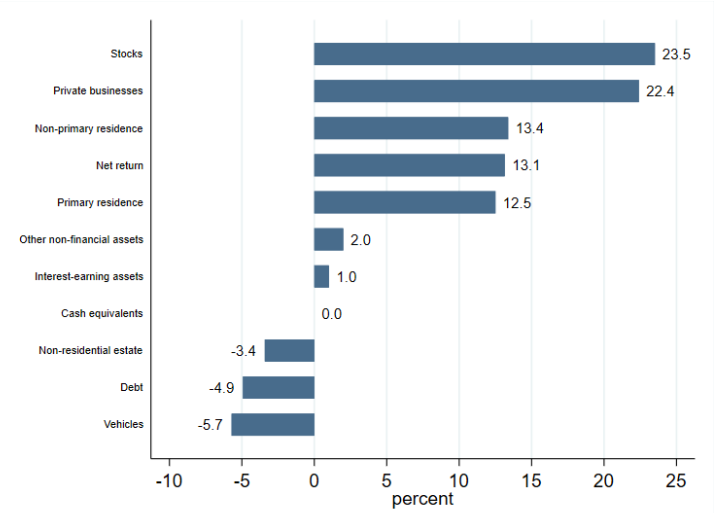
(b) Wealth returns, February 2020



(c) Wealth returns, April 2020



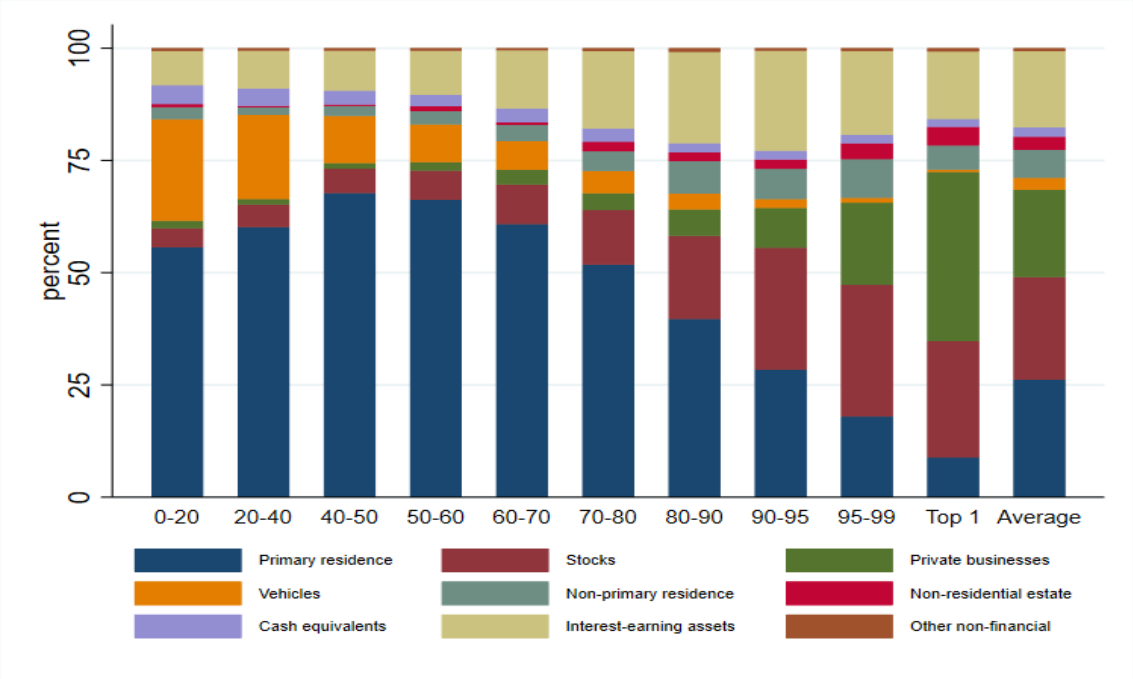
(d) Wealth returns, February 2021



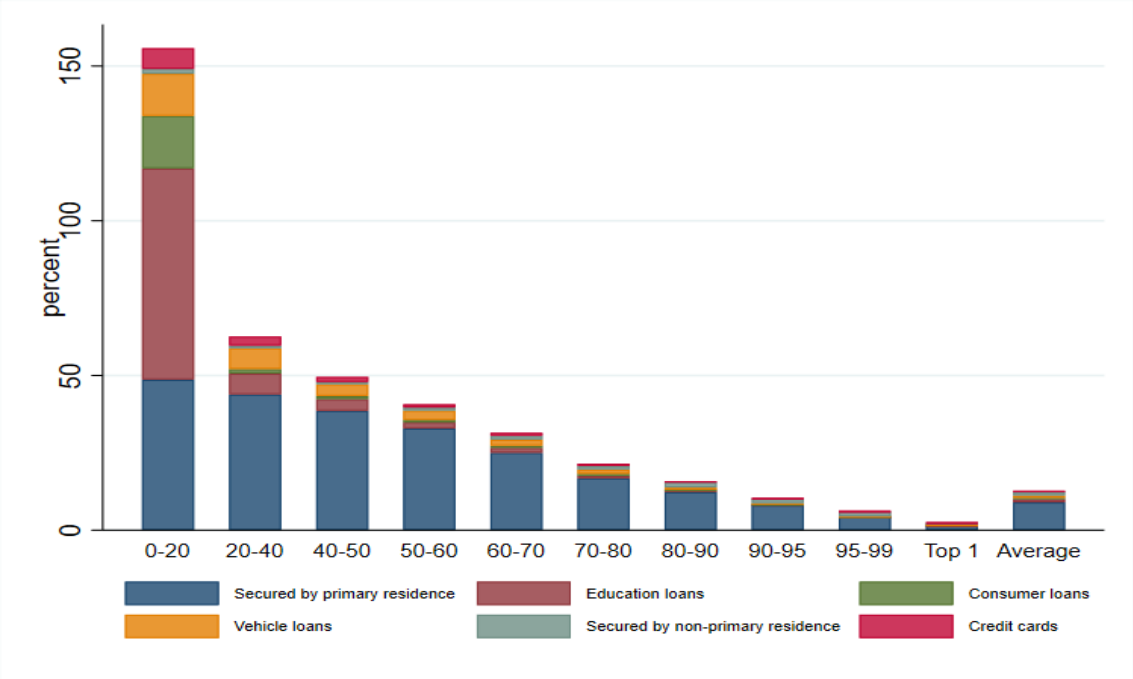
Notes: See Section 2.2 and Appendix B for detailed descriptions of the estimation method.

Figure 5: Household portfolio by wealth, SCF 2019

(a) Asset composition

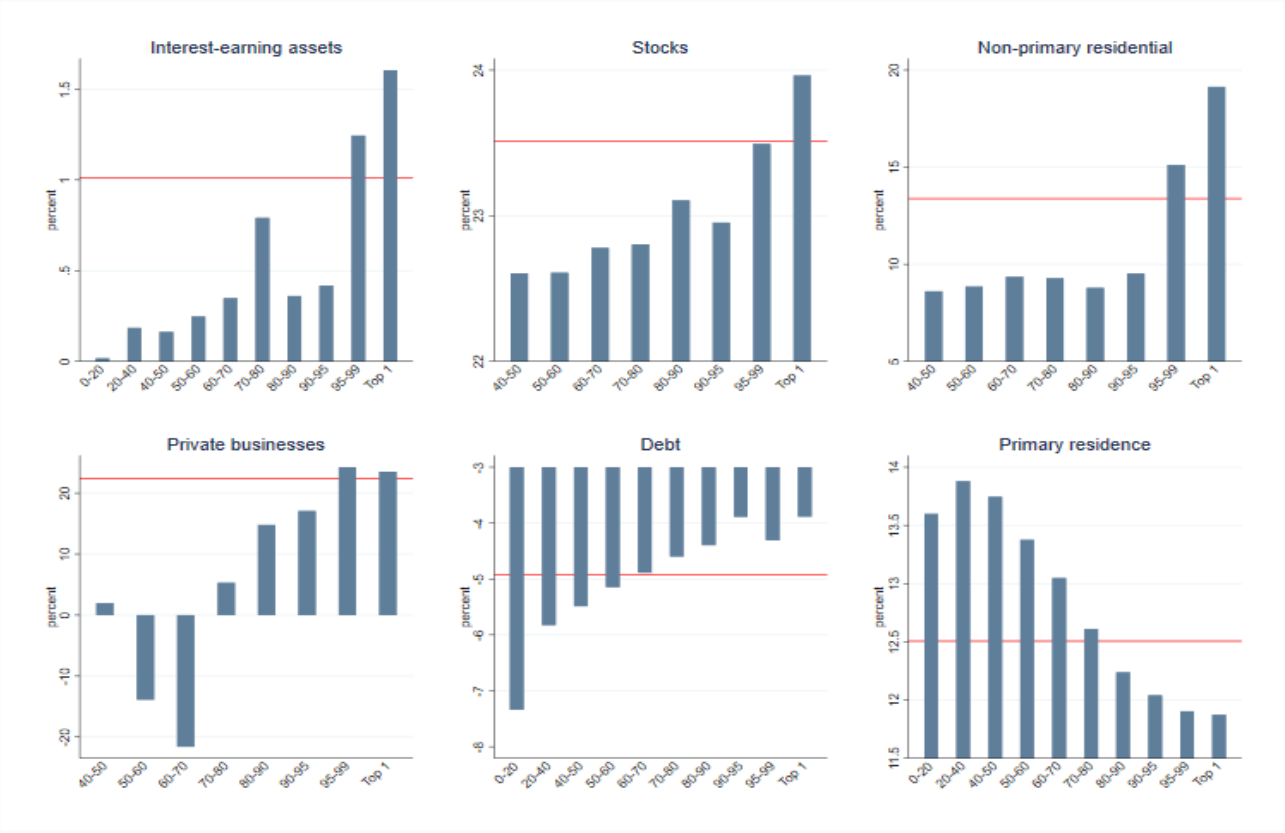


(b) Debt composition (% of total assets)



Notes: Household portfolios constructed using appropriately weighted aggregates in the 2019 SCF.

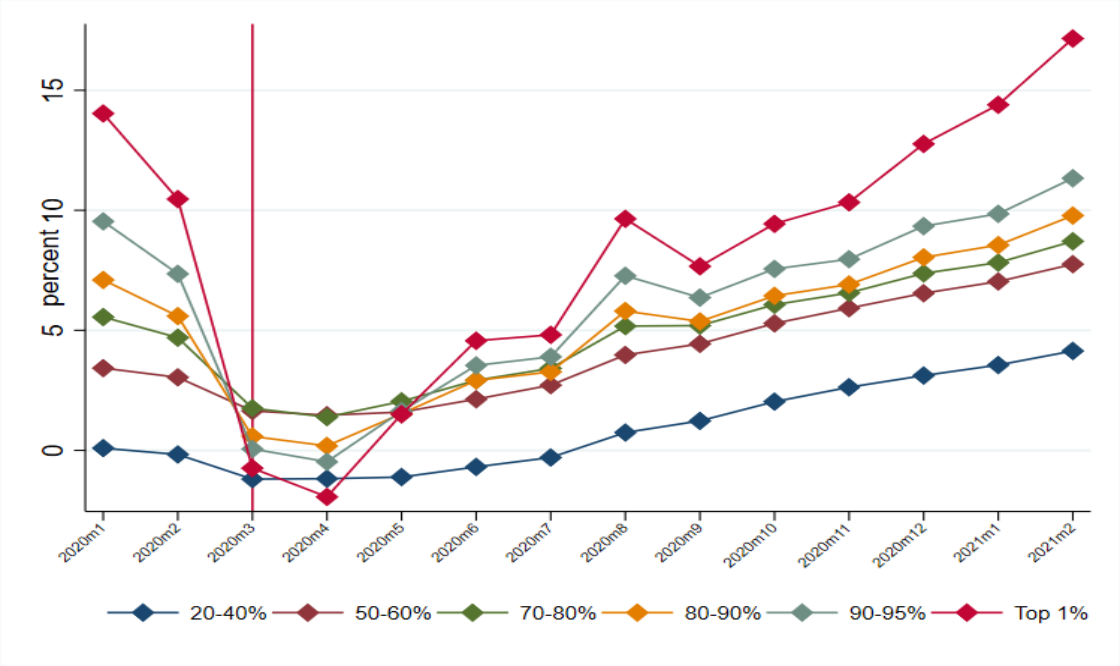
Figure 6: Returns to wealth components by wealth fractile, February 2021



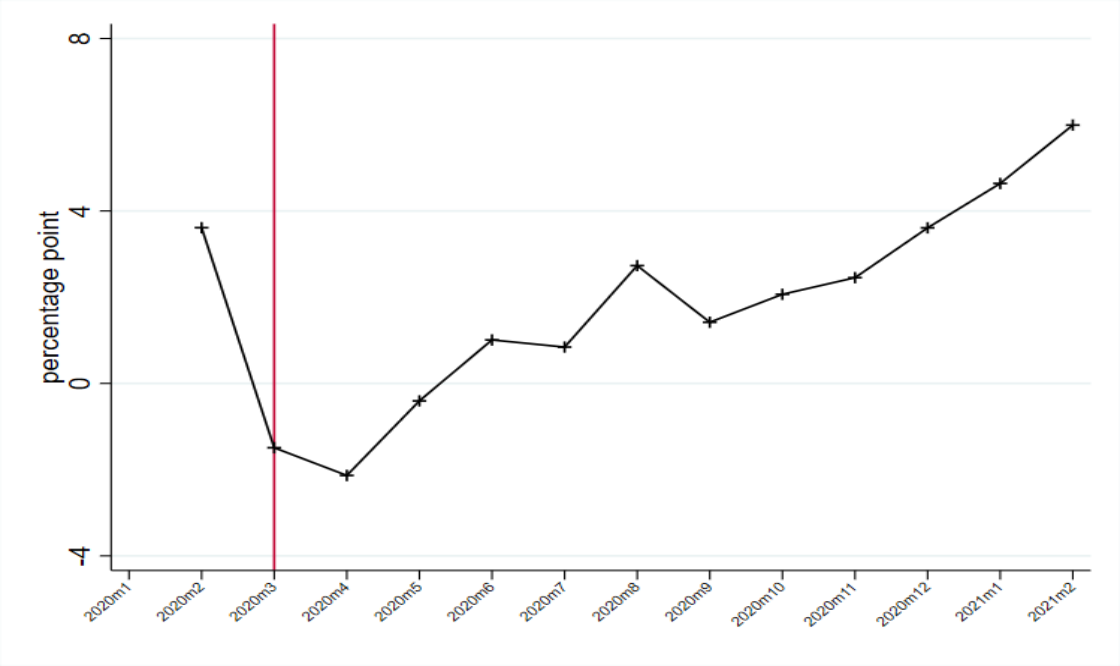
Notes: Red lines indicate the returns earned by the average household on specific wealth components. See Section 2.2 and Appendix B for detailed descriptions of the estimation method.

Figure 7: Return heterogeneity during COVID-19

(a) Return to wealth for selected wealth fractiles



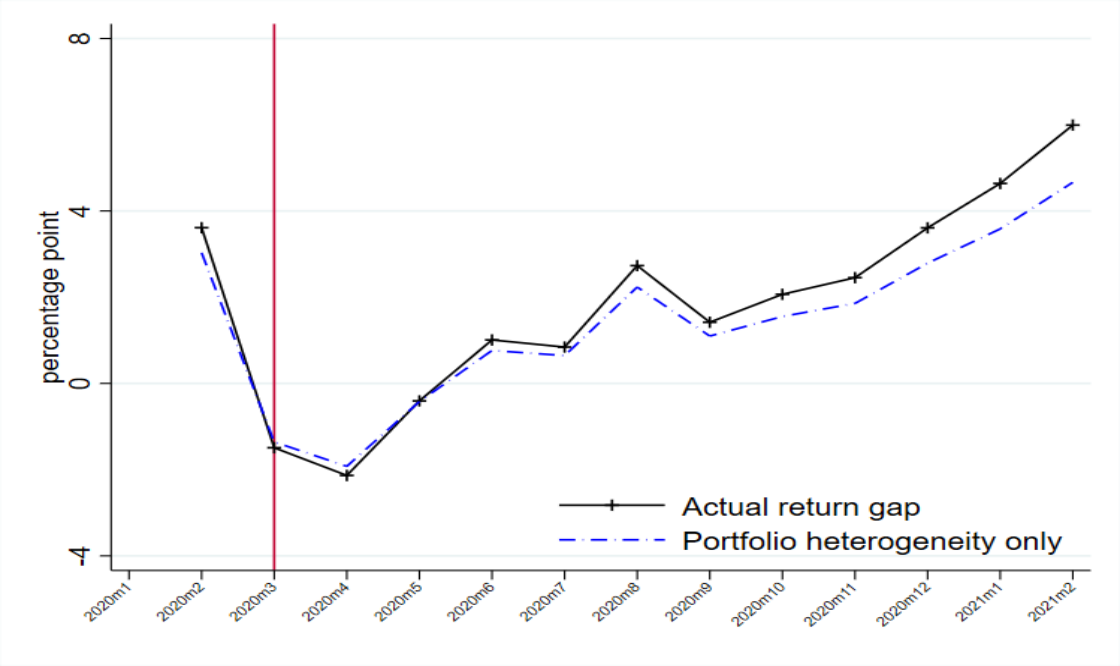
(b) Return gap between top 1% and bottom 99% households



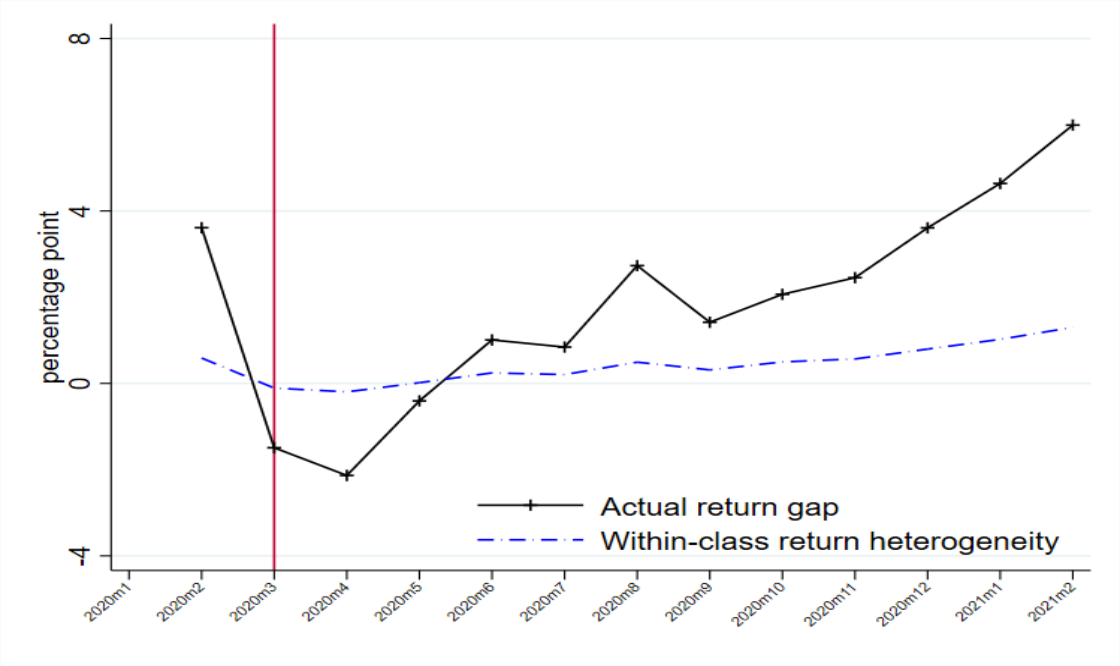
Notes: See Section 2.2 and Appendix B for detailed descriptions of the estimation method.

Figure 8: Counterfactual analysis of the role of two sources of return heterogeneity

(a) Portfolio heterogeneity



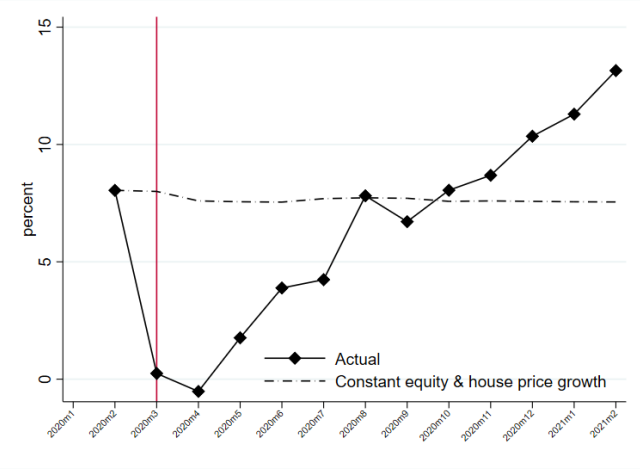
(b) Within-class return heterogeneity



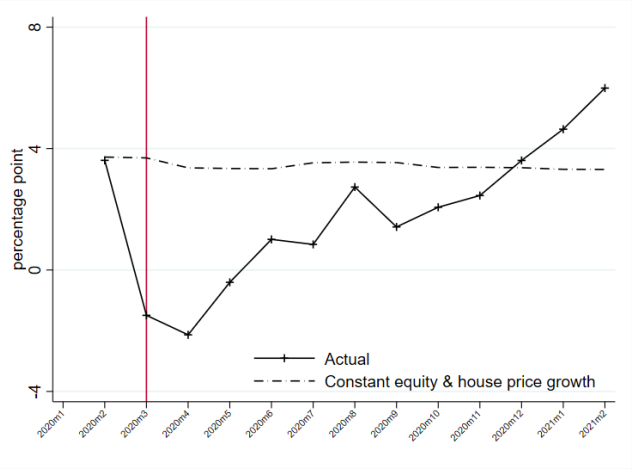
Notes: See Section 3.3 for a detailed description of the counterfactual analysis.

Figure 9: Counterfactual analysis of the role of asset price changes

(a) Average return



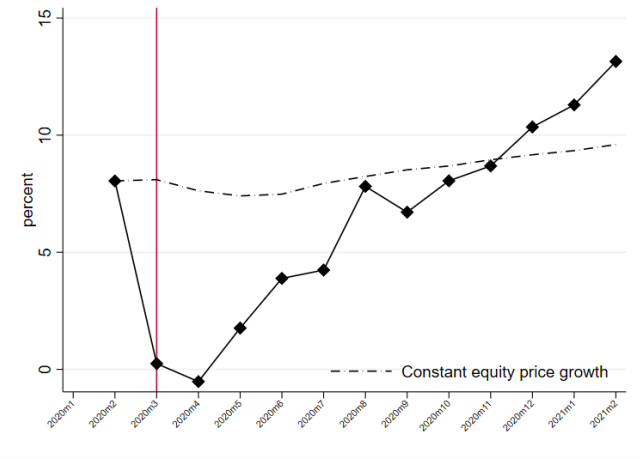
(b) Return gap



(c) Average return

(d) Return gap

(e) Average return



(f) Return gap

Notes: See Section 4.2 for a detailed description of the counterfactual analysis.

Figure 10: Wealth inequality and asset price growth

Notes: See Section 4.2 for a detailed description of the predicted top wealth shares.

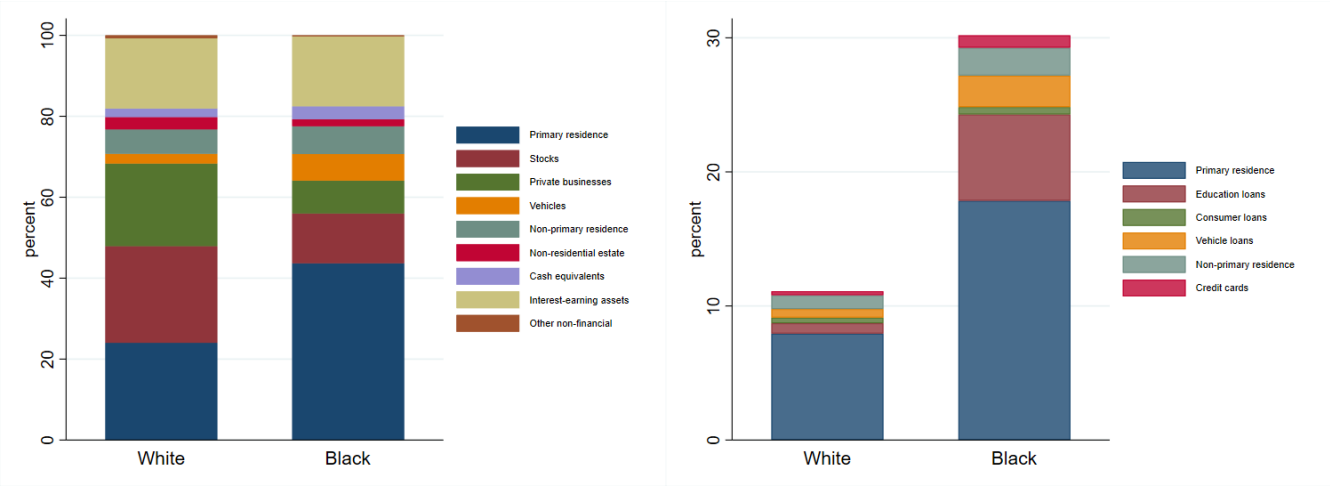
Figure 11: Wealth inequality and saving-rate heterogeneity

Notes: See Section 5 for a detailed description of the predicted top wealth shares.

Figure 12: Household portfolio by race, SCF 2019

(a) Asset composition

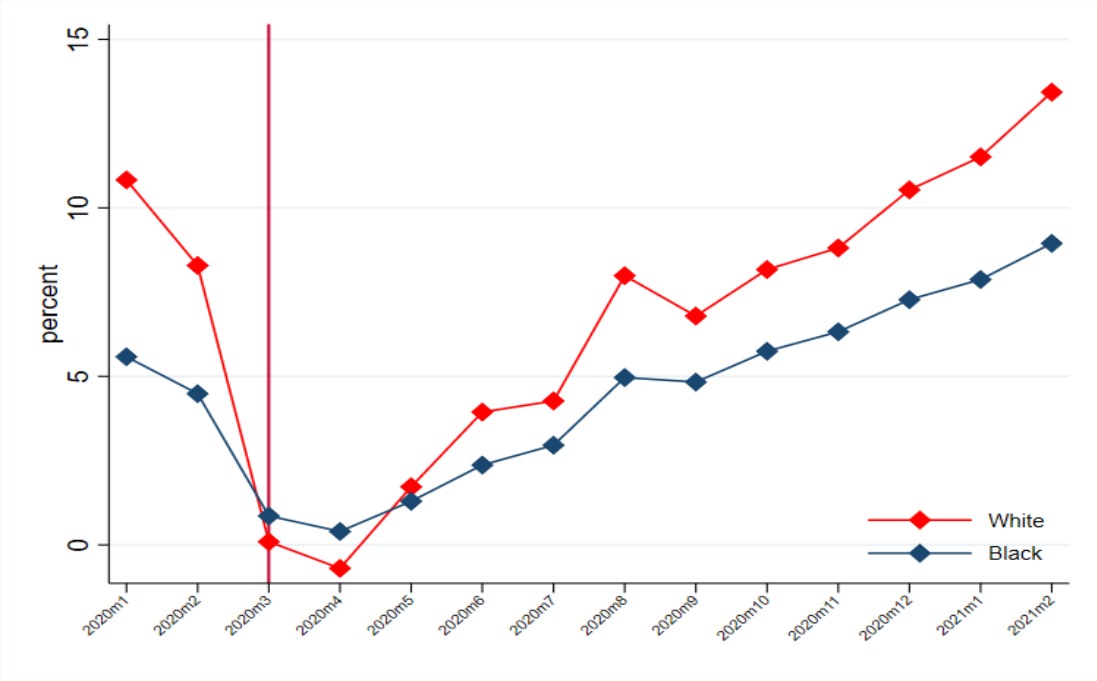
(b) Debt composition (% of total assets)



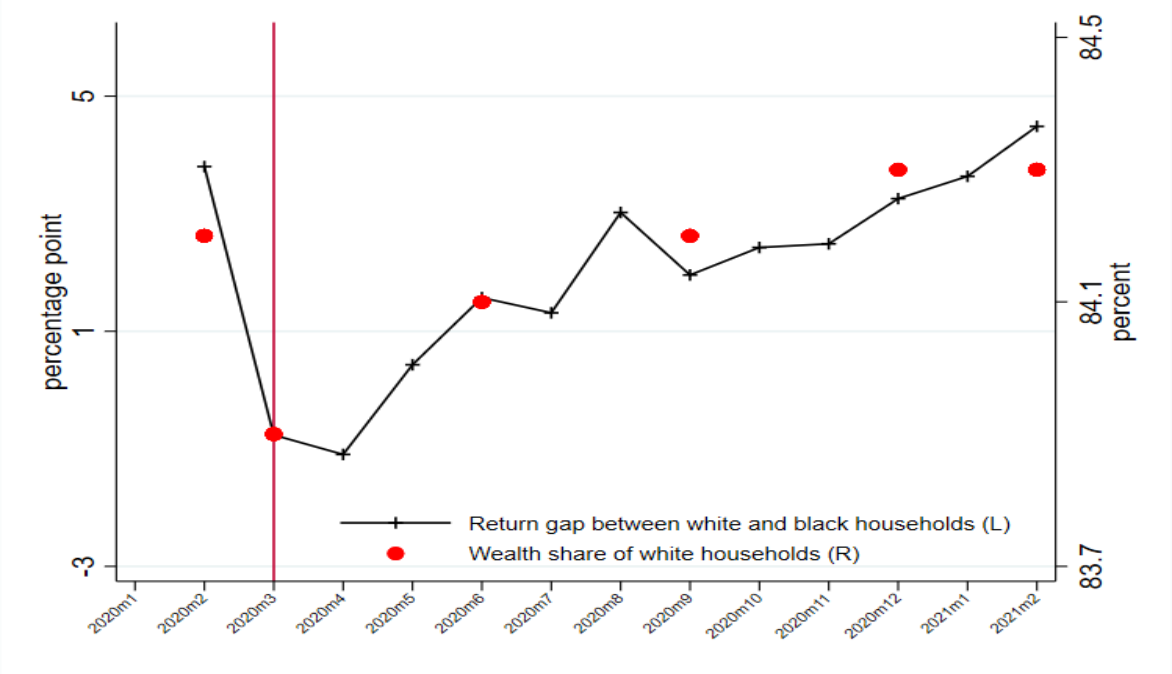
Notes: Household portfolios constructed using appropriately weighted aggregates in the 2019 SCF.

Figure 13: Racial return heterogeneity during COVID-19

(a) Return to wealth



(b) Return gap between white and black households



Notes: See Section 2.2 and Appendix B for detailed descriptions of the estimation method.

Table 1: Determinants of the wealth return gap

	(1)	(2)	(3)	(4)	(5)
Stock return	0.072***				
	(0.005)				
Private business return	0.311***				
	(0.011)				
Housing return	-0.322***				
	(0.018)				
Spread: stock and housing return		0.081***			
		(0.005)			
Spread: private business and housing return		0.307***			
		(0.014)			
Stock price growth			0.075***		
			(0.005)		
Private business valuation growth			0.125***		
			(0.005)		
House price growth			-0.312***		
			(0.020)		
Spread: stock and house price growth				0.068***	
				(0.008)	
Spread: private business and house price growth				0.117***	
				(0.007)	
Spread: weighted equity and house price growth					0.185***
					(0.004)
Adj R^2	0.997	0.995	0.996	0.991	0.990
#. Obs	36	36	36	36	36

Notes: The dependent variable is the monthly return gap between the top 1% and top 99% households in the wealth distribution. ** and *** denote significance at 5% and 1%, respectively. All specifications include a dummy for the pandemic episode to account for the level shifts of the variables.

Table 2: Heterogeneity in household-level wealth returns

	Dependent variable: Net return						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
50-90%	9.418***		9.177***	3.775***	-0.714***	-0.785***	0.043
	(0.198)		(0.211)	(0.235)	(0.147)	(0.137)	(0.140)
90-95%	11.304***		10.937***	4.885***	-0.794**	-0.964***	0.360
	(0.350)		(0.366)	(0.438)	(0.313)	(0.310)	(0.311)
95-99%	13.394***		13.030***	7.377***	0.074	-0.087	1.190***
	(0.413)		(0.424)	(0.486)	(0.477)	(0.458)	(0.457)
Top 1%	15.814***		15.412***	9.396***	2.219***	2.020***	3.277***
	(0.750)		(0.750)	(0.782)	(0.807)	(0.779)	(0.778)
Black		-4.541***	-1.137***	-0.060	0.277	0.301	0.236
		(0.329)	(0.356)	(0.316)	(0.211)	(0.202)	(0.199)
Hispanic		-4.064***	-1.222***	-0.230	-0.043	-0.143	-0.089
		(0.283)	(0.298)	(0.262)	(0.168)	(0.173)	(0.173)
Other		-0.681	-0.708	0.613**	0.138	0.121	0.283
		(0.415)	(0.339)	(0.311)	(0.194)	(0.175)	(0.169)
Homeowners w. mortgages				10.362***		0.693	-0.017
				(0.290)		(0.390)	(0.394)
Homeowners w.o. mortgages				10.767***		0.675	-0.146
				(0.294)		(0.356)	(0.359)
Age 30-40				0.681		0.098	0.142
				(0.469)		(0.255)	(0.250)
Age 40-50				1.685***		0.180	0.199
				(0.472)		(0.290)	(0.287)
Age 50-60				1.556***		-0.173	-0.172
				(0.447)		(0.248)	(0.247)
Age 60-70				0.948		-0.444	-0.377
				(0.470)		(0.274)	(0.271)
Age 70+				1.639***		-0.221	-0.246
				(0.438)		(0.297)	(0.295)
High school				-0.579		-0.364	-0.271
				(0.315)		(0.200)	(0.197)
Some college				-1.132***		-0.459**	-0.306
				(0.348)		(0.211)	(0.210)
College degree				-0.471		-0.357	-0.114
				(0.368)		(0.226)	(0.222)
Above college				-0.873***		-0.388	-0.014
				(0.341)		(0.258)	(0.256)
Portfolio shares	N	N	N	N	Y	Y	Y
# of Obs	5,267	5,267	5,267	5,267	5,267	5,267	5,267
R^2	0.260	0.036	0.263	0.440	0.825	0.826	0.829

Notes: ** and *** denote significance at 5% and 1%, respectively. The bootstrap standard errors are constructed according to Pence (2015) to account for imputation uncertainty and sampling variance of the SCF data.

Appendices to "Wealth Inequality and Return Heterogeneity during the COVID-19 Pandemic"

A Household Portfolios in SCF and DFA

The Distributional Financial Accounts (DFA), a new data set introduced by the Federal Reserve Board in 2019, provides quarterly estimates of the distribution of U.S. household wealth since 1989Q3. The DFA is constructed using two sources of data: the Financial Accounts of the United States and the Survey of Consumer Finances (SCF). The idea is to distribute each component of aggregate household net worth (i.e., Table B.101.h of the Financial Accounts) using analogous information in the SCF.[19] See Batty et al. (2021a) for details on the construction of the DFA.

One advantage of the DFA is that it is updated quarterly nearly in real-time. These data can be used to assess whether wealth portfolios measured in the SCF 2019 data (the weights in our return estimation) can capture the portfolios in the year before the COVID-19 pandemic reasonably well, so that returns to initial wealth during the first year of the pandemic can be constructed. For this purpose, we first show that the SCF 2019 data, which were mostly collected in 2019Q2, generate similar portfolios to the DFA 2019Q2 data. We then show that the DFA-implied portfolios are stable between 2019Q1 and the quarter before the pandemic, 2019Q4. We regroup the SCF wealth categories to be consistent with those in the DFA. The resulting categories are much broader than our SCF classifications.[20] As shown in Figures 2 and A1, household portfolios in the 2019 SCF are similar to those in the 2019Q2 DFA, and that the DFA portfolios are stable in 2019.

An interesting question is whether the wealth composition at the disaggregate level changed substantially during the pandemic. It is possible that some households, likely the wealthy, increased their holdings of risky assets, while other households liquidated their assets to smooth consumption or to protect their wealth from volatile asset prices. In Figure

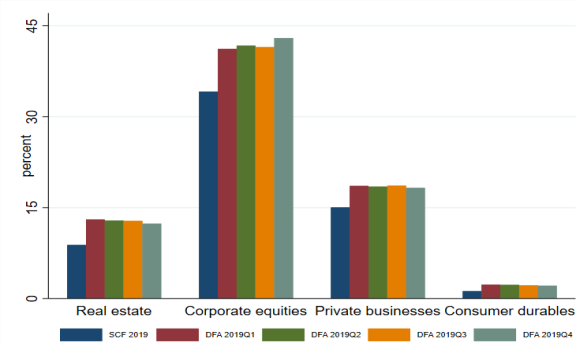
[19] This involves three steps. The first step is to build an SCF analogue for each component of aggregate household net worth, reconciling the concepts and measures used in the two data sources. The second step is to interpolate and forecast the SCF analogues between the triennial SCF observations and beyond the most recent survey year. The final step is to calculate the shares of assets and debt held by different groups in each quarter in the quarterly SCF data and use these shares to distribute the Financial Accounts aggregates.

[20] We regroup SCF asset and debt categories to be consistent with the DFA. The resulting common categories include: (1) real estate (matches primary residence in the SCF), (2) corporate equities and mutual fund shares (matches directly and indirectly held equities and the value of closely-held S and C corporations in the SCF), (3) equity in noncorporate business (matches non-publicly traded businesses and net equity in residential real estate properties owned by households for renting out), (4) consumer durables (approximated by vehicle and other non-financial assets in the SCF), (5) home mortgage (matches debt secured by primary residence in the SCF), (6) consumer debt (matches consumer debt in the SCF), (7) other debt (matches other debt in the SCF), and (8) other assets (matches assets that have not been classified in the SCF).

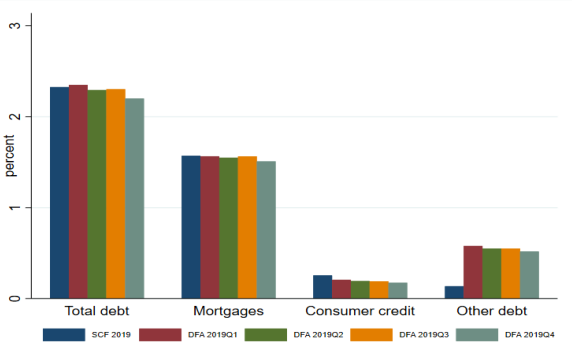
A2, we use the DFA data to examine the wealth portfolios of different household groups during the pandemic. We find that the wealth composition barely changed for households in the bottom 99% of the wealth distribution. The only noticeable, but moderate change happens at the top 1%: their share of corporate equities fell early in the pandemic and bounced back later. These patterns are largely consistent with the change in asset prices, rather than substantial portfolio adjustments across wealth groups. It is important to note that our analysis focuses on wealth and returns of synthetic wealth groups, as is standard in the literature, and does not speak to portfolio adjustments at the individual household level.

Figure A1: Household portfolios in SCF and DFA by wealth, 2019

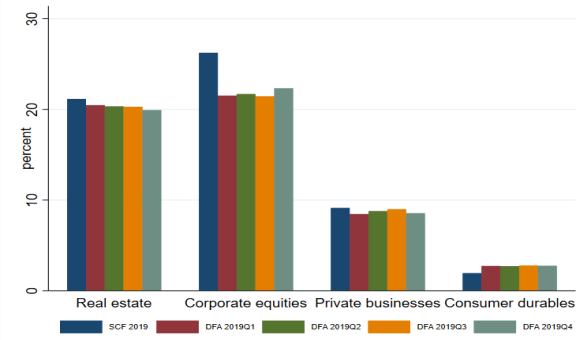
(a) Top 1%, assets



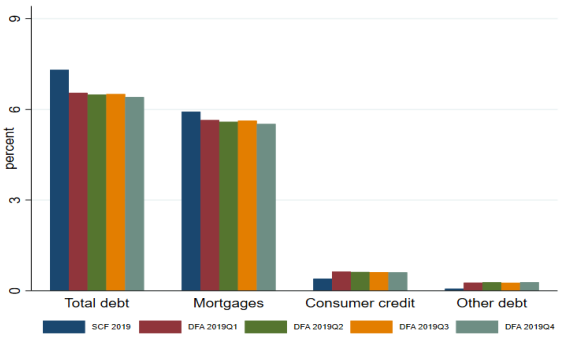
(b) Top 1%, debt (% of total assets)



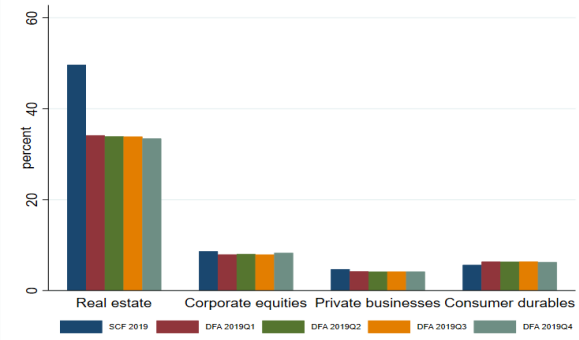
(c) Next 9%, assets



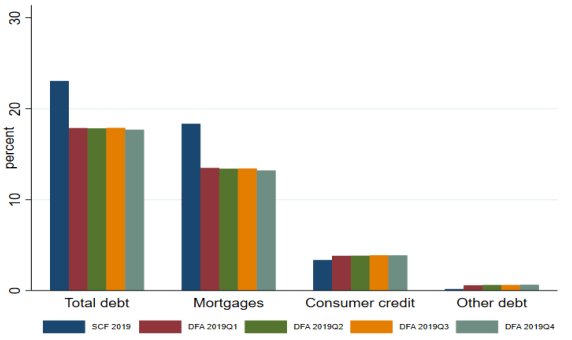
(d) Next 9%, debt (% of total assets)



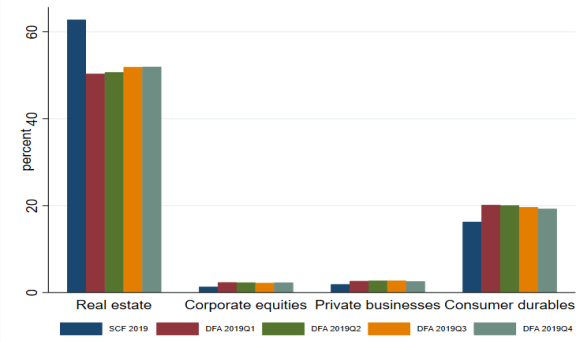
(e) Next 40%, assets



(f) Next 40%, debt (% of total assets)



(g) Bottom 50%, assets



(h) Bottom 50%, debt (% of total assets)

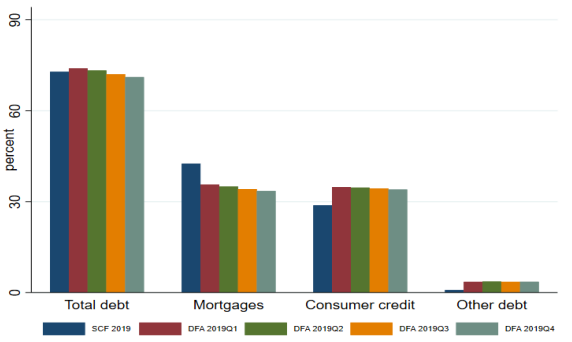
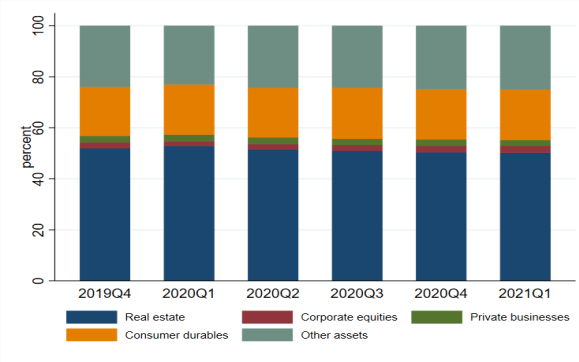
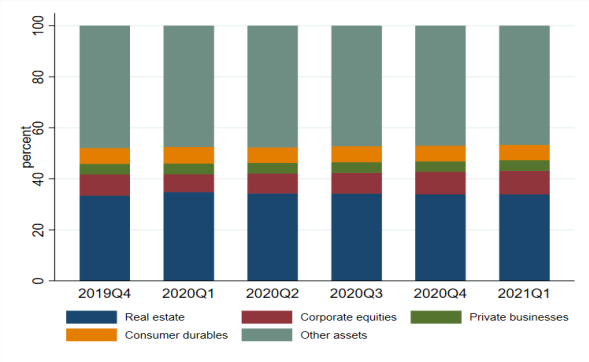


Figure A2: Asset composition during COVID-19

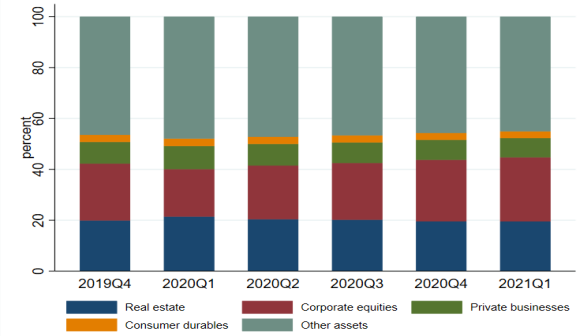
(a) Bottom 50%



(b) Next 40%



(c) Next 9%



(d) Top 1%

Source: Distributional Financial Accounts (DFA), Federal Reserve Board.

B Measuring Yields: The Two-Step Procedure

This section describes our two-step procedure for estimating the yield of each wealth component during the COVID-19 pandemic. A similar approach is used for the analysis of the Great Recession. The first step produces the annualized yield of an asset (or debt) between 2017 and 2019 for each household group. Following Fagereng et al. (2020), the yield of asset (debt) j between 2017 and 2019 for group i is estimated by

$$YIELD_{j,i,t} = \frac{y_{j,i,t}}{a_{j,i,t} + 0.5(a_{j,i,t+3} - a_{j,i,t} - \tilde{y}_{j,i,t})}, \tag{7}$$

where $y_{j,i,t}$ is total flow income (payments) generated in 2017-2019. $a_{j,i,t}$ and $a_{j,i,t+3}$ are the reported asset (debt) values in 2016 and 2019. $\tilde{y}_{j,i,t}$ is the income capitalized into $a_{j,i,t+3}$. Note that $\tilde{y}_{j,i,t}$ is specific to the asset type as detailed below. The denominator adjusts the beginning-of-period asset by adding a fraction (50%) of net flows invested between t and

$t+3$ (henceforth referred to as FGMP adjustment).

After annualizing the yield of the asset (debt) obtained in the first step, in the second step, we multiply this yield by the growth rate of its aggregate counterpart from 2019Q2 to the month of interest. This approach allows us to obtain the yield in real time, while preserving its heterogeneity across households. We next describe $y_{j,i,t}$, $\tilde{y}_{j,i,t}$ and the aggregate yield for each asset (debt) category.

Interest-earning assets. In the SCF 2019, households report their annual interest income for 2018. In the aggregate, the Bureau of Economic Analysis (BEA) publishes monthly personal interest income. To obtain $y_{j,i,t}$, we use annual growth rates of aggregate interest income to obtain micro-level interest income for 2017 and 2019 and sum the three years of interest income to get $y_{j,i,t}$. As in Fagereng et al. (2020), we assume that interest incomes are capitalized into $a_{j,i,t+3}$ and that there is no capital gain for this type of asset, so $\tilde{y}_{j,i,t} = y_{j,i,t}$. In the second step, the aggregate yield on interest-earning assets is expressed as the ratio of annualized aggregate interest income over the value of interest-earning assets (obtained from U.S. financial accounts data) at the quarterly frequency, with FGMP adjustment applied to the aggregate yield as well.

Public equities. In the SCF 2019, households report their annual dividend income for 2018. In the aggregate, the BEA publishes monthly personal dividend income. As in the case of interest-earning assets, we utilize the growth rates of the aggregate dividend income series to estimate $y_{j,i,t}$. We assume dividend income and capital gains are capitalized into $a_{j,i,t+3}$, so $\tilde{y}_{j,i,t} = y_{j,i,t} + g_{j,i,t}a_{j,i,t}$. In the second step, the aggregate stock yield is expressed as the ratio of 12-month S&P 500 dividends over the 12-month lagged value of the S&P 500 index (obtained from Robert J. Shiller's homepage) at the monthly frequency.

Primary residence. The yield of the primary residence is the ratio of owners' equivalent rents (OER) over the home value. Since OER are not measured in the SCF, we construct the aggregate yield as the ratio of annualized personal consumption expenditures on the imputed rent of owner-occupied housing (obtained from the BEA) over the market value of owner-occupied real estate (obtained from U.S. financial accounts data) at the monthly frequency, applying the FGMP adjustment. We further subtract from this ratio the annual depreciation rate of 2.3% for residential 1-to-4-unit structures, estimated by the BEA, and the average effective property tax rate paid by U.S. homeowners in 2019 of 1.03%, based on the estimate of the Tax Foundation.

Non-primary residential properties. In the SCF 2019, households do not report rent income separately but report it together with a few other categories (e.g., royalties). To

obtain a more precise measure of the yield, we condition on households who own non-primary residential properties but do not own non-residential properties or any other miscellaneous non-financial assets such as royalties. To obtain $y_{j,i,t}$, the growth rates of BEA's aggregate rent income data are used. For computing $\tilde{y}_{j,i,t}$, we assume that rent income is not capitalized into the asset value but net capital gains are, so $\tilde{y}_{j,i,t} = (g_{j,i,t} - 3\delta^R)a_{j,i,t}$, where δ^R is the annual depreciation rate of residential rental properties, set to 3.64% based on the estimate by the Internal Revenue Service (IRS). In the second step, we construct the aggregate rent-price ratio using the CPI-rent index and the CoreLogic national home price index, and use the growth rate of this ratio to adjust the micro-level yields. We further subtract from the adjusted micro yields the average effective property tax rate paid by U.S. homeowners in 2019 of 1.03% (the Tax Foundation's estimate).

Private businesses. To obtain the yield of private businesses, we first estimate the net profits earned by non-corporate (proprietors' and partnerships') businesses and corporate businesses (S and C corporations), adjusted for the owners' latent labor income and retained profits, as in Moskowitz and Vissing-Jorgensen (2002) and Kartashova (2014). In the first step, we use the growth rates of aggregate proprietors' income, corporations' after tax profits, and the wage index for private management workers to compute the three-year profits of the two types of businesses.[21] For non-corporate businesses, $\tilde{y}_{j,i,t}$ is retained profits; for corporate businesses, $\tilde{y}_{j,i,t}$ is the capital gains as described in Section 2.2. In the second step, the aggregate yield for non-corporate businesses is the ratio of proprietors' income over non-corporate equities (from U.S. financial accounts data). The aggregate yield for corporate businesses is the ratio of closely held corporate profits over closely held corporate equities (from U.S. financial accounts data) with FGMP adjustments. The return on total private businesses is the weighted average of the returns on the two types of businesses, where the weight is the share of each business in the group's total private business value.

Vehicles. In our baseline procedure, we use a standard user-cost model for estimating the return on vehicles. According to the model, this return is measured by the service flow (or the user cost) net of depreciation. The service-flow rate is $(r + \delta^u)/(1 + r)$, where r is the real interest rate and δ^u is the depreciation rate from the user's point of view. In calibrating these parameters, we set $r = 0$, consistent with the current low real-rate environment, and $\delta^u = 8.3\%$, consistent with industry analysts' opinion that the average life span of a car is 12 years.[22] The depreciation rate is calibrated using the replacement value of vehicles (from the U.S. financial accounts) and the expenditures on new vehicles (from the BEA), which is

[21] Data on proprietors' income and corporate after-tax profits are obtained from the BEA. The wage index refers to the Employment Cost Index (ECI): wages and salaries for private industry workers in management, business, and financial industries, are obtained from the U.S. Bureau of Labor Statistics.

[22] See, for example, Ken Budd, "How Today's Cars Are Built to Last", November 1, 2018, AARP.org.

-14% on average since 2007.[23] The resulting return on vehicles is -5.7%.

An interesting observation is that during the COVID-19 pandemic, used car prices surged (Figure D4), resulting in high inflation in this category, whereas before the pandemic, inflation of used car prices was essentially zero. To assess the implications of surging used-car prices for wealth returns, we include the 12-month inflation rate of used car prices (the Manheim index) into the capital gain part of the vehicle return and rerun our main analysis. Appendix Figure D5 (panel a) shows that the average wealth return is barely affected (increasing from 13.1% to 13.6% in February 2021), due to the small share of vehicles in total assets. However, since vehicles account for a relatively large part of the wealth at the lower end of the wealth distribution, the return to net worth increases more for those households and hence the return gap shrinks (panel b, Figure D5), by about 0.6 pp in February 2021.

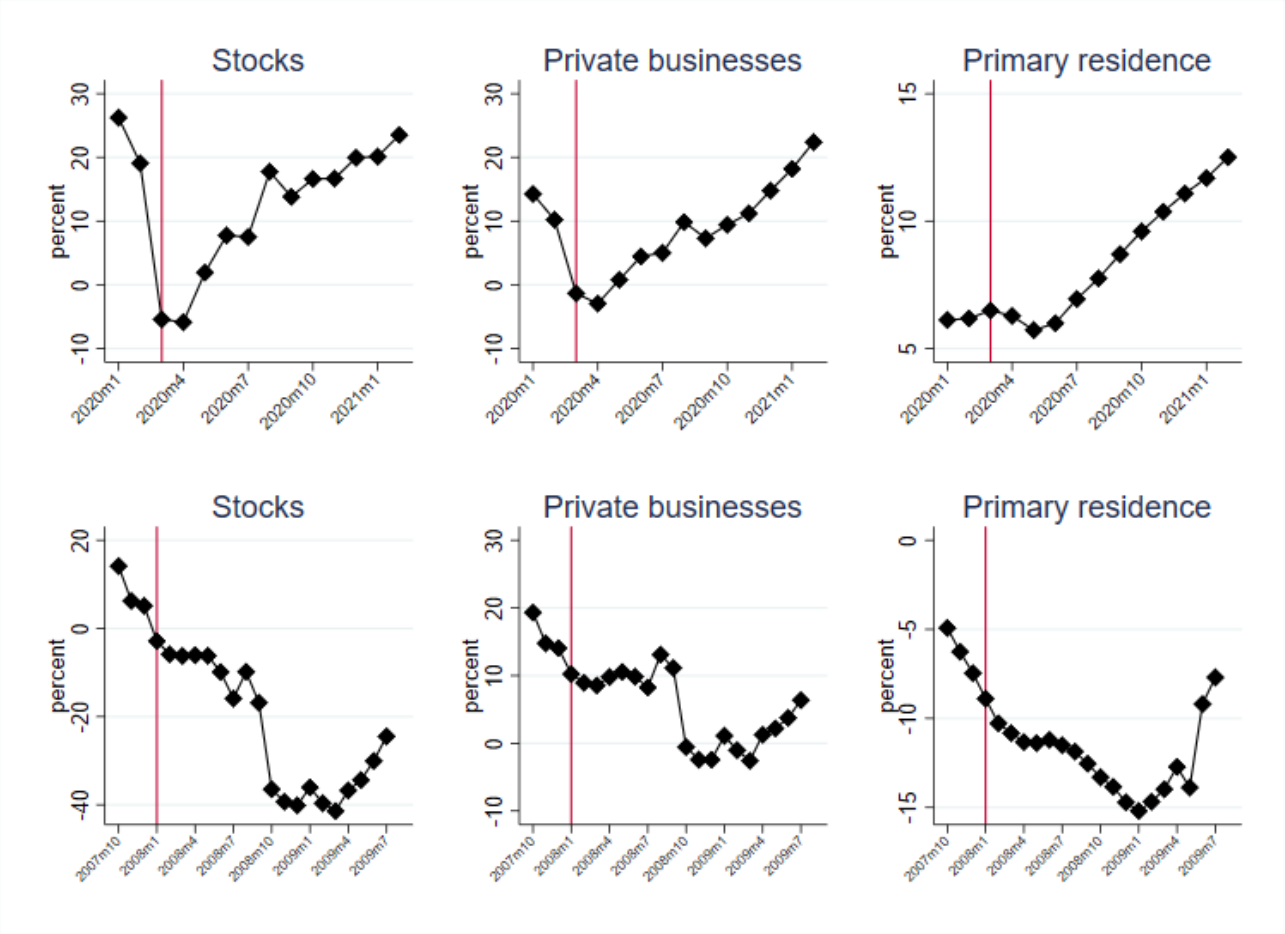
Debt. For each debt type, in the first step, we compute total payments over 2017-2019, applying the growth rates of aggregate mortgage payments and aggregate consumer debt payments (from the Federal Reserve Board's estimates of household debt service payments) to households' reported 2018 payments. The law of motion for debt implies that $\tilde{y}_{j,i,t} = y_{j,i,t}$. In the second step, we construct the aggregate yield as the payment-to-debt ratio for mortgage debt and for consumer debt with FGMP adjustments. The only exception is the return on credit card debt, which we set to 16% according to the estimate of the national average credit-card rate in 2020 by CreditCards.com's weekly rate report.

Other categories. Lastly, we use external return estimates when equation (2) cannot be estimated using our data. For example, the return on non-residential real estate equity is approximated by the Green Street's commercial property return index (CPRI). The return on other financial assets is set to zero, as assets in this category are typically not traded publicly or their value is uncertain. The return on other non-financial assets is set to 2%, again due to their limited tradability and uncertain valuation, but we expect these real assets to generate a return at least as high as the expected inflation rate. Due to the small shares of these miscellaneous financial and non-financial assets, however, using reasonable alternative return rates does not alter our results qualitatively or quantitatively.

[23] Specifically, we subtract expenditures on new vehicles from the annual change in vehicle stock, divided by vehicle stock in the previous year. To obtain vehicle stock, we use the fact that vehicle stock accounts for 1/3 of consumer durables stock in the U.S. financial accounts data (Batty et al. (2021a)).

C Additional Figures and Empirical Results

Figure C1: Returns on major assets during the COVID-19 pandemic (top panel) and the Great Recession (bottom panel)

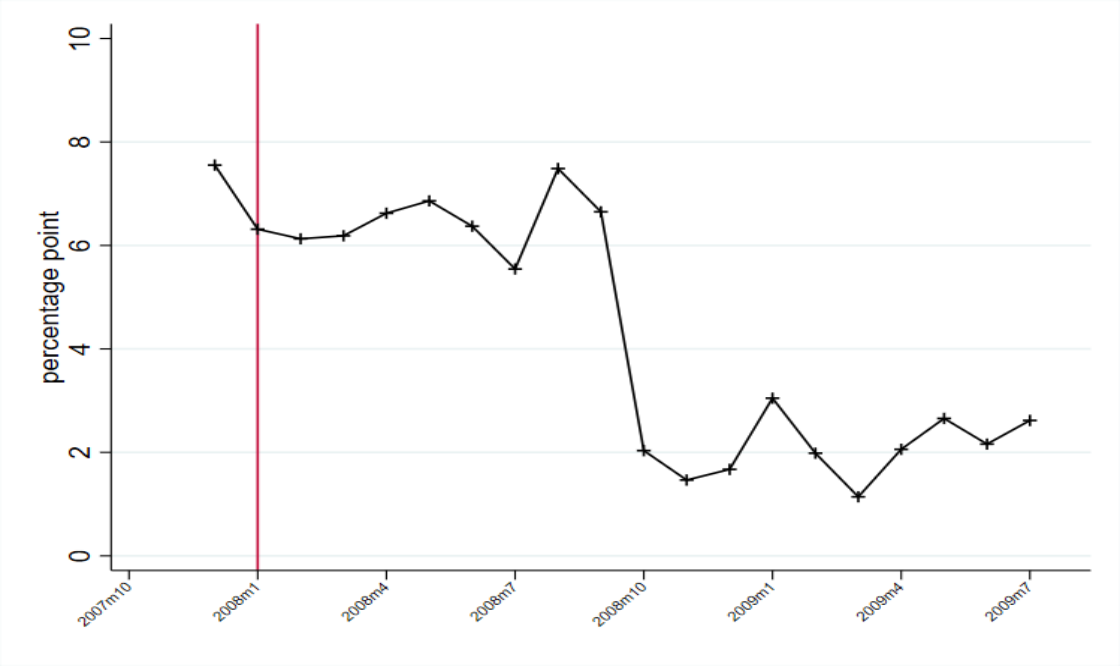


Notes: See Section 2.2 and Appendix B for detailed descriptions of the estimation method.

Figure C2: Return heterogeneity during the Great Recession

(a) Return to wealth for selected wealth fractiles

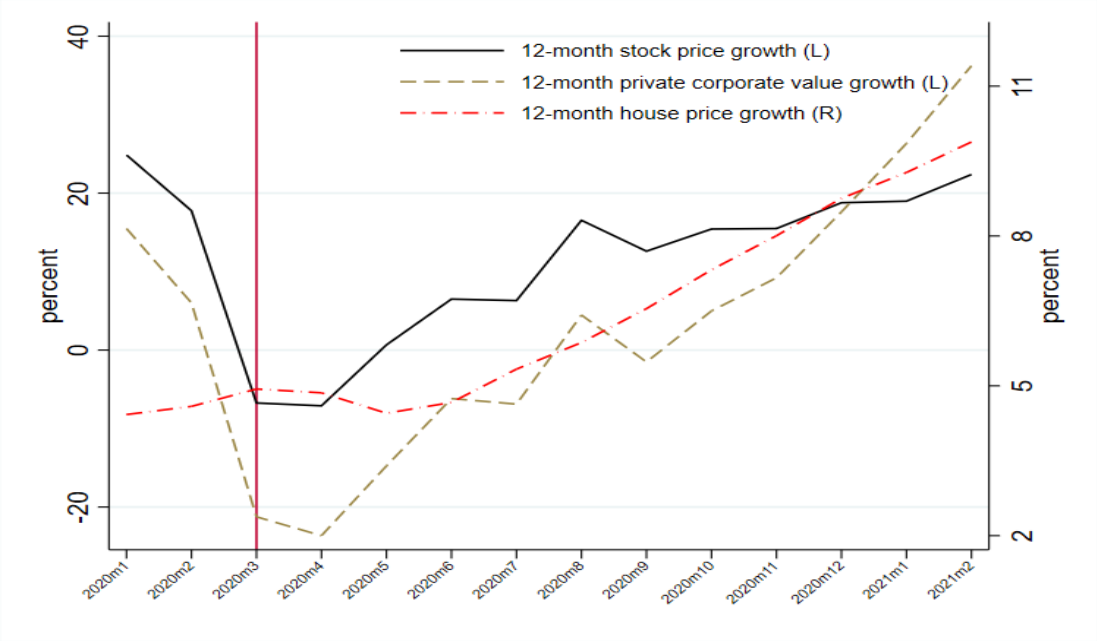
(b) Return gap between top 1% and bottom 99% households



Notes: See Section 2.2 and Appendix B for detailed descriptions of the estimation method.

Figure C3: Asset price growth in two episodes

(a) Covid-19

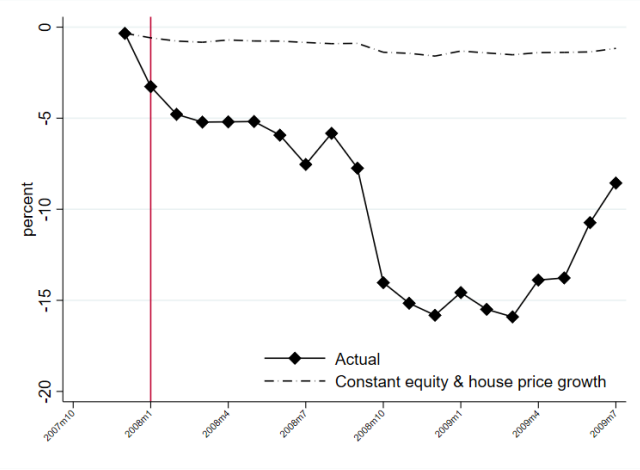


(b) Great Recession

Sources: CoreLogic national home price index; the Russell 3000 broad-market index (for stock price growth); the Russell 2000 index (for valuation growth of private corporate businesses, i.e., S and C corporations).

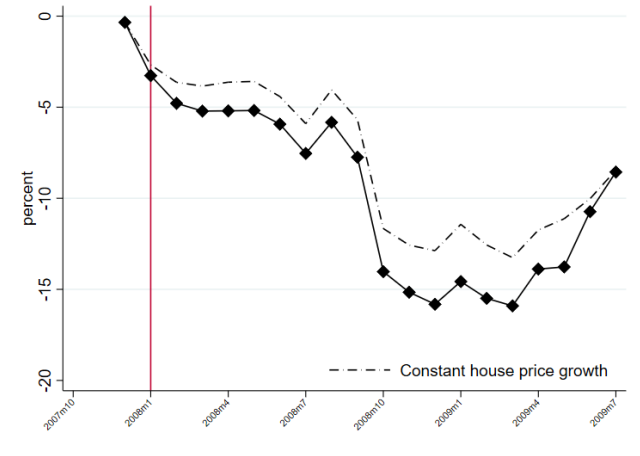
Figure C4: Counterfactual analysis of the role of asset price changes, 2007-2009

(a) Average return



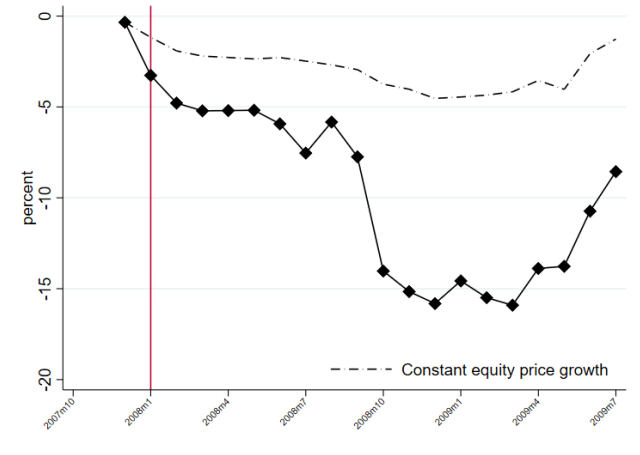
(b) Return gap

(c) Average return



(d) Return gap

(e) Average return



(f) Return gap

Notes: See Section 4.2 for a detailed description of the counterfactual analysis.

D Robustness

D.1 Heterogeneity in Private Business Returns

In our previous wealth return estimation (Section 3), we used the Russell 2000 (small-cap) index to measure the capital gains of private corporate businesses. One concern is that, since we apply the growth rate of this index to all businesses, this approach could mask substantial heterogeneity in the effects of the pandemic on the valuation of private corporate businesses in different industries, resulting in biased estimates. This appendix addresses this concern by using industry-specific returns to measure the capital gains of private corporate businesses.

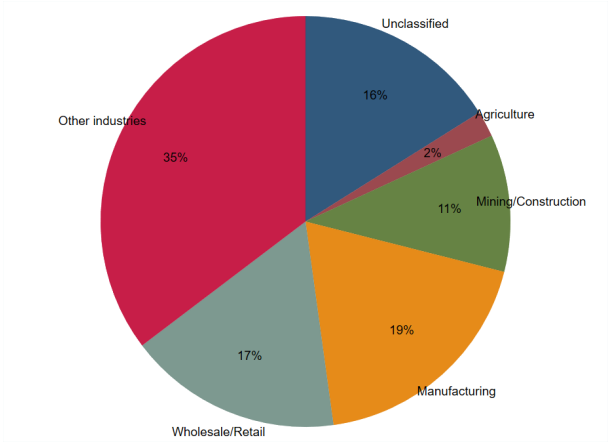
The SCF data have information on the broad industry in which a household's two largest businesses operate. Figure D1 shows the shares of these industries in the private corporate businesses held by the top 1% and bottom 99% households. Businesses that do not have industry information are labeled as "unclassified". Figure D2 shows the corresponding returns of these broad industry portfolios since January 2020, based on publicly traded firms in these industries.

To formally assess the implications of the industry composition of households' businesses and the evolution of industry-specific returns during the pandemic for the wealth returns, we re-run our main analysis and summarize the results in Figure D3. For the baseline estimates, we use the weighted average return to measure the capital gains of private corporate businesses for all households, which masks heterogeneity arising from industry-specific returns during the pandemic. For the alternative estimates, we apply industry-specific returns to the businesses with identified industry information and the broad-market (the Russell 3000) index returns to unclassified businesses. The capital gain of the private corporate businesses of a specific household group in this case is the sum of the returns in each industry (i.e., Figure D2) weighted by the share of the industry in the group's portfolio (i.e., Figure D1). Returns on all other wealth components are the same in the two estimation procedures.

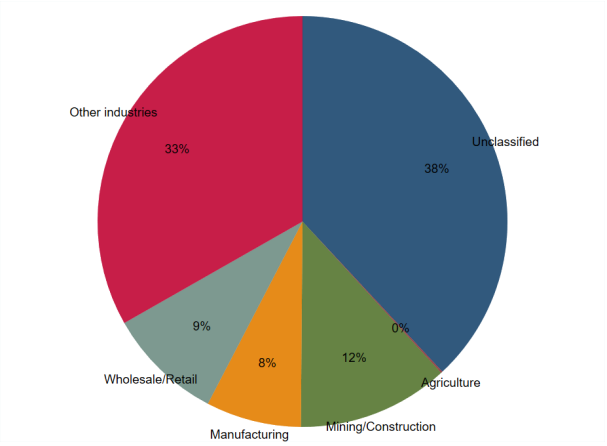
By construction, the average wealth returns are the same in the two approaches (panel a, Figure D3). The return gap turns out to be quite similar, as shown in panel (b) of Figure D3. If the top 1% households hold higher shares of their corporate businesses in the industries that earn systematically higher (lower) returns, we would expect the return gap to be higher (lower) than the baseline return gap. We do not find support for this hypothesis, however.

Figure D1: Industry composition of private corporate businesses

(a) Held by bottom 99%

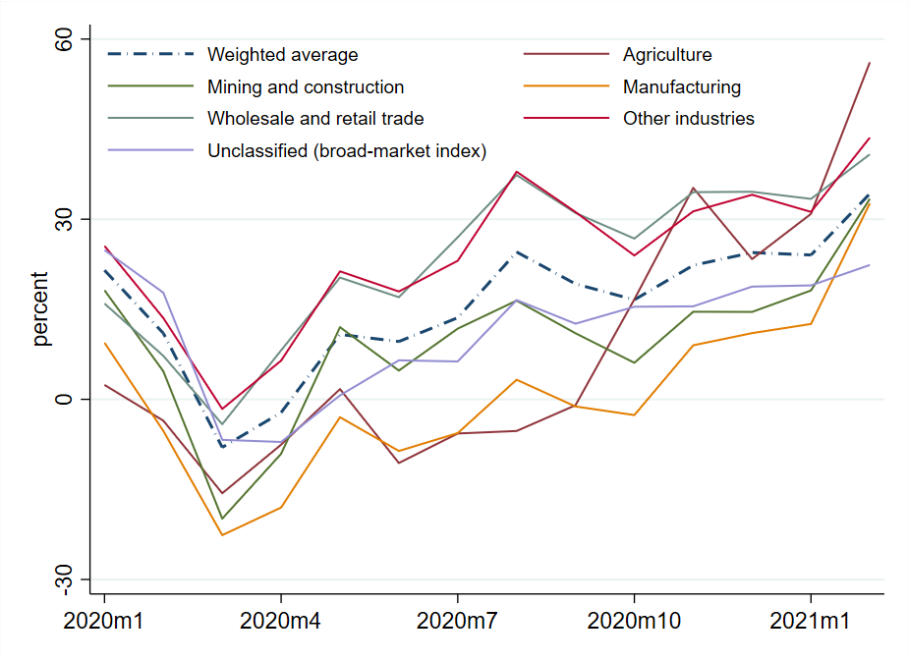


(b) Held by top 1%



Source: SCF 2019. Notes: Each pie chart shows the shares of private corporate businesses (S and C corporations) in each industry. "Unclassified" refers to (i) businesses with a value above a certain cut-off ($100 million*1.2249) whose industry assignment was removed by the SCF from the public version of the data, and (ii) businesses that are not reported as the two largest private businesses (i.e., the remaining businesses).

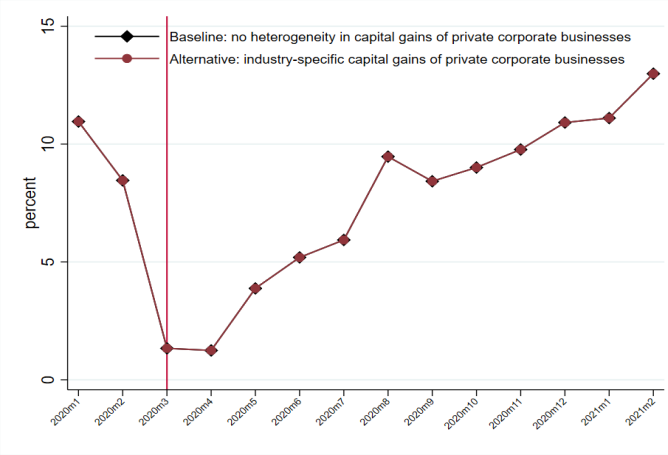
Figure D2: Fama-French industry-specific returns (ex. dividends)



Sources: Fama-French industry portfolios (downloaded from Kenneth R. French's homepage); the Russell 3000 (broad-market) index. Notes: The weighted average return is constructed using industry-specific returns and the SCF data for the weights (i.e., the share of aggregate private corporate businesses held in each industry in 2019). We convert the original Fama-French monthly returns to 12-month cumulative returns at monthly frequency.

Figure D3: The role of heterogeneous (industry-specific) capital gains of private corporate businesses

(a) Return to net worth

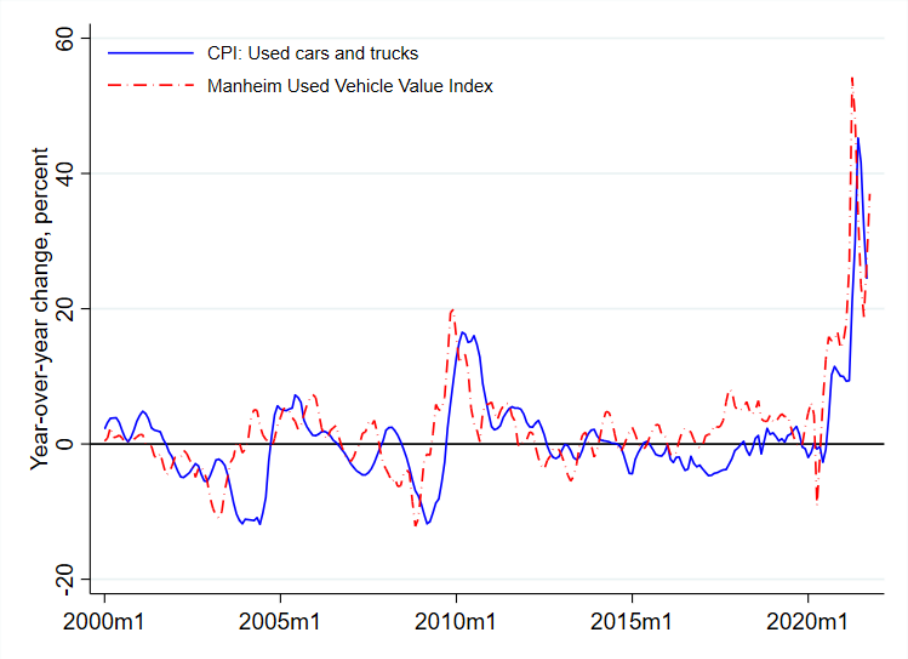


(b) Return gap between top 1% and bottom 99%

Notes: The baseline estimates use the weighted average return (the dashed line in Figure D2) for measuring the capital gains of private corporate businesses. The alternative estimates use Fama-French industry-specific indices and the broad-market index to construct the capital gains of private corporate businesses.

D.2 Return on Vehicles during COVID-19

Figure D4: Inflation of used car prices

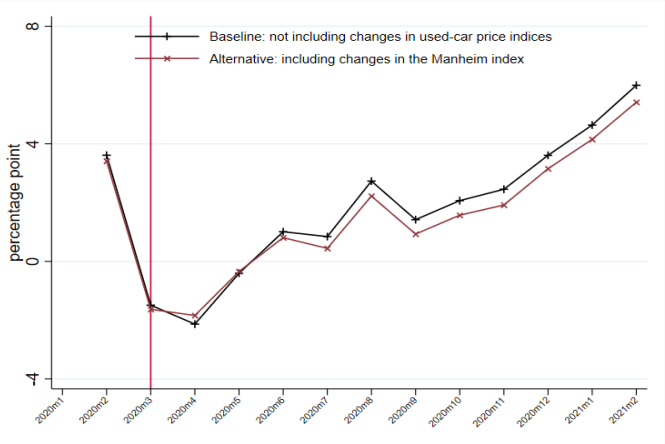


Sources: The Manheim used vehicle value index; Bureau of Labor Statistics.

Figure D5: The effect of surging vehicle prices on wealth returns during COVID-19

(a) Return to net worth

(b) Return gap between top 1% and bottom 99%

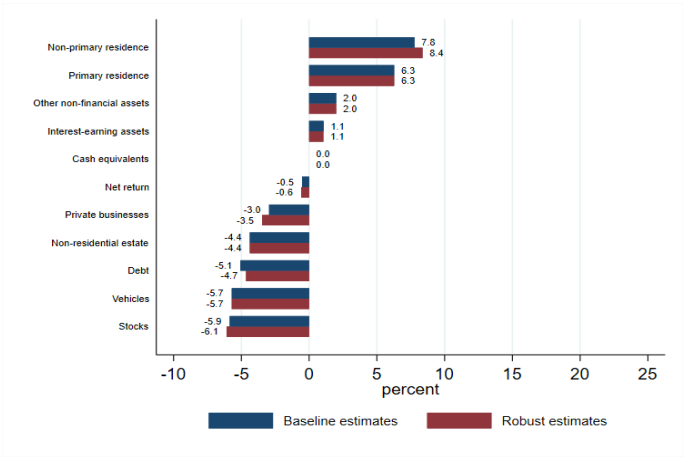


Notes: The baseline return estimates do not include changes in used-car price indices. The alternative return estimates incorporate 12-month growth of the Manheim used-car price index as part of the vehicle capital gains.

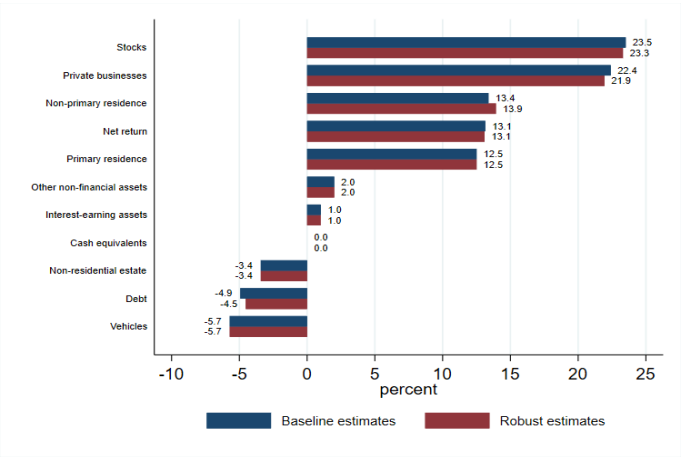
D.3 Alternative Return Estimation Method

Figure D6: Returns from alternative estimation methods

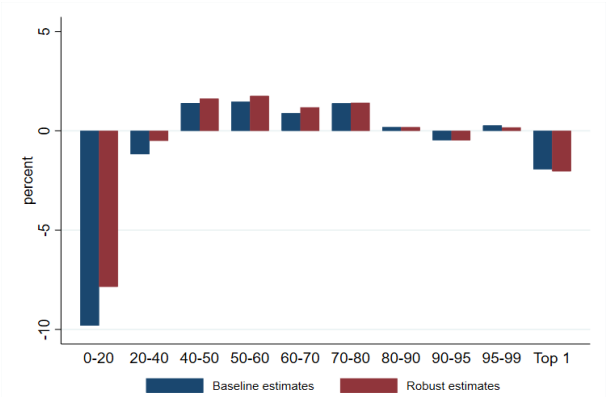
(a) Average returns, April 2020



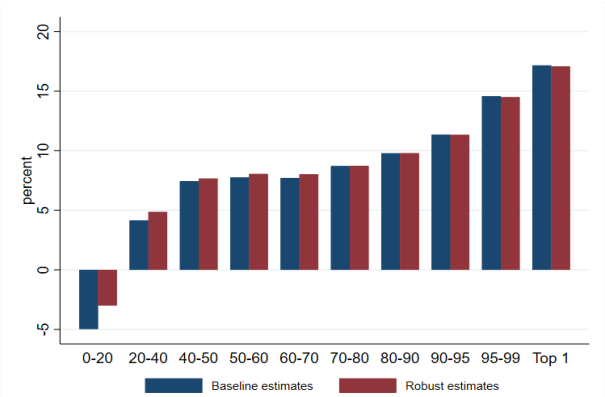
(b) Average returns, February 2021



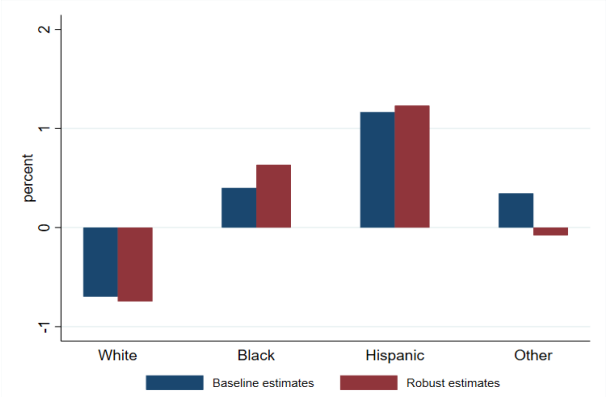
(c) Return by wealth, April 2020



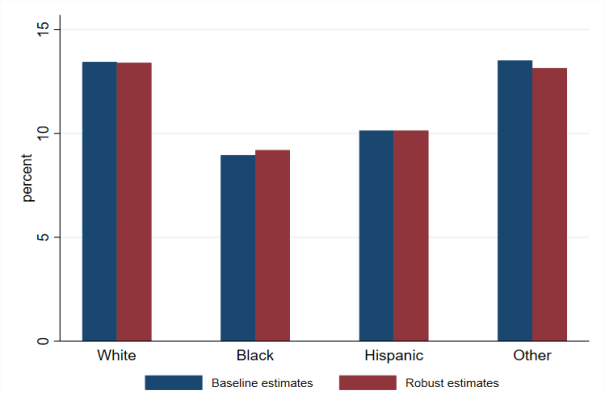
(d) Return by wealth, February 2021



(e) Return by race, April 2020



(f) Return by race, February 2021



Notes: See Section 6 for a detailed description of the alternative estimation method.