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# The distribution of household debt in the United States, 1950-2022 ☆

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ABSTRACT

Using new household-level data, we study the secular increase in U.S. household debt and its distribution since 1950. Most of the debt were mortgages, which initially grew because more households borrowed. Yet after 1980, debt mostly grew because households borrowed more. We uncover home equity extraction, concentrated in the white middle class, as the largest cause, strongly affecting intergenerational inequality and life-cycle debt profiles. Remarkably, the additional debt did not lower households' net worth because of rising house prices. We conclude that asset-price-based borrowing became an integral part of households' consumption-saving decisions, yet at the cost of higher financial fragility.

## 1. Introduction

Rising household debt levels characterize the modern financial history of the United States. The numbers are eye-catching. Between 1950 and the Financial Crisis, U.S. household debt grew fourfold relative to income (Fig. 1a). In 2010, the household debt-to-income ratio peaked at close to 120%, up from 30% after World War II. This increase was mainly driven by *housing* debt, which consistently

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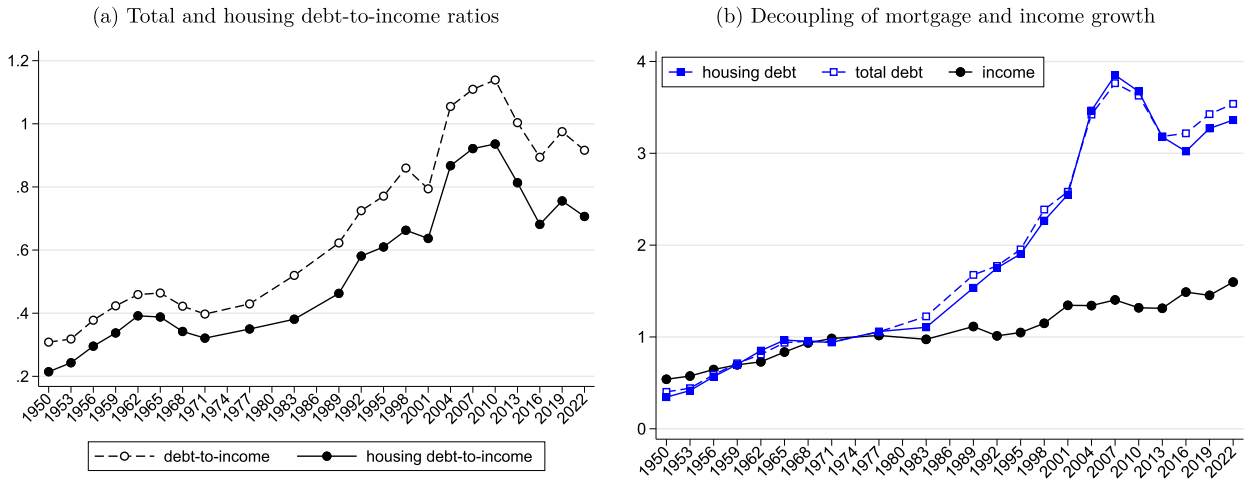



Notes: The left panel shows the ratio of average total household debt and mortgage debt to average total household income over time. The right panel shows the growth rates of average total debt, mortgage debt and income, relative to their averages over the 1970s.

**Fig. 1.** Debt-to-income ratios and decoupling of debt and income growth.

accounted for around 80% of total debt. Data limitations left a blind spot regarding the historical evolution of the distribution of household debt and hence limited our understanding of the causes and consequences of the secular change in household finances. Using novel household-level microdata on income, assets, and debt, this paper contributes to closing this gap.

We document the evolution of household debt over the entire postwar period, asking which households have borrowed so much more, how this relates to their incomes and asset values, and which consequences their high debt levels have for the macroeconomy. Given its macroeconomic importance, we primarily focus on housing debt, but also present selected results on non-housing debt. We rely on the newly compiled SCF+ dataset that combines historical waves of the Survey of Consumer Finances (SCF), going back to 1949, with the modern SCF that the Federal Reserve Board has administered since 1983 (Kuhn et al. 2020). We further use data from the Panel Study of Income Dynamics (PSID), which provides household-level panel data on housing assets and mortgage debt since 1969.

Our first main new finding is that the nature of the debt increase has changed qualitatively over the seven decades of rising household indebtedness. In the 1950s and early 1960s, increases in debt-to-income ratios were driven by the fact that more households were taking out mortgages during the postwar homeownership boom, so debt increased at the extensive margin. By contrast, when debt-to-income ratios surged after 1980, this was due to the fact that conditional on having a mortgage, households borrowed more. The debt increase after 1980 led to a strong and characteristic divergence of debt growth, driven by housing debt, and income growth (Fig. 1b). This is our second main new finding. The distribution of debt across income groups however remained strikingly stable during this divergence period. The upper half of the income distribution always owed at least 80% of both mortgage and total household debt.

Using PSID data, we find that almost half of the debt growth after 1980 resulted from home equity extraction, which is our third main new finding. Borrowing against rising house values allowed households to realize capital gains that would otherwise have remained illiquid. These realized capital gains have been concentrated in the white middle class but played out unequally across generations, with the cohorts born between 1935 and 1954 extracting most equity. The widespread equity extraction also led to changing life-cycle profiles of debt across generations. However, the concurrently rising asset prices prevented a systematic reduction in life-cycle (net) wealth accumulation.[1] These new facts of life-cycle dynamics and intergenerational inequality are our fourth main new finding. We conclude that debt accumulation in reaction to changing asset prices has become a key part of households' consumption-saving decisions since the 1980s. At the macroeconomic level, we find that though households did not become wealth-poorer, their expanding balance sheets have increased financial fragility. We illustrate the declining resilience against financial shocks by "stress testing" households with interest rate and earnings shocks that deteriorate their debt service capacity.

The microdata allow us to scrutinize the idea that the rising debt-to-income ratios after 1980 were a characteristic feature of specific population groups. We show that the decoupling of income and debt growth after 1980 is not driven by particular groups of households but applies across income, education, age, race, or marital status. These socioeconomic groups differ in both their income levels and expected future income growth. The uniform divergence of income and debt growth across all groups points to a quantitatively important role for asset price growth as a driver of the debt boom.

To support the hypothesis of asset-price-related borrowing, we rely on PSID panel data. The PSID contains data on housing and mortgages that allow us to identify home equity extractors and quantify the size and distribution of home-equity-based borrowing since the 1980s. Previous research has identified equity extraction in response to rising house prices and falling interest rates as an

[1] When we refer to wealth in the paper, we mean net wealth throughout, i.e. assets net of debt.

important factor for the household debt increase (Greenspan and Kennedy 2008, Klyuev and Mills 2007, Mian and Sufi 2011, Bhutta and Keys 2016). From the early 1980s to the 2008 crisis, we find that equity extraction alone pushed the housing debt-to-income ratio up by more than 30 percentage points. But we also document that equity extraction was responsible for a significant part of the rise in U.S. household debt even before the extraction boom of the 2000s, which has been the main focus of prior work. Looking across household groups, we find that middle-class households are the largest contributors to the extraction boom. Moreover, the equity extraction boom was almost exclusively driven by white households. This racial inequality in equity extraction aligns with previous work on the size and persistence of the racial wealth gap, for which the black-white homeownership gap plays a key role (Derenoncourt et al. 2022, Aliprantis and Carroll 2019, Bartscher et al. 2021).

From a theoretical perspective, increased borrowing against rising asset values constitutes smoothing of future capital gains income. Increasing debt levels collateralized by rising asset values relax the household budget constraint today, as they shift future income from capital gains to the present. This idea of expanded budget sets from realized capital gains relates our work to Fagereng et al. (2022), who show that a budget set expansion from movements in asset prices is welfare-enhancing. Realizing capital gains via augmenting debt instead of selling the asset is particularly relevant in the context of housing, as it allows to liquidate capital gains without selling the house, such that households still enjoy the full consumption utility of their home although their equity declined.[2]

Regarding inequality, we explore the distributional consequences of the boom in debt and equity extraction from rising asset prices. Changing asset prices at a certain point in time benefit the owners of the asset at that time and thus naturally play out differentially across generations. We therefore look at the intergenerational inequality of realized capital gains through equity extraction, and find large differences, with the 1935-1954 cohorts extracting most home equity. These cohorts entered the housing market before 1980 and benefited from the entire house price and extraction boom. Yet, we also find that their wealth levels relative to income did not fall behind other generations because of the counteracting effect of rising house prices on the asset side of their portfolio.

The long-run SCF+ data also allow us to study the life-cycle profiles of household debt across generations. We document that equity extraction led to pronounced changes in these life-cycle profiles. Our oldest cohort took out a mortgage early in life and repaid it constantly over time, such that their debt-to-income profile was falling over the life cycle. For the younger cohorts, we observe a shifting and tilting of the profiles from cohort to cohort. The turning point coincides with the onset of the 1980s debt boom. As a consequence, households from younger birth cohorts enter retirement with much more debt (see also Lusardi et al. 2018, 2020). While the pre-war generations typically approached retirement with modest debt ratios of 30% to 60% of income, households in the cohort 1945-1954 had average debt ratios of almost 120% at the same age.

In a final step, we study the macrofinancial consequences of the debt and equity extraction boom. We rely on the rich SCF+ microdata to document the evolution of mortgage debt service as a fraction of household income over time. We find that debt-service burdens have increased substantially despite the concurrent fall in mortgage interest rates. As high debt service burdens are a frequently-debated indicator of the household sector's financial fragility, we conduct a "stress test" with respect to interest rate and earnings risk. We find that the resilience of the U.S. household sector to financial shocks has strongly declined over the debt boom, especially in the lower half of the income distribution and the middle class. Our results highlight that equity extraction poses a tradeoff between an expansion of individual budget sets and the reduced ability of the U.S. household sector to absorb financial shocks because of its high debt service burden.

**Literature.** The analysis of household balance sheets and their importance for financial stability and the business cycle has become an active research field in finance and macroeconomics.[3] In influential work, Mian and Sufi (2009, 2011) argue that household debt in low-income regions of the U.S. grew strongly before the 2008 crisis, followed by severe output and employment losses. In theoretical work, Kumhof et al. (2015) and Mian et al. (2021a) show that higher savings of the rich may lead to a fall in interest rates, higher borrowing by lower-income households, and higher financial fragility. However, Coibion et al. (2020) find that low-income households face higher borrowing costs and lower credit access as inequality increases. Adelino et al. (2016), Foote et al. (2021) and Albanesi et al. (2022) study the debt boom of the 2000s and highlight the important role of the middle class in this period. Our paper is the first to study the distribution of U.S. household debt over the long run. Moreover, we study debt along another important socioeconomic dimension of the U.S. inequality debate beyond income, namely race. The long time span of our data further allows us to track birth cohorts over time and highlight intergenerational redistribution as a key inequality dimension of the debt boom.

A large literature has examined wealth and collateral effects due to house price increases and their consequences for household borrowing and consumption.[4] Different papers have shown that the propensity to extract equity increases when house prices rise and interest rates fall (Bhutta and Keys 2016, Andersen and Leth-Petersen 2021, Boar et al. 2021). Moreover, rising house prices can lead to higher borrowing through different channels (Berger et al. 2018), most importantly the relaxation of collateral and liquidity constraints, and housing wealth effects. A growing empirical literature stresses the importance of relaxed debt constraints.[5] Leombroni et al. (2020) link intergenerational inequality back to asset prices and demonstrate how a changing wealth distribution can itself have effects on asset prices. We contribute to this literature by quantifying the importance of equity extraction in the U.S. household debt boom, and documenting its distributional consequences.

[2] Selling the house and buying a cheaper one may involve substantial transaction, search, and potentially also emotional costs (see Aladangady 2017), and we find that few households do this in practice.

[3] For example, Mian and Sufi 2017, Chen et al. 2020, Jordà et al. 2013, Adelino et al. 2018, Albanesi et al. 2022, and Mian and Sufi 2018. Trends in household debt are discussed in Dynan and Kohn (2007) and Wolff (2010).

[4] For example, Iacoviello (2005), Hurst and Stafford (2004), Calomiris et al. (2013), Campbell and Cocco (2007), and Kaplan et al. (2020).

[5] For example, Aladangady 2017, Cloyne et al. 2019, Andersen and Leth-Petersen 2021, Ganong and Noel 2020, Kessel et al. 2019, and Chen et al. 2020.

The history of U.S. household debt documented in this paper is compatible with the idea of a savings glut due to global factors (Bernanke 2005) or growing income inequality (De Stefani 2018, Mian et al. 2021b), which lowered interest rates, loosened borrowing constraints, and increased house values. Several important papers have also traced house price increases to regulatory changes since the 1980s,[6] and highlighted the role of expectations driving up home values and debt (for example, Kaplan et al. 2020, Loewenstein 2018, De Stefani 2020). Our analysis does not speak to the initial trigger of this process.[7] We argue that once house prices were rising, homeowners made large capital gains that they extracted by increasing debt levels. While this did not imply a deterioration in net worth, it increased their vulnerability to interest rate surges.

## 2. Data

The main data source for this paper is the harmonized, long-run "SCF+", which allows us to track the financial situation of U.S. households since World War II by combining historical waves of the Survey of Consumer Finances (SCF) going back to 1949 with the modern waves available since 1983 (Kuhn et al., 2020). A key strength of the SCF+ data is that they provide joint information on income, debt, and asset holdings at the household level together with demographic information. Kuhn et al. (2020) give a detailed description of the SCF+ and its construction.

The SCF is a key resource for research on household finances. The modern surveys have been conducted every three years since 1983 by the Federal Reserve Board (see Bricker et al. 2017 for more details).[8] The comprehensiveness and quality of the SCF explain its popularity among researchers (see Kuhn and Rıos-Rull 2016 and references therein). The historical predecessor surveys were carried out annually between 1947 and 1971 and then again in 1977. We follow Kuhn et al. (2020) and use data since 1949, which is the first year in which all relevant variables are available, and pool the early waves into three-year bins to increase sample sizes. The SCF+ data are weighted with post-stratified cross-sectional weights that ensure representativeness along several socioeconomic characteristics, in particular race, education, age, and homeownership.

Of particular interest for our study is the coverage of household debt and its components, which we aggregate into housing and non-housing debt. For housing debt, we focus on debt for owner-occupied housing. This includes mortgages and home equity lines of credit. We treat investment in non-owner-occupied housing like business investment and use the net position to calculate wealth.[9] Non-housing debt includes car, education and consumer loans. Data on credit card balances become available after 1970 with the introduction and proliferation of credit cards.[10] Our measure of total income is constructed as the sum of wages and salaries plus income from professional practice and self-employment, rental income, interest, dividends, and transfer payments, as well as business and farm income. If not otherwise mentioned, we abstain from sample selection.

As discussed in Kuhn et al. (2020), aggregated household surveys are not always easy to reconcile with macroeconomic data sources like the National Income and Product Accounts (NIPA) and the Financial Accounts (FA). Measurement concepts differ, such that even high-quality microdata may not match aggregate data one-to-one. To judge the reliability of the SCF+ data, we compare the trends in average income and household debt in the SCF+ to data from the NIPA and FA (Appendix Fig. A.2). After accounting for measurement differences affecting levels, the aggregated microdata match macroeconomic trends closely so that they can be used to study underlying distributional changes over time. The alignment is particularly close for house values and housing debt.

The key strength of the SCF+ is that it allows us to study the joint distribution of income, debt, and assets over seven decades. However, it consists of repeated cross sections and thus does not allow us to track households over time. To explore how households change their debt over time, we therefore rely on the Panel Study of Income Dynamics (PSID) as our second main data source.

The PSID started in 1968 as a panel tracking U.S. households over time. Initially, the PSID provided only limited information on household assets and debt. Information on wealth and its components is only available since 1984. However, information on housing is available in each wave since 1968, and on mortgage balances since 1969 (with the exceptions of 1973-1975 and 1982). The PSID collects data at the family level and the SCF+ reports data at the household level. To account for these differences, we aggregate PSID families living together into one household for better comparability (Pfeffer et al. 2016). Following Kaplan et al. (2014), we only use data from the *Survey Research Center (SRC)* sample, which tracks the original households from the first PSID wave in 1968 over time, as well as the new households formed by former members of these households (for example, adult children moving out). We use the longitudinal PSID family weights and post-stratify them to match the same Census variables that are targeted in the post-stratification of the SCF+ waves.[11] Appendix Fig. B.1 compares the PSID data and SCF+ data for housing assets, housing debt, and income. We find that the two datasets align very well. Additional details are given in Appendix B. The PSID was conducted at an annual frequency until 1997 and every two years thereafter. To ensure consistency over time, we discard all even years from the sample.[12]

[6] For example, Hoffmann and Stewen 2019, Favara and Imbs 2015, Di Maggio and Kermani 2017, Mian et al. (2017).

[7] For a detailed overview on the drivers of house prices and their connection to credit markets, see Duca et al. (2021).

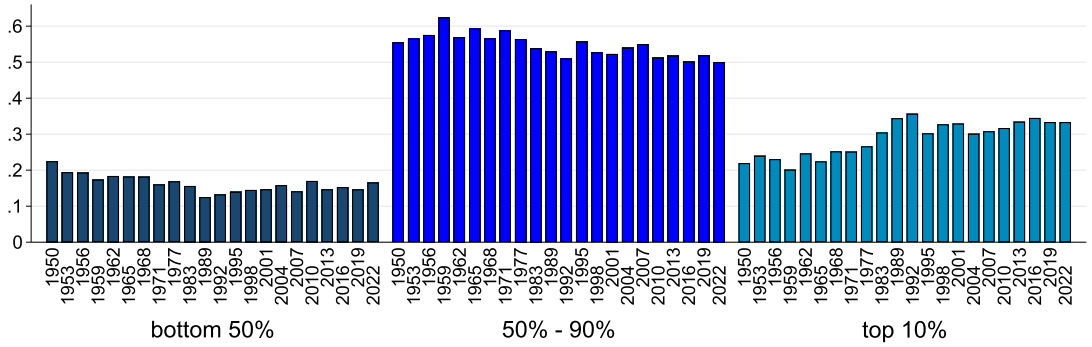
[8] The 1986 survey was designed as a panel survey to the 1983 survey but suffers from sample attrition and is therefore not included in our dataset.

[9] Several papers have stressed the importance of real estate investors (borrowers with multiple first-lien mortgages) for the debt boom prior to 2007 (Haughwout et al. 2011, Bhutta 2015, Mian and Sufi 2021, Albanesi et al. 2022, DeFusco et al. 2017, De Stefani 2020). While they accounted for a disproportionately large share of mortgage growth before 2007 compared to their relatively small population share, mortgage debt on the principal residence is on average eight times larger than that on other real estate (see Appendix Fig. A.1).

[10] The appearance of new financial products like credit cards does not impair the construction of consistent data over time. Implicitly, these products are counted as zero for years before their appearance.

[11] We verified that all reported results are similar when using the unweighted PSID data or the original longitudinal PSID weights without post-stratification.

[12] The only information we use from the even years is whether a household has moved over the last year. We use this information to construct a measure of whether the household has moved during the last two years, consistent with the data from the post-1997 waves.




Notes: The figure shows shares in housing debt for the different income groups over time.

**Fig. 2.** Housing debt shares by income group.

We further use long-run data on the consumer price index (CPI) from the *Macrohistory Database* (Jordà et al. 2017) to deflate nominal variables. All presented results are in real terms, converted to 2019 dollars.

## 3. Debt boom and distributional changes, 1950-2022

Aggregate data show the existence of a housing debt boom in the United States since 1950, yet they remain silent on its causes and consequences. To understand them, we have to look at the household level, where economic decisions are made. The SCF+ microdata allow us to study the growth and distribution of debt at the household level and by household characteristics over time.

We address two key distributional questions: How is housing debt distributed among rich and poor households, and how has this changed over time? To answer these questions, we stratify households by income. Following standard practices in the literature, we divide the population into three groups (see Piketty and Saez, 2003; Saez and Zucman, 2016; Alvaredo et al., 2018; Kuhn et al., 2020). The first group is households in the bottom 50% of the income distribution, and the second covers households between the 50th and 90th percentiles. We refer to this group as the *middle class* throughout the paper. The third group consists of the top 10% of the income distribution.

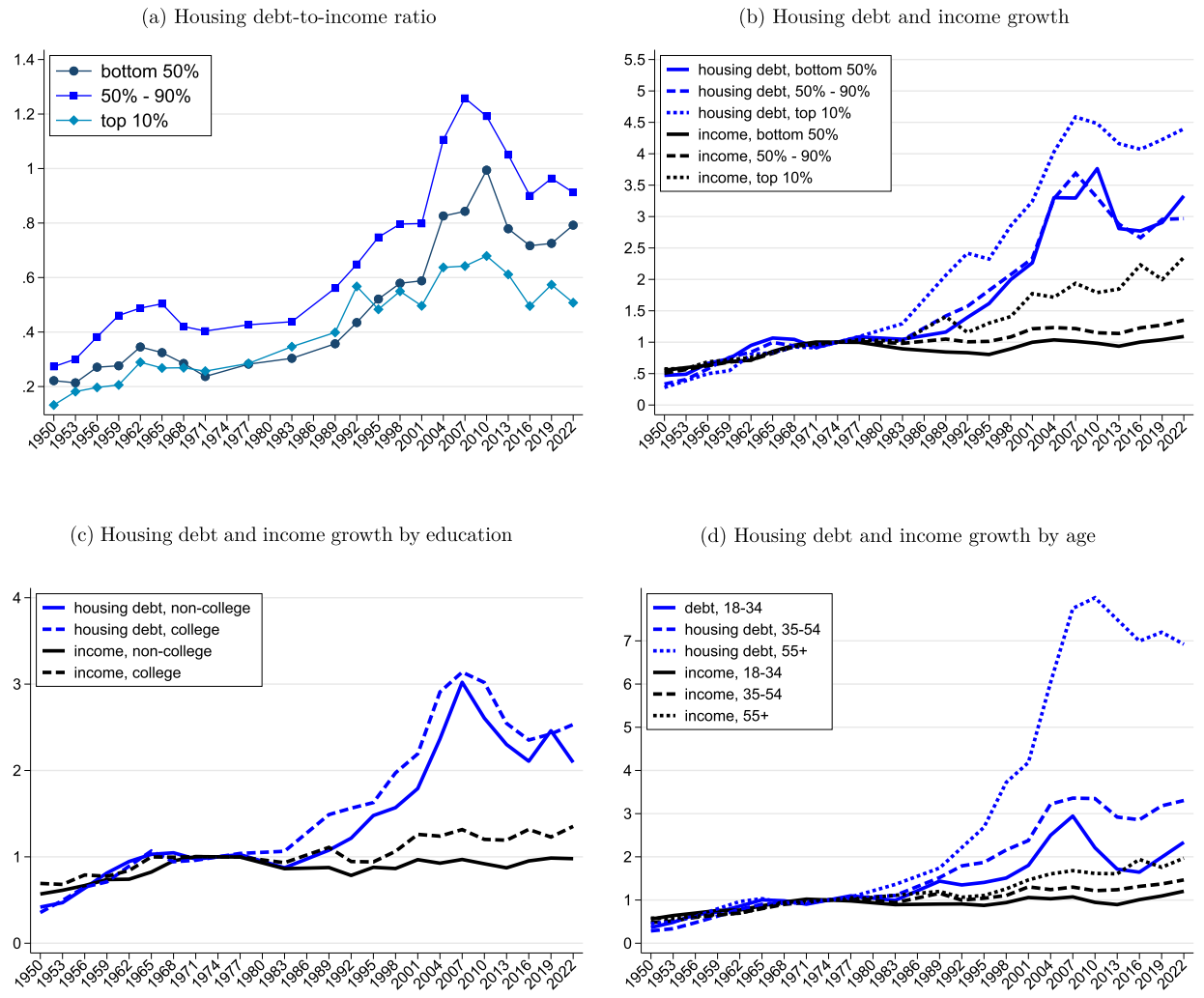
It is important to recognize that the SCF+ consists of repeated cross sections. This means we cannot track if households move between income groups between surveys. The considered groups are reasonably large, so inter-group mobility can be expected to be limited, but we also use panel data from the PSID to test this assumption, along the lines of Díaz-Giménez et al. (2011). The results speak in favor of high income-group stability over time (Table A.1). On average, we find that households remain in the same income group for 77% of the years in which we observe them. Moreover, households that change income groups tend to remain close to the "border" with the previous group. For instance, among households that changed into the middle-class group, 64% were no more than two deciles away from this group two years earlier.

Fig. 2 shows the share of housing debt owed by the three income groups since 1950. Housing debt shares have been strikingly stable over time. Over the entire postwar period, middle-class households have always accounted for the largest share of outstanding mortgages, on average between 50% and 60%. Low-income households in the bottom half of the income distribution owed only 20% of total housing debt. The share of the top 10% fluctuated around 20% before the 1980s and then increased to around 30%. Consequently, the upper half of the income distribution has always accounted for about 80% of housing debt. Hence, households with higher incomes not only own most assets but also owe most housing debt. These distributional facts are the same when considering total household debt, which again underlines the macroeconomic importance of housing debt.

It follows from the stability of debt shares that the middle class also played a dominant role in the growth of housing and total debt over time. From 1950 to 2007, middle-class households accounted for 55% of the housing and total debt increase, whereas households from the bottom 50% of the income distribution contributed only around 15% (Appendix Fig. A.4). Hence, the explanation for soaring household debt in the United States lies in the borrowing behavior of the upper half of the income distribution, and in particular of middle-class households (see also Adelino et al. 2018).

Through the lens of economic theory, (future) income dynamics are a natural candidate to explain rising debt levels and differential debt growth. To explore the role of income for debt dynamics, we rely on the joint distribution of housing debt and income and the rich demographic information in the SCF+, considering groups of households that arguably had different income dynamics and expectations during the debt boom. First, we look at the debt dynamics by income itself. Fig. 3a shows the evolution of housing debt-to-income ratios for the three income groups over time.[13] Starting in 1950, we observe a surge of housing debt-to-income ratios for households in the upper half of the income distribution. This first post-war debt boom came to a halt in the mid-1960s. After 1980, housing debt-to-income ratios started to rise strongly during a second debt boom. Although housing debt-to-income ratios increased for all households, the increase was stronger for households in the bottom 90%.

[13] The evolution of housing debt-to-income ratios by income decile is shown in Appendix Fig. A.6 for different survey waves.



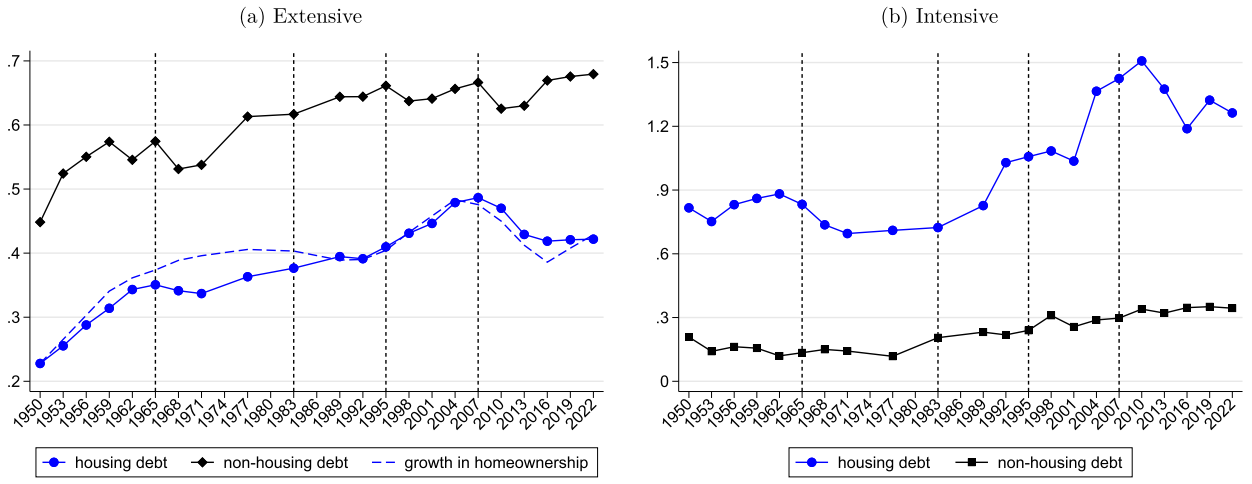

Notes: Fig. 3a shows housing debt-to-income ratios by income group. Figs. 3b to 3d show the growth of average housing debt and income by income group, education and age, relative to 1970s averages.

**Fig. 3.** Housing debt and income along the income distribution.

To decompose the forces behind the stronger increase of housing debt-to-income ratios among the bottom 90%, we consider mortgage and income growth separately by income group in Fig. 3b. For the two groups in the bottom 90%, we find that the rising housing debt-to-income ratios resulted from strongly rising debt levels in combination with modest or stagnant income growth. By contrast, the top 10%'s increase in housing debt-to-income is muted, even though they expanded their debt share compared to the 1950s (Fig. 2). This is because their income has risen much more than for the bottom 90%. Whereas income of the middle class only increased by about 25% over the past 50 years, the top 10%'s income more than doubled, corroborating the well-known rise in income inequality. The PSID data show that income groups are fairly stable over time (Table A.1). Combining this fact with low income growth of households outside the top 10% makes it seem unlikely that households in the bottom 90% were anticipating strong future income growth that they began to borrow against in the early 1980s.

An alternative to corroborate diverging trends of income and housing debt growth is to consider education as a proxy for lifetime income. The rising income disparities by education over the past decades have been widely documented (for example, Levy and Murnane, 1992; Katz and Autor, 1999). Looking at college and non-college households in Fig. 3c, we find that both groups increased their mortgage borrowing substantially from the 1980s on, despite different income growth. Both college and non-college households owed on average three times as much in 2007 than in 1980, and for both groups housing debt growth exceeded income growth by a wide margin. Hence, we find a decoupling of housing debt from income dynamics, just as when stratifying by current income.

The life cycle provides a third dimension to study the relationship between future income trends and housing debt accumulation. Remaining lifetime income naturally declines over the life cycle, so older households have less future income to borrow against. Fig. 3d shows mortgage and income trends for three age groups over time. We find that housing debt increased for all age groups but that households with the lowest future income potential increased their borrowing the most, providing further evidence for a




Notes: The left panel shows the share of households with positive housing (dotted blue line) and non-housing debt (squared black line). Moreover, it shows the growth rate of the homeownership rate since 1950, normalized to extensive-margin housing debt in 1950 for comparison. The right panel shows the (non-)housing debt-to-income ratio of households with positive (non-)housing debt. The dashed vertical lines indicate pivotal dates related to the debt boom.

**Fig. 4.** Extensive and intensive margins of debt-to-income ratios. (For interpretation of the colors in the figure(s), the reader is referred to the web version of this article.)

decoupling of housing debt and income growth over the last five decades. Again, all of these facts emerge almost identically when considering total household debt instead of mortgage debt, underlining the macroeconomic importance of housing debt.[14]

We conclude that rising indebtedness and a divergence of income and debt growth are a common phenomenon among U.S. households since 1980. In Appendix Fig. A.5, we show that the same findings also apply if we slice the data along three additional important socioeconomic dimensions: race, marital status and the number of children. Hence, housing debt growth exceeded income growth independent of future income dynamics and for all households in the macroeconomy. This "decoupling" of income and debt growth across the population is one of our main new findings. The broad-based increase suggests that a common macroeconomic trend drove debt growth across household groups. In the next step, we decompose the increase of debt-to-income ratios into changes at the extensive and intensive margin. In other words, we investigate to what extent the total number of indebted households has increased, and to what extent indebted households have borrowed larger amounts. To get a comprehensive picture of households' indebtedness, we report results for personal debt along with housing debt.

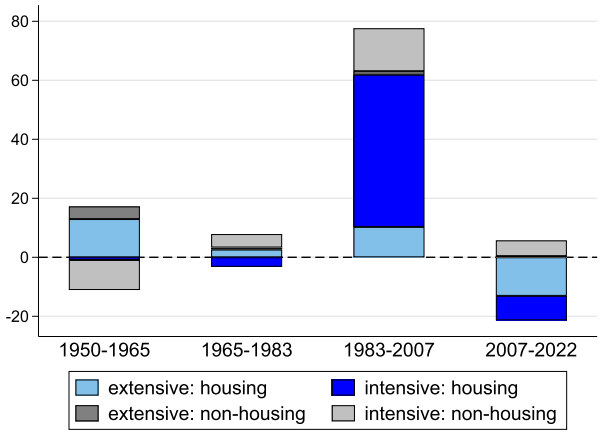
Let $d_{i,t}$ stand for the mean total debt-to-income ratio of income group $i$ in period $t$. The expression $s_{i,t}^{H^+}$ is the share of households with positive housing debt (extensive margin), and $d_{i,t}^{H^+}$ is the average housing debt-to-income ratio of households with positive housing debt (intensive margin). The values $s_{i,t}^{N^+}$ and $d_{i,t}^{N^+}$ are the respective values for non-housing debt. The mean debt-to-income ratio, $d_{i,t}$, can be written as $d_{i,t} = s_{i,t}^{H^+} d_{i,t}^{H^+} + s_{i,t}^{N^+} d_{i,t}^{N^+}$. The percentage-point change in debt-to-income ratios between period $t$ and $t-1$ can then be decomposed as follows:

$$\begin{aligned} d_{i,t} - d_{i,t-1} = & \underbrace{(s_{i,t}^{H^+} - s_{i,t-1}^{H^+})\, d_{i,t-1}^{H^+}}_{\Delta \text{ extensive housing}} + \underbrace{s_{i,t}^{H^+}\, (d_{i,t}^{H^+} - d_{i,t-1}^{H^+})}_{\Delta \text{ intensive housing}} \\ & + \underbrace{(s_{i,t}^{N^+} - s_{i,t-1}^{N^+})\, d_{i,t-1}^{N^+}}_{\Delta \text{ extensive non-housing}} + \underbrace{s_{i,t}^{N^+}\, (d_{i,t}^{N^+} - d_{i,t-1}^{N^+})}_{\Delta \text{ intensive non-housing}} . \end{aligned} \tag{1}$$

The first part of this expression is the change in the debt-to-income ratio due to a change in the extensive margin of housing debt. It captures by how much debt-to-income would have risen if only the share of households with housing debt, $s_{i,t}^{H}$, had changed. The second part is the effect due to variations in the intensive margin, that is, changes in debt-to-income due to an increase in borrowed amounts of indebted households $d_t^{H^+}$. The third and fourth parts are the respective effects for non-housing debt. Fig. 4 shows the different components of this decomposition, $s^{H^+}$, $s^{N^+}$, $d^{H^+}$, and $d^{N^+}$, over time.

The extensive margin in Fig. 4a captures the share of households with positive (non-)housing debt $s_t^H$ ($s_t^N$). The intensive margin in Fig. 4b is represented by the debt-to-income ratio for households with positive levels of (non-)housing debt $d_t^H$ ($d_t^N$). A first look at the dynamics of the extensive margin of housing debt reveals that it closely tracks changes in the homeownership rate, shown as a dashed line. In general, we see that in particular housing debt was growing strongly at the extensive margin during the post-war boom phase until the mid-1960s. By contrast, there was no growth at the intensive-margin over this period. Between the mid-1960s and early 1980s, both debt margins remained relatively stable. Thereafter, we see a pronounced increase in housing debt at the intensive

[14] Results are available upon request.




Notes: The graph shows the decomposition into extensive and intensive margin effects from equation (1) over different phases of the debt boom, stratified by income. Observations with debt-to-income ratios above 50 in absolute value were excluded.

**Fig. 5.** Decomposition of changes in debt-to-income.

margin up to the Financial Crisis. Since the mid-1990s, this increase was accompanied by an increase at the extensive margin, driven by rising homeownership rates. After the crisis, we see a period of falling mortgages levels that happened both at the intensive and extensive margin.

Looking at personal (non-housing) debt, we see that more households have personal than housing debt. In particular, the roll-out of credit cards in the 1970s led to an increase in the share of households with personal debt (Appendix Fig. A.7). Yet, we also find that the amounts that households owe as personal debt are small compared to the average amount owed on mortgages (Fig. 4b). Recently, the consequences of strongly rising student debt have received increased attention (for example, Looney and Yannelis 2015, Avery and Turner 2012). Rising student debt is visible in Fig. 4b as a part of the intensive margin of non-housing debt. Since 1983, we find a significant contribution from this component. These increasing debt levels might shape the financial decisions of future generations of American households. However, from a macroeconomic perspective, the contribution of student debt is much smaller than the increase in housing debt over the same period (Appendix Fig. A.7).

Fig. 5 shows the decomposition from equation (1) for the last 70 years, divided into the four time periods indicated in Fig. 4. In line with the previous evidence, the increase in debt over time mainly came from housing debt. The underlying reasons for the debt increase changed, however. Up to the mid-1960s, it was mainly accounted for by the extensive margin of housing debt. After a period of stability from the mid-1960s to the early 1980s, the increase mainly stemmed from the intensive margin of housing debt, which accounts for 52pp of the 78pp increase in the debt-to-income ratio over this period. Finally, after the 2008 financial crisis, we observe a period of debt reduction, which is entirely driven by housing debt, both at the extensive and intensive margin.

In short, we find that debt grew mainly because of housing, first because more households started having debt, and later because indebted households held more debt. This shift in the nature of the post-war debt boom from the extensive to the intensive margin is another main new finding of our paper. The importance of housing debt collateralized by the underlying house value suggests growing asset values as a candidate for the macroeconomic force driving the decoupling of debt and income growth. In the following, we will provide evidence for the hypothesis of increased borrowing of incumbent homeowners (home equity extraction) as a key driver of the debt boom and the divergence of income and debt trends.

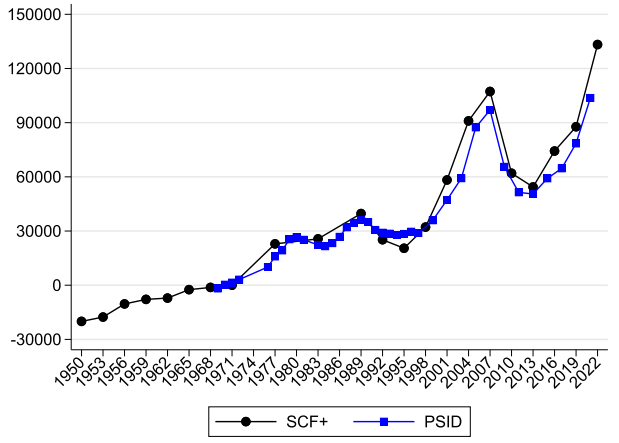
## 4. Debt boom and home equity withdrawal

We have seen that households in all parts of the population have increased their borrowing over time, and that there has been a broad-based divergence of income and debt growth. A plausible explanation is rising house prices and asset values. In the following, we provide evidence in favor of this interpretation.

Fig. 6 shows the change in home equity, that is, housing assets minus housing debt, over time. We compare two time series for average home equity relative to 1971, computed from the SCF+ and the PSID.[15] Both series align closely and show a striking pattern: Despite the surge in debt, home equity increased substantially. Rising home equity implies that households became wealth-richer despite their higher debt, and never had as much home equity as at the peak of the debt boom.

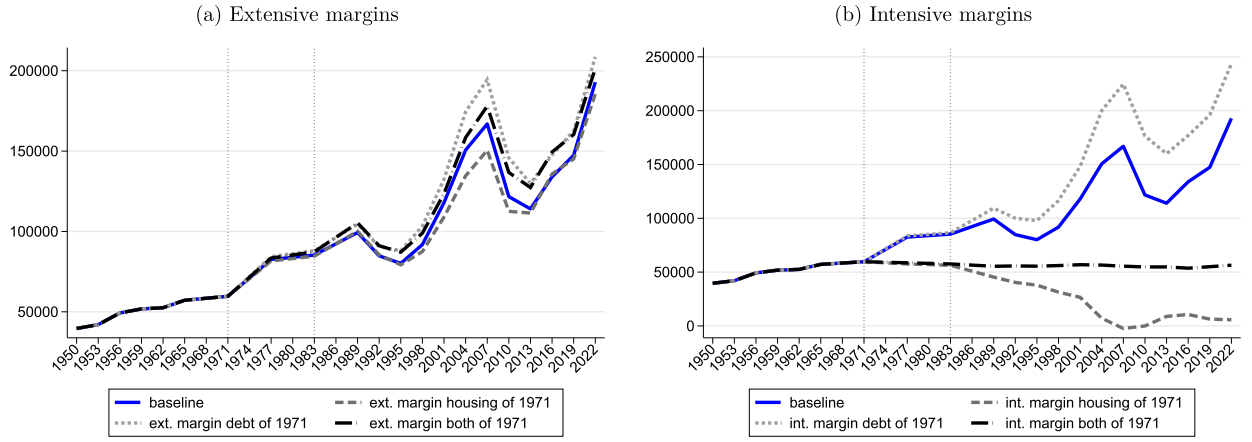
Home equity grew only moderately until 1971. Its growth then strongly accelerated during the 1970s, and again in the mid-1990s. These periods were characterized by strong house price growth. Appendix Fig. B.4 illustrates that home equity grew strongest in those

[15] As the SCF+ pools observations from 1969-1971, we use the same reference period in the PSID.




Notes: The graph shows the change in average home equity since 1971 from the SCF+ and PSID.

**Fig. 6.** Change in home equity.




Notes: The graphs show average home equity from the SCF (blue), along with counterfactuals (gray). The counterfactuals in the left panel hold the extensive margins of housing, housing debt, or both at their 1971 values. The right panel does the same for the intensive margins. The dotted vertical lines indicate the years 1971 and 1983.

**Fig. 7.** Decomposition of home equity, SCF+.

regions where house prices grew most. These price increases led to average capital gains of up to $60,000 over the 1970s where house price grew most (Appendix Fig. B.5).[16]

To substantiate the hypothesis that house price changes drove the surge in home equity since the 1970s, we decompose its evolution in three counterfactual experiments. We consider the extensive margin (the share of borrowers or homeowners) and the intensive margin (the value of houses or housing debt, conditional on having a home or mortgage). Fig. 7 shows three counterfactual scenarios. In both panels, the blue lines show the actual trajectory of home equity from the SCF+ data. Fig. 7a fixes the extensive margins of homeownership and housing debt at their 1971 levels to see the marginal effects that higher numbers of homeowners or borrowers had on the evolution of home equity. In the third counterfactual, we fix both extensive margins at their 1971 levels. We find that extensive-margin changes had hardly any effect on the evolution of home equity over the 1970s, and only a modest effect over the 1980s until the mid-1990s, when the homeownership rate started to rise. Overall, extensive-margin variations played a negligible role for the growth in home equity.

Fig. 7b considers the intensive margin of housing and borrowing. We construct an analogous decomposition where we either fix homeowners' housing assets or debtors' housing debt at their 1971 levels. Now there are huge differences across the counterfactual simulations. If we hold the intensive margin of debt constant at its 1971 level, we track the evolution of the data until 1983. Afterwards, we find that home equity would have increased by $157,000 in the counterfactual scenario, instead of the observed $108,000, until

[16] This evidence is in line with the work of Guren et al. (2021), who argue that exposure to regional house price cycles led to housing wealth effects already before the boom phase starting in the late 1990s.

2022. Hence, the fact that borrowers adapted their savings behavior and took out larger amounts of debt against rising asset values slowed down the growth of home equity.

By contrast, if we fix the intensive margin of housing, that is, fix (real) housing values, we get a divergence from the actual data trajectory starting in 1971, and see no growth in home equity during the 1970s. Under this scenario with constant home values, home equity would even have declined after 1983, highlighting that borrowing happened against capital gains and rising asset values. The third counterfactual keeps both housing and debt at their 1971 levels. In this case, we find no change in home equity over time, in line with small extensive-margin effects. We corroborate the pattern and timing of the described effects with higher-frequency data from the PSID in Appendix Fig. B.3.

In summary, we find that the increase in average home equity over time is almost entirely driven by rising house values and that the household reaction of increasing debt levels after 1983 slowed down the rise in home equity. Starting in the 1970s, house price increases provided an ideal "breeding ground" for a home equity extraction boom. In the 1980s, financial innovations made it easier and cheaper for households to tap into their rising home equity and reap the benefits of house price surges.[17] Hence, households started to actively manage their portfolio and increased debt levels against rising asset values as part of their consumption-saving decision.

In the next step, we will quantify the role of home equity extraction for the post-1980s debt boom. To do so, we complement the SCF+ data with panel data from the PSID. As discussed in Section 2, we use data from the SRC sample at a biennial frequency. Several approaches have been proposed to measure home equity extraction. Bhutta and Keys (2016) use the New York Fed Consumer Credit Panel to calculate the amount of home equity withdrawal (HEW) based on home equity loans, HELOCs, second mortgages, and cash-out refinancings. According to their calculations, households on average extracted $40,000 between 1999 and 2010, their period of study. However, their data only cover a relatively short period and do not include individual or household demographics to study the distribution of equity extraction. Greenspan and Kennedy (2008) and Klyuev and Mills (2007) use aggregate data to compute the amount of home equity extraction. While this allows to consider a longer time span, the resulting measures are coarse, and aggregate data do not allow distributional analyses. Moreover, none of the existing studies compares the relative importance of HEW and other reasons for increased mortgage borrowing. The PSID permits us to overcome these limitations with a combination of a long time series for housing and mortgage data and household-level information.

To decompose the debt increase and isolate the contribution of HEW, we need to separate it from other channels that affect debt levels over time: transitions between renting and ownership, upgrading to bigger or better homes, and downgrading. We employ the following definitions:

**New owners** are defined as households who (1) bought a house and (2) were not homeowners in the previous survey. Their mirror image is **new renters**.

**Upgraders** are households who (1) were homeowners before, (2) bought a new house, and (3) either explicitly stated upgrading as a reason to move or moved to a home with a larger number of rooms. Their mirror image is **downgraders**.[18] As we are interested in their contribution to the overall debt increase, we will focus on upgraders (downgraders) who increased (decreased) their mortgage in the following.

**Extractors** are defined following the approach of Bhutta and Keys (2016).[19] In particular, these are households who (1) did not purchase a new home and (2) increased their nominal mortgage balance by more than 5% from one survey to the next, with a minimum increase of 1,000 dollars.[20] The debt change is computed in real terms.

The sum of first and second mortgages is our outcome variable. Since 1996, the PSID provides detailed information on mortgage types. These reveal that on average, 92% of first mortgages are conventional mortgages, and 5% are home equity loans. Before 1994, the PSID only reports first and second mortgages in one variable. However, the largest part of extraction happens via first mortgages, as the overall quantity of second mortgages is comparatively small (Appendix Figs. A.8 to A.10).[21]

In the left panel of Fig. 8, we report the share of households (extensive margin) who extracted equity, upgraded, or bought a new home.[22] We see a pronounced increase in the share of extractors since the mid-1980s, whereas the shares of upgraders and new owners remained relatively constant over time. After 2007, we see a sharp decline in the number of extractors, which only stabilizes toward the end of our sample. The right panel of Fig. 8 documents a surge in the amount by which households changed their debt conditional on extracting, upgrading, or changing from renting to owning (intensive margin). The average extraction amount is approximately $37,000 between 1999 and 2010, close to the estimate by Bhutta and Keys (2016) of $40,000 for this period.[23] The SCF includes a question on equity extraction related to first mortgages since 2004. Despite some differences in mortgage classifications between the

[17] We discuss these factors in more detail in Section 6.

[18] The number of rooms was averaged across all years a household is living in a given house to avoid spurious classifications due to one-time misreporting. Households who increased (decreased) both the size and value of their house by more than 50% were defined as upgraders (downgraders) even if they did not explicitly indicate to have moved.

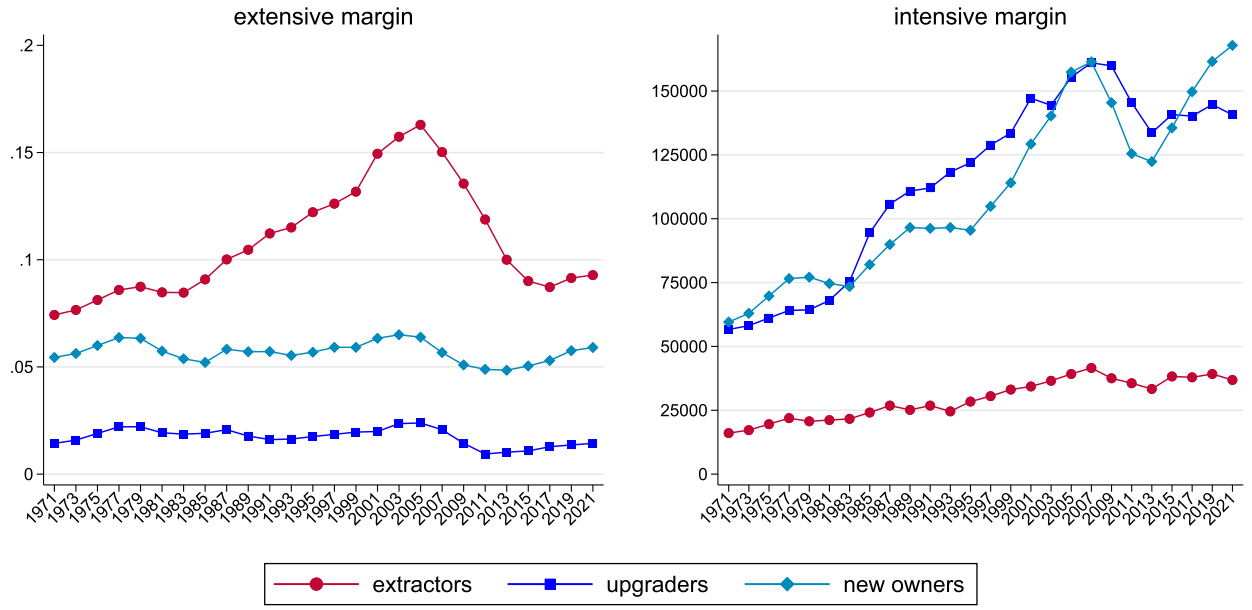
[19] See also Duca and Kumar (2014) for a similar approach.

[20] We also include a relatively small number of households who increased their nominal mortgage balance but moved to a less expensive, smaller, or same-sized home.

[21] Even at the peak of the boom in 2007, only 9% of households had a second mortgage, with an average balance of $4,600. By contrast, 47% had a first mortgage, with an average balance of $77,000.

[22] We focus on these groups because they will be most important for our following analysis. A full version with downgraders and new renters can be found in Appendix Fig. C.2.

[23] Note that our measure refers to total extraction over the previous two years. The results of Bhutta and Keys (2016) suggest that between 10% and 20% of households extract in two consecutive years.




Notes: The left panel shows the share of households who extracted equity, upgraded, or bought a new home over time. The right panel shows the average debt increase of these households. The series were smoothed by taking a moving average across three neighboring waves.

**Fig. 8.** Intensive and extensive margins by type.

surveys, the SCF also yields a similar average extraction amount of $39,000 between 2004 and 2010. We provide a detailed overview of and comparison to the previous literature on HEW in Appendix C. We find our results to be quantitatively consistent.

To quantify the relative importance of the different borrower types for the growth of average household debt, we use the following accounting approach. Let $D_t$ denote the stock of housing debt in period $t$; $D_t^+$ the new debt taken out by extractors, upgraders, or new owners; $D_t^-$ the debt paid back by households who downgrade or switch to renting; and $A_t$ the regular amortization (and interest payments) of households who do not move or refinance. Then the law of motion for aggregate housing debt is

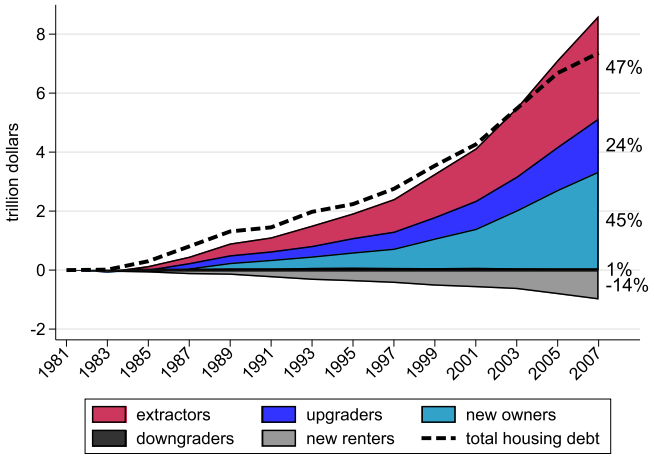
$$D_t = D_{t-1} + D_{t-1}^+ - D_{t-1}^- - A_{t-1}. \tag{2}$$

For $D_t$ to increase beyond $D_{t-1}$, we need to observe increases in $D_{t-1}^+$, or decreases in $D_{t-1}^-$ or $A_{t-1}$. As a specific example, consider a change in equity extraction. Two reasons account for additional debt due to equity extraction: First, there may be *more households* extracting equity. Second, conditional on extracting equity, households may extract *larger amounts*. Let $b$ denote the base year, and let $E_t$ denote the average debt increase of households who extracted equity in period $t$ (intensive margin in Fig. 9). Let $s_t$ denote the share of extractors in period $t$ (extensive margin in Fig. 9). The additional debt due to increases in the share of extractors since $b$ is $E_t^{ext} = E_t \times (s_t - s_b)$. The additional debt due to changes in the average extraction amount is $E_t^{int} = s_b \times (E_t - E_b)$. Adding these two numbers tells us how much lower average housing debt would have been if the share and amount of extractors had stayed at their base-year levels. We cumulate these series over time and subtract the base-year levels to obtain the amount by which the stock of housing debt increased due to additional equity extraction. Analogous calculations are done for upgraders, downgraders, and new homeowners.

Fig. 9 shows our third main new finding, the contribution of the different household types to the increase in housing debt relative to the base year. We consider data between 1981 and 2007 to cover the whole debt boom period since the 1980s. The dashed line in the figure shows the observed increase in housing debt since 1981. Overall, our accounting framework matches the total housing debt increase between 1981 and 2007 well.[24] The red area shows that home equity extraction has been the largest driver of the debt boom, accounting for 47% of the total increase in housing debt. In other words, almost half of the increase in housing debt is driven by incumbent owners borrowing against their home equity. Upgraders as the second group of incumbent homeowners account for another 24% of the increase. Net in- and outflows from the housing market, from new owners (45%) and new renters (-14%) account for less than a third of the increase. The net contribution of downgraders was negligible over the considered time period.

Together, upgrading and home equity extraction account for more than 70% of additional housing debt since 1981. This corroborates the previous finding that the intensive margin of housing debt is the key driver of the debt boom after 1980. Note that both extractors and upgraders tap into home equity for additional spending. Upgraders increase housing consumption by buying a larger or better house, while extractors may use the funds for home improvements or other consumption purposes. Though we cannot observe

[24] The close match implies that changes in $D^+$ and $D^-$ in equation (2) largely account for debt changes between 1981 and 2007. The small residual suggests that no major changes in average amortization behavior occurred.




Notes: The graph shows the change in total housing debt since 1981 as a dashed black line, together with estimates of the change in the stock of housing debt due to HEW, upgrading, downgrading, new homeownership, and giving up homeownership. Please refer to the text for details on the construction of these estimates. The percentages on the right side are the shares of each shaded area relative to the actual increase (indicated by the dashed line) in 2007.

**Fig. 9.** Decomposition of the housing debt boom.

directly what households use the money for, we can get a good idea based on the SCF, which asked households about the purpose for which they extracted home equity since 1995. Around 37% of extractors use the money for home improvements and repairs. Another 35% spend the money on consumption and repayment of other debts. Other important purposes are investments in other assets (8%), vacation properties (6%), car purchases (6%), and health and education (5%).[25] Finally, we also find that the relative contribution of new homeownership rose in the mid-1990s. The increasing share of debt from new owners reflects the increase in homeownership rates before 2008.

In Appendix Fig. C.3, we conduct an analogous decomposition as in Fig. 9 for the period of debt reduction after the Global Financial Crisis. Again, equity extraction dominates the picture. Fig. 8 shows that households on average extracted slightly smaller amounts over this period, but the lion's share of the reduction comes from the extensive margin, which fell back to pre-boom levels. The other large contributor to the debt reduction is new owners. Here, the reduction mostly comes from new owners taking out smaller mortgages in the post-crisis period.[26]

Equity extraction over the boom between 1980 and 2007 was economically large: U.S. households on average extracted between 2.5% and more than 6% of their annual income each year (cf. Fig. 16b). To examine the aggregate relevance of equity extraction more closely, we use the average amount of additional debt due to extraction, as in Fig. 9, and multiply it with the total number of households to obtain the aggregate effect. The black line in Fig. 10 shows the actual housing debt-to-income ratio from the PSID data.[27] The blue line shows the counterfactual housing debt-to-income ratio after subtracting our estimate of additional debt due to extraction. Without home equity extraction, the housing debt-to-income ratio would have increased by two thirds less from 1981 to 2007 than it actually did. Debt-to-income ratios would have stayed at around 40% until 2001 and increased only during the boom of the 2000s, when new homeowners increased aggregate housing debt. We also approximate the effect on total household debt based on the SCF+ data, which include comprehensive information on non-housing debt. If we assume that housing debt had increased by 50% less from 1983 to 2007 and that non-housing debt had not been affected by the slower increase in housing debt, total household debt relative to income would have peaked a third lower in 2007, at around 74% of income instead of close to around 110% (see Fig. 1a).[28] Total household debt would have increased by 43% less between 1983 and 2007.

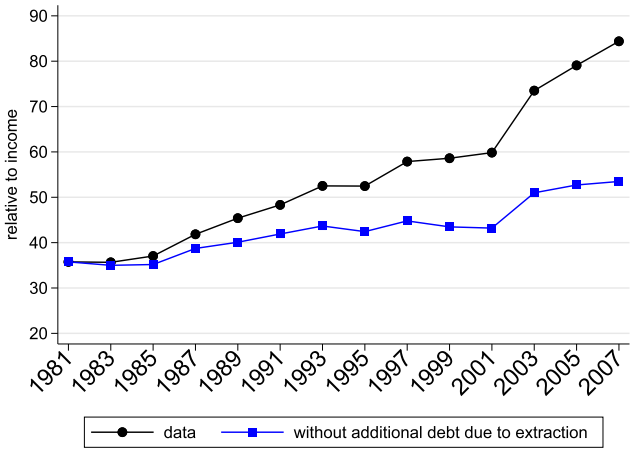
In the following, we investigate how the equity extraction boom was distributed across different groups of households. In particular, we focus on two key aspects of the U.S. inequality debate, namely households' position in the income distribution and their racial background. Fig. 11 highlights the role of the white middle class in the extraction boom. First, we find that equity extraction of the middle class accounts for the majority of total equity extraction (Fig. 11a). Taken together, the upper half of the income distribution extracted over 80% of all equity over this time period, leaving only a small contribution to households from the bottom 50%. Second, we find that the extraction boom was almost exclusively driven by white households (Fig. 11b). Previous research has shown that racial wealth gaps have been extremely sticky over time (see, for example, Thompson and Suarez 2017, Derenoncourt et al. 2022,

[25] Interestingly, the distribution of households naming health and education as a reason spikes in the age range 50-60, when children typically reach college age (Appendix Fig. A.11).

[26] While upgraders also reduced their intensive-margin debt substantially, this group is much smaller than the group of new owners, leading to a smaller aggregate impact.

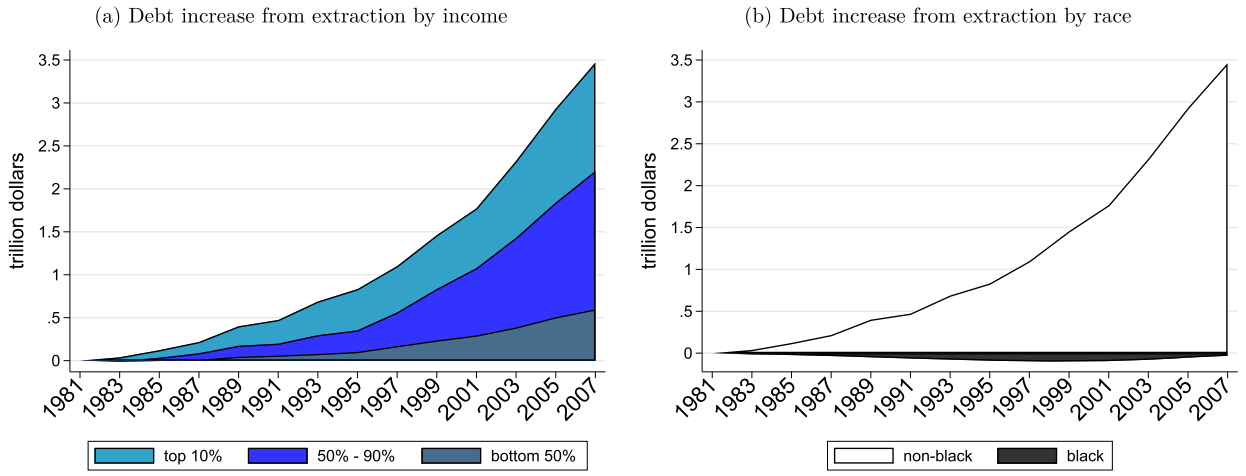
[27] Note that the housing debt-to-income ratio has increased somewhat less in the PSID than in the SCF+, reaching 0.84 in 2007, compared to 0.92 in the SCF+ (Appendix Fig. B.2).

[28] In the PSID, information on non-housing debt is only available since 1984, and the quality and detail of the data are lower than in the SCF+. However, comparing the debt increase in the PSID since 1984 and the SCF since 1983 yields similar results.




Notes: The graph shows the housing debt-to-income ratio from the PSID. The blue line with squares shows actual housing debt minus additional debt due to extraction relative to income.

**Fig. 10.** Counterfactual housing debt-to-income.




Notes: The graph shows additional debt due to extraction by income group (left) and race (right).

**Fig. 11.** Distribution of extraction.

Aliprantis and Carroll 2019, Bartscher et al. 2021). In Appendix D.1, we trace these differences back to the large and persistent Black-white homeownership gap, which leads to a substantially smaller share of Black than white households having a mortgage. Moreover, conditional on owning a home, Black households on average own less valuable houses.[29] Housing accounts for a much larger share of the average Black household's asset portfolio compared to the average white household (60% versus 40%, see Appendix Table D.1). This means that Black households have a relatively high exposure to house price changes. They also have less liquid assets, which may make equity extraction for consumption smoothing more attractive for them. However, Black households have much less housing assets to borrow against. It is important to note that the evidence in Fig. 11b does not mean that Black households did not extract equity. However, they did not extract more equity over time than they did in the early 1980s. Hence, we conclude that the extraction boom was not only mainly a middle-class affair, but a white middle-class affair.

In the final step, we provide direct evidence that home equity extraction is related to rising house prices. Previous literature has already emphasized that house price increases trigger equity extraction by relaxing collateral constraints (for example, Aladangady 2017, Berger et al. 2018, Cloyne et al. 2019, Andersen and Leth-Petersen 2021). Moreover, the role of reduced interest rates for equity extraction has been pointed out (for example, Bhutta and Keys 2016, Boar et al. 2021). To investigate these channels and their importance for different types of households, we run the following regression in the PSID:

$$Y_{it} = \beta_0 + \beta_1 \mathbb{I}_{g^p>1} + \beta_2 \mathbb{I}_{g^i<1} + \beta_3 \mathbb{I}_{LTV>med.} + \beta_4 \mathbb{I}_{g^p>1} \cdot \mathbb{I}_{LTV>med.} + \tag{3}$$

[29] The same is true at the median (Appendix Fig. D.2b). Conditional on having a mortgage (house), the debt-to-income (housing-to-income) ratio of Black households is actually very similar to that of white households (Appendix Fig. D.2a). This reflects the lower average incomes of Black households.

**Table 1**
Propensity to extract.

| | All | B 50% | M 40% | T 10% | White | Black |
|---|---|---|---|---|---|---|
| $\mathbb{I}_{g^p>1}$ | 0.029*** | 0.017* | 0.040*** | 0.024 | 0.029*** | 0.019 |
| | (0.007) | (0.009) | (0.011) | (0.020) | (0.007) | (0.029) |
| $\mathbb{I}_{g^i<1}$ | 0.012** | 0.004 | 0.021** | 0.006 | 0.014** | -0.009 |
| | (0.005) | (0.009) | (0.008) | (0.014) | (0.006) | (0.015) |
| $\mathbb{I}_{LTV>med.}$ | -0.020*** | 0.017 | -0.028*** | -0.046** | -0.017** | -0.094*** |
| | (0.007) | (0.012) | (0.008) | (0.018) | (0.008) | (0.030) |
| $\mathbb{I}_{g^p>1} \times \mathbb{I}_{LTV>med.}$ | 0.056*** | 0.055*** | 0.050*** | 0.066*** | 0.053*** | 0.093** |
| | (0.007) | (0.015) | (0.009) | (0.023) | (0.007) | (0.040) |
| $\mathbb{I}_{g^p>1} \times \mathbb{I}_{g^i<1}$ | 0.004 | 0.004 | -0.003 | 0.020 | 0.005 | -0.025 |
| | (0.009) | (0.011) | (0.013) | (0.018) | (0.009) | (0.035) |
| Constant | 0.180*** | 0.121*** | 0.203*** | 0.226*** | 0.177*** | 0.245*** |
| | (0.005) | (0.007) | (0.007) | (0.016) | (0.005) | (0.016) |
| Controls | yes | yes | yes | yes | yes | yes |
| Mean | 0.206 | 0.141 | 0.236 | 0.245 | 0.205 | 0.222 |
| Observations | 50,109 | 16,644 | 25,892 | 7,571 | 47,394 | 2,714 |

Notes: The table presents results for Equation (3). Standard errors (in parentheses) are clustered at the household-state level (* p<.1, ** p<.05, *** p<.01). The controls include dummies for race, sex, marital status, state, age groups, income groups and the number of children.

$$\beta_5 \, \mathbb{I}_{g^p>1} \cdot \mathbb{I}_{g^i<1} + \Gamma' X_{ist} + \epsilon_{it},$$

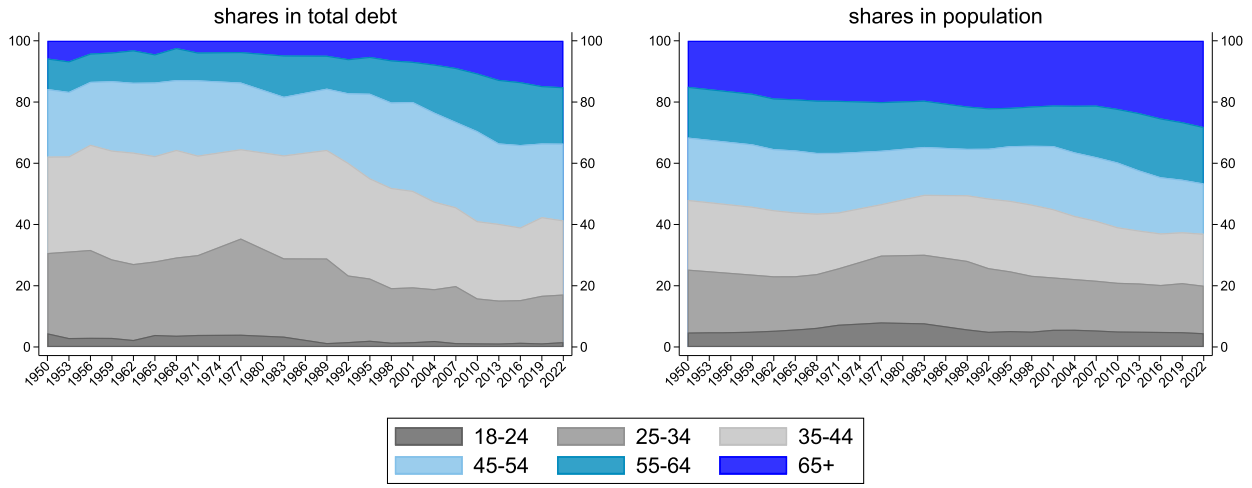
where $Y_{it}$ is a binary indicator for equity extraction of household $i$ in period $t$; $\mathbb{I}_{g^p>1}$ is an indicator for whether the value of a households' home increased since the last period (without having moved); $\mathbb{I}_{g^i<1}$ is an indicator for whether the 30-year mortgage interest rate fell since the last period; $\mathbb{I}_{LTV>med.}$ is an indicator for having an above-median LTV ratio in period $t-1$; and $X_{ist}$ is a vector of controls, including dummies for race, sex, marital status, state, age group, income group and the number of children.

Table 1 presents the regression results. The first column shows results for all households. The following columns show results for the three income groups, as well as Black and white households.[30] Looking at all households in column 1, we find a strongly significant increase in the propensity to extract home equity of 3 percentage points after an increase in house values. While the effects are smaller and imprecisely estimated for households in the bottom 50% and top 10% of the income distribution and for Black households, they are on average almost twice as large and highly significant for the middle class and for white households, in line with our previous findings. Looking at the marginal effect of a reduction in the mortgage interest rate, we find a similar response. The effects are slightly smaller than for house price increases, but again clearly concentrated among white and middle-class households. For the effect of the loan-to-value ratio, we find that households who had above-median LTV ratios in the previous period have a lower propensity to extract equity, in line with binding borrowing constraints. However, this is reversed strongly if households also experience an increase in the value of their home. This suggests an important role for the relaxation of collateral constraints. We also find a positive interaction effect between interest rate falls and house price increases, but the effects are relatively small and imprecisely estimated. In summary, Table 1 provides supporting evidence that households extracted home equity by borrowing against rising house prices, especially if collateral constraints were relaxed, and that the responses were strongest for white and middle-class households.

The argument that households extract equity via mortgages when house prices rise is supported by life-cycle theory. Housing is both a consumption and investment good, and it is indivisible. When house prices rise persistently, this leads to (expected) capital gains for homeowners in the future when they sell their house. As housing is indivisible, all capital gains can only be realized at once in a sale and thereafter, the consumption utility of the house can no longer be enjoyed. Borrowing mitigates this intertemporal consumption smoothing problem, as it allows to smooth future expected capital gains in the housing market even before they are realized through trading, and while still living in the house and enjoying its full consumption service. Home equity extraction, therefore, should be seen as optimal life-cycle smoothing behavior. We lay out this argument in more detail in Appendix E and illustrate the mechanism in a simple model.

A link between house prices and consumption-saving behavior has already been established in the quantitative literature on the housing market. Berger et al. (2018) develop a theoretical model to study the different effects through which house price changes can affect consumption spending. They demonstrate that house price increases can induce debt-financed consumption responses by relaxing borrowing constraints or inducing wealth effects in a life-cycle framework. Their discussion emphasizes the importance of income uncertainty and borrowing constraints, as constrained households have higher effective discount rates, such that the positive effect from a revaluation of current housing assets outweighs the negative effect from higher future costs of living (see also Aladangady 2017). The life-cycle dimension is important for the wealth effect. In an infinite-horizon framework, increases in house values today are offset by increases in house values in the future, such that the expected lifetime budget constraint remains unchanged (Sinai and Souleles, 2005). However, this knife-edge result no longer applies with finite lifetimes, as the house will ultimately be sold (or bequeathed) so the capital gains are realized and enter the lifetime budget constraint.

[30] When stratifying with respect to income or race, we exclude the corresponding controls.




Notes: The left panel shows the share of each age group in total household debt. The right panel shows the population share of each age group among all households.

**Fig. 12.** Shares of age groups in total debt and population.

Large extraction of capital gains from rising house prices also raises the question of how unequal these effects played out across different generations. Homeownership has a natural life-cycle profile, and house price changes will play out differently across birth cohorts who are at different points in their life cycle. While young households want to buy houses and have to take out more debt for a given down payment, older households who are already homeowners benefit from rising house prices and capital gains (Loewenstein 2018). In the next section, we will use the long-time coverage of the SCF+ to follow specific generations over time to see how rising debt levels and equity extraction differ across cohorts and have changed the life-cycle debt across generations of U.S. households.

## 5. Debt boom and intergenerational inequality

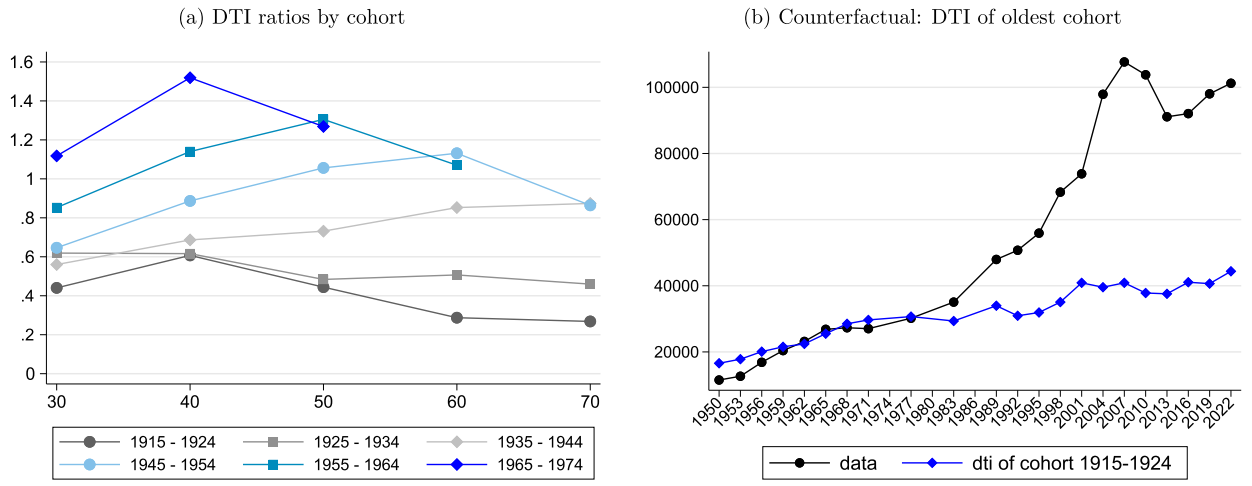
Demographic change influences aggregate debt dynamics, as households owe different amounts of debt at different points of the life cycle. Hence, even without any change in borrowing behavior, aggregate indebtedness will change if the age structure of society changes. Additionally, borrowing behavior by age can change across cohorts, thereby affecting macroeconomic debt dynamics. Especially home equity extraction has ramifications for debt accumulation over the life cycle. Instead of steadily paying down their debt and throwing a "mortgage-burning party" after 30 years, as previously common (Story 2008), households extracting equity increase their debt balance again in the middle of the life cycle. We will use the SCF+ data to quantify the role of the changing age composition and changing borrowing behavior by age for the aggregate debt boom.

To study the effect of the changing age structure on aggregate debt, Fig. 12 compares the debt shares held by different age groups to their population shares over time. The debt shares were very stable until around 1990. Thereafter, we observe a "graying" of U.S. household debt (Brown et al., 2020), with the share of debt owed by households above age 45 increasing from around 40% to 60%. By contrast, their population share only increased by around 12.5 percentage points over the same period. Thus, pure changes in the age composition do not account for the whole increase in debt held by older households, and there must have been changes in borrowing behavior over the life cycle. Indeed, the pure age composition effect from changes in population shares exerted *downward* pressure on aggregate household debt. The reason is that although older households increased their debt over time, they still have lower average debt levels than younger households. Consequently, household debt increased by less than what it would have if the age composition had remained as in 1950, all else equal (Appendix Fig. D.3a).

The previous evidence on the large contribution of home equity extraction to the aggregate debt increase, combined with the fact that it typically occurs in mid-life, suggests that home equity extraction is the likely driver behind the change in life-cycle borrowing behavior. In the PSID data, we find that the median new owner, who takes out a mortgage to buy a home instead of renting, is 32 years old, while the median extractor is 45 years old. Hence, relative to taking out debt when entering the housing market, home equity extraction increases debt later in life. To study how the life cycle of debt changed across cohorts, we rely on the long time period covered by the SCF+ and its rich demographic information. We construct synthetic birth cohorts for households with heads born 1915–1924 (1965–1974) as our oldest (youngest) cohort.[31] For all cohorts, we estimate the life-cycle profiles of total debt-to-income (DTI) ratios by regressing individual ratios on six age group dummies for households with a head aged 25-34, 35-44, 45-54, 55-64, 65-74, and 75-85 years. The estimated life-cycle profiles are shown in Fig. 13a.

We observe a striking increase in DTI ratios from one cohort to the next, leading to an overall increase in DTI profiles. We also observe that the upward shift of DTI profiles did not happen in parallel but that there is a turning point that moves forward in the life cycle from generation to generation. The turning point occurs when the average household from the 1915-1924 cohort is 60 years

[31] In Appendix D.3, we show that the same patterns are visible in the PSID data, which allow to follow actual instead of synthetic cohorts.




Notes: The left panel shows the life-cycle profiles of total debt-to-income (DTI) ratios for our synthetic cohorts. DTI ratios were winsorized at the 99th percentile within each year. The right panel shows average debt in comparison to a counterfactual assigning the average DTI ratio of the oldest cohort (1915-1924) to all households.

**Fig. 13.** Changes in life-cycle debt dynamics.

old, the average household from the 1925-1934 cohort is 50, and the average household from the 1935-1944 cohort is 40. In other words, it coincides with the onset of the equity extraction boom around 1980.[32]

Starting with the 1955-1964 cohort, we finally observe a level increase of the entire profile, including the starting point at age 30. While the oldest generation started their economic life cycle with an average DTI ratio of around 0.4, we find that after three cohorts with similar initial DTI ratios of around 0.6 the beginning-of-life DTI ratios jump up, starting with the cohort born between 1955 and 1964, which was on average 30 in 1990. Younger cohorts had to take out more debt already when buying their first home because they entered a housing market with steeply rising prices.

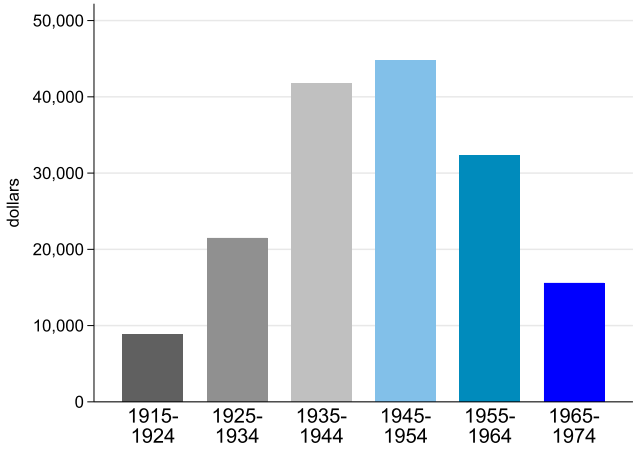
As a consequence of the rising DTI profiles, households also reach retirement with substantially higher debt levels (Lusardi et al., 2018, 2020). Comparing cohorts at age 60, the visual contrast is stark. The oldest cohort approached retirement with modest DTI ratios of around 30% at age 60. Households born in the two decades after World War II had DTI ratios of almost 120% at the same age. Projecting forward the DTI profiles of the youngest cohort suggests that they will enter retirement with similar levels of indebtedness as their predecessors.

How much did the change in borrowing behavior shape the aggregate debt increase? To answer this question, we use that households from the oldest cohort were already on average 60 years old at the onset of the post-1980 extraction boom, and thus spent most of their lives in a world without significant equity extraction. We construct a counterfactual debt level without changes in borrowing behavior by multiplying the actual income of each household at a certain age with the average DTI ratio of the oldest cohort in that age group, thereby assigning all households the average life-cycle debt accumulation pattern of the oldest cohort (1915-1924). Fig. 13b shows that in this case, the debt boom after 1980 remains largely absent. Before 1980, the counterfactual debt profile closely follows the actual average debt trajectory, suggesting that the debt profile of the oldest cohort captures the debt accumulation of the older cohorts well. For 2022, we find that if all households had maintained the life-cycle DTI profile of the cohort born between 1915 and 1924, average debt would barely have increased, reaching around 44,000 dollars instead of the observed 101,000 dollars, which highlights the importance of changed life-cycle borrowing behavior as a key driver of the U.S. debt boom.

We have seen that these rising debt levels happened against rising house values and capital gains. The timing of the house price increase implies that different generations of U.S. households had very different experiences with the housing market. Whereas the older cohorts enjoyed large capital gains from rising house prices, the younger cohorts had to get more indebted to buy a house at the beginning of their life cycle (Fig. 13a). The asset-price-induced debt boom therefore played out very differently across generations and constitutes a potentially powerful driver of changes in intergenerational inequality.

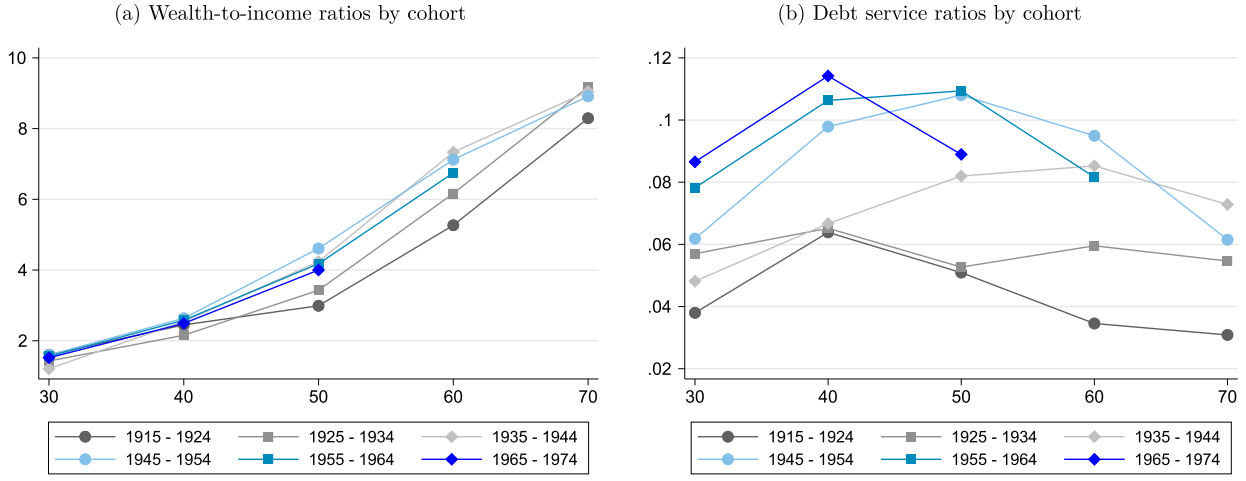
Capital gains on the household balance sheet from rising asset prices may remain “paper gains” (Sinai and Souleles, 2005) that matter for measured wealth but not for welfare. Only if the capital gains are realized, they expand the budget constraint and become welfare relevant (Fagereng et al., 2022). Above, we have discussed that home equity extraction provides a way to realize (expected) capital gains and still enjoy the consumption flow of owner-occupied housing. To quantify the income-increasing realized capital gains across generations, we therefore estimate the total extracted equity over the post-1980 debt boom for each cohort. Fig. 14 shows large differences in total extracted equity from 1980 until 2007 across our six birth cohorts. The cohorts born between 1935 and 1954 bought houses at relatively low prices before 1980 and could reap large capital gains when prices were surging. Accordingly, they extracted most home equity, on average more than $40,000. The older generations could also buy houses at relatively low prices but

[32] In Appendix Fig. D.4, we present versions of Fig. 13a that are stratified by within-age income and net wealth, respectively. We see that the shifting and tilting occurs for all households, but is most pronounced in the middle of the distributions. We thank an anonymous referee for this suggestion.




Notes: The graph shows average total equity extraction, summed over the extraction boom from 1981 to 2007, for our six different cohorts. The graph is based on the PSID. Extraction amounts were winsorized at the 1st and 99th percentile within each year.

**Fig. 14.** Sum of extracted home equity by cohort over the extraction boom.



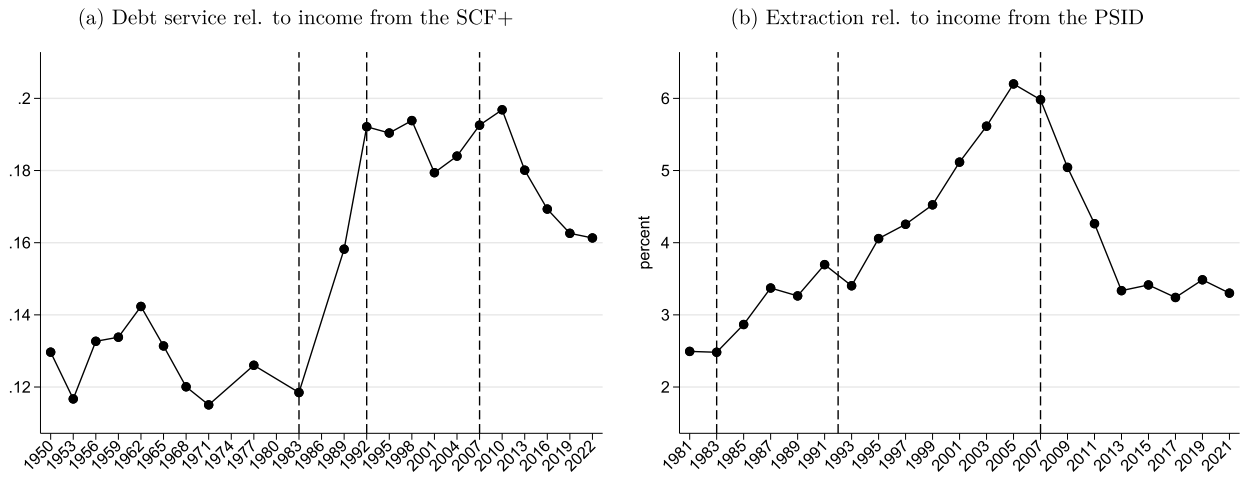

Notes: The left panel shows the life-cycle profiles of the wealth-to-income (WTI) ratio for each of our synthetic cohorts. The right panel shows debt-service-to-income (DSTI) for housing debt. WTI and DSTI ratios were trimmed at the 99th percentile within each year.

**Fig. 15.** Wealth and debt service over the life cycle.

were already older in 1980, so they only experienced a small part of the equity extraction boom. Finally, the younger generations born after 1955 typically bought into a housing market that already required high initial debt levels because of the higher prices and subsequently, they could extract less home equity.

Our fourth main new finding is that more debt did not lead to lower net worth on average due to simultaneously increasing asset values: We find that the very different life-cycle debt profiles and equity extraction did not lower wealth accumulation across generations. In Fig. 15a, we show life-cycle wealth-to-income ratios for our six cohorts. We find that younger cohorts did not have systematically lower wealth-to-income ratios than their predecessors, despite their higher debt levels. Wealth-to-income ratios at age 30 remain very similar across all cohorts. Later in life, we find that although the cohorts born between 1935 and 1954 extracted most home equity, they still remained the wealthiest cohorts in the post-war United States. By contrast, the oldest generation, which was already 60 years old at the onset of the equity extraction boom, not only extracted the least equity of all six generations but was also consistently the poorest generation.

Although the debt expansion has not lead to lower net wealth for the generations most exposed to equity extraction, their balance sheets have become more inflated and thus more risky. Fig. 15b shows the debt-service-to-income (DSTI) ratios of our six cohorts over the life cycle. Again, we can clearly discern when each cohort reached the 1980s. At this point, as for the DTI profiles in Fig. 13a, the DSTI profiles turn upward. For the three youngest cohorts born between 1945 and 1974, we see a downward shift after the 2008 financial crisis. However, these generations' DSTI ratios are still at historical highs, in particular at later stages of the life cycle, when future income is likely to decline. Therefore, they are more vulnerable to interest rate increases or other shocks to their debt service




Notes: The left panel shows mortgage debt service costs relative to income, conditional on having mortgage debt, from the SCF+. The right panel shows home equity extraction relative to income from the PSID. The dashed lines indicate the years 1983, 1992 and 2007 in both graphs.

**Fig. 16.** Extraction and debt service.

capacity than generations that were not affected by the extraction boom. In the last section of the paper, we use the SCF+ data to study the implications of rising debt levels for households' debt service costs relative to their income over time.

## 6. Aggregate consequences of the debt boom

In Fig. 16a, we show DSTI ratios from the SCF+ over time for all households with positive housing debt.[33] DSTI ratios were relatively stable before the 1980s and after the onset of the extraction boom, they rose sharply until the early 1990s. However, while the extraction boom accelerated even more from the early 1990s to the 2008 crisis, as illustrated in Fig. 16b, DSTI ratios stabilized in the early 1990s and remained surprisingly stable until the Financial Crisis. Over time, two counteracting forces shaped the evolution of the DSTI ratio: Falling mortgage interest rates exerted downward pressure, whereas the rising debt-to-income ratios had an opposing effect. Starting from the early 1980s, conforming mortgage interest rates fell from more than 12% to 6% in the 2000s (Appendix Fig. C.5). The observed stable DSTI ratio during the 1990s is the result of falling interest rates and increasing debt levels roughly canceling each other.

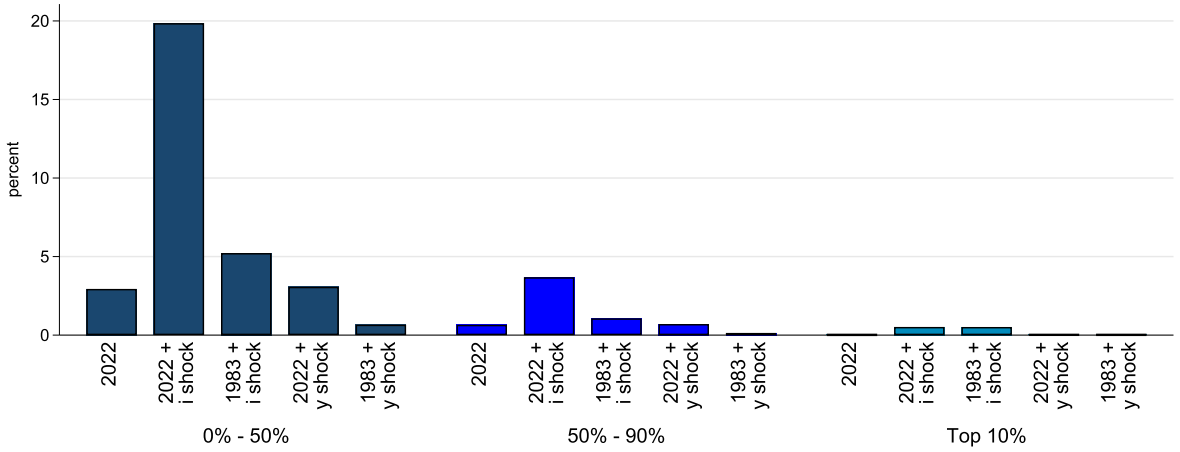
Mian et al. (2021a) jointly account for these developments in a theoretical framework with rising income inequality as the exogenous cause. They propose a theory where high saving rates and strongly rising top incomes lead to a decline in interest rates, drive up house prices, and make mortgage debt cheaper for the bottom 90% of the income distribution. This theory assigns home equity extraction a key role in the debt boom after 1980, for which our analysis provides empirical support. Their theory also predicts that extracting households did not get poorer over time, consistent with our evidence.

Other explanations for the decline in mortgage interest rates are deregulation and innovations that reduced the cost of debt and made equity extraction easier (Justiniano et al., 2019). Regulatory reforms like the *Monetary Control Act of 1980* and the *Garn - St. Germain Act of 1982* and technological advances like the introduction of credit scoring made financial instruments to cash out home equity cheaper (Campbell and Hercowitz, 2009; Exler and Tertilt, 2020). Until 1982, the *Truth in Lending Act of 1982* allowed consumers to rescind home equity credit within three days, which made second mortgages expensive for banks. The deregulation in the early 1980s allowed more banks to sell second mortgages, and they quickly gained popularity (Story, 2008; Elia, 1981). Another factor facilitating lending was the spread of mortgage-backed securities. These had been invented on the late 1970s and spread quickly in the 1980s, allowing banks to finance mortgage lending with bonds and alleviating them of the need to increase deposits (Doepke and Schneider 2006). In response to these developments, the financial industry started to aggressively market home equity borrowing products and invented new products like home equity lines of credit (Maki 2001). The HEL market grew from $1 to $100 billion between 1982 and 1988 (Story 2008 and Appendix Fig. C.4), with higher competition lowering the costs for borrowers.

The lower mortgage costs allowed households to sustain larger debt balances over long periods. High balances however become problematic once debt costs increase, which can entail sizeable consumption cuts (Ahn et al., 2023). We see in Fig. 16a that DSTI ratios remained elevated compared to historical levels even after the debt reduction after the Financial Crisis. If interest rates surge, households may have to reduce their borrowing or consumption to service the higher interest payments. Mian et al. (2021a) highlight this risk and its consequences for macroeconomic demand in a high-debt environment in theory.

During the debt boom, mortgage interest rates were mostly declining but they recently surged pronouncedly, making the consequences of such an increase a highly relevant question. By the end of 2022, mortgage interest rates were around 3.3 percentage

[33] Debt service comprises the entire cash flow of households to service the mortgage including interest, amortization, fees, and taxes if they are paid to the mortgage company.




Notes: The graph shows the share of households with critically high debt-service-to-income (DSTI) ratios in 2022 by income. It additionally shows counterfactuals for this share if households were hit by the interest shock ("2022 + i shock") or the earnings shock ("2022 + y shock") described in the text, or if they were hit by these shocks, but starting from DSTIs as low as in 1983. See text for additional details ("1983 + i/y shock").

**Fig. 17.** Share of households with critically high DSTI ratios.

points higher than the average over the previous two years (Appendix Fig. C.7a). We use this interest rate hike as the shock in a "household stress test" based on information from the most recent SCF in 2022 to quantify the interest rate exposure resulting from extended household balance sheets.

We assume that all households in the 2022 SCF who have bought a new house or refinanced a mortgage during the past two years (2020 and 2021) have to pay 3.3 percentage points more interest on their mortgage. As we do not know exact reset rates, we do not include adjustable rate mortgage (ARM) holders in the analysis. However, their number is small: only 5% of mortgage holders had an ARM in the 2022 SCF. By contrast, around 19% of borrowers had moved over the past two years, and around 23% had refinanced a mortgage. The shock induced by our stress test is thus economically sizable: The aggregated additional debt costs from the interest shock across all households amounts to 0.6% of total household income.

Higher DSTI ratios imply higher committed monthly payments that reduce the resources of households for other expenditures. Ganong and Noel (2023) find that it is typically a lack of liquidity and not high LTV ratios that leads households to default on their mortgage. To get a sense of how many households might be forced to borrow less than desired or cut their consumption after the shock, we calculate how many households will have critically high DSTI ratios. We consider a threshold of 43% as critically high, in line with the Dodd-Frank Act (Hizmo and Sherlund 2018). Our experiment is a comparative statics exercise, abstracting from general equilibrium and behavioral effects. Behavioral effects could be "lock-in effects", where households abstain from moving when rates increase, as moving would require to prepay the old mortgage and take out a new one at a higher rate (Fonseca and Liu, 2024; Liebersohn and Rothstein, 2025; Batzer et al., 2024). Moreover, households may choose to borrow smaller amounts when interest rates increase (DeFusco and Paciorek, 2017; Fuster and Zafar, 2021). Our baseline estimate quantifies how many households potentially have critically high DSTI ratios absent a behavioral response. It can thus be thought of as an upper bound. To provide an estimate of behavioral responses, we provide a sensitivity analysis in Appendix Fig. C.8 that takes into account empirical estimates of lock-in effects and the interest rate elasticity of mortgage demand. We estimate that the behavioral responses can account for about a quarter of our baseline effect.[34]

We also consider a shock to household income. Here, we take the Great Recession as the baseline for our stress test. From 2008 to 2009, the share of households with unemployed heads in the CPS increased by 5.3 percentage points for the bottom 50%, by 2.8 percentage points for the middle 40%, and by 1.8 percentage points for the top 10% (Appendix Fig. C.7b). We employ the estimates by Davis and von Wachter (2011), who document that earnings drop by 39% after job displacement. We thus let the income of the main wage earner drop by 39% for an additional 5.3/2.8/1.8 percent of bottom 50%/middle 40%/top 10% households. We shock households randomly within each income group and average results across 99 random draws.

Fig. 17 shows the share of all households from the 2022 SCF who have a critically high DSTI ratio, together with the share who would have a critically high DSTI ratio after the interest shock (bars labeled "2022 + i shock") or earnings shock (bars labeled "2022 + y shock"). In addition, we ask what the share of households with critically high DSTI ratios would be after the same shocks, but starting from pre-boom DSTI ratios (bars labeled "1983 + i/y shock").[35]

The top 10% are well protected against both kinds of shocks. However, households from the middle class and the lower half of the income distribution are much more exposed to interest shocks. Around 3% of bottom 50% households already had critically high DSTI ratios in 2022 without an additional shock. This share would surge to almost 20% if those who bought or refinanced in 2020 or

[34] We thank two anonymous referees for this suggestion.

[35] We do this by scaling 2022 DSTI ratios with the ratio of average 1983 to average 2022 DSTI ratios for each income group before applying the shock. To avoid extreme outliers, we trimmed DSTI ratios at the 99th percentile.

2021 had already had to pay 2022 interest rates. By contrast, it would only rise to 5% if households had started out with 1983 DSTI ratios. The share of middle-class households with critically high DSTI ratios increases from 0.7% to 3.7% after the interest rate shock when starting from current DSTI ratios. Again, the increase would be much smaller when starting from 1983 DSTI ratios (around 1.1%). While the qualitative patterns are the same for the income shock, the overall effect size is small. This is because only a few households are hit by substantial negative income shocks even in a recession, whereas an interest shock affects all households who would like to take out a mortgage.

While our analysis remains silent on the exact response margins, for example, which households will borrow less, who will no longer be able to buy a home, or who will have to cut their consumption, our stress tests show that the secular increase of DSTI ratios has made households more susceptible to shocks that affect their debt service capacity, especially interest rate shocks. In summary, our analysis in this paper highlights the tradeoff underlying the household debt boom: the higher debt levels allowed households to expand their individual budget sets by realizing capital gains, especially the generations of incumbent homeowners in the 1980s; but the rising debt levels also increased the financial fragility of the U.S. household sector to historically high levels.

## 7. Conclusion

This paper studies the increase in household debt in the United States since World War II. Relative to income, household debt has risen by a factor of four. Using long-run household-level data from the SCF+, we document the growth of U.S. household debt, its composition and distribution, as well as its changing nature over time. The past seven decades saw two debt booms, one after World War II and one from the 1980s to the 2008 financial crisis. The first boom was triggered by a homeownership expansion in the postwar era, and therefore mainly happened at the extensive margin. By contrast, the second boom phase was characterized by a decoupling of income and debt growth and strong debt increases at the intensive margin. This boom dwarfed the first one.

We emphasize the nexus between house prices, housing wealth, and equity extraction. House price increases led to a substantial increase in household wealth, to which households responded by increasing their mortgage balances to extract home equity. Such home-equity-based borrowing accounts for about half of the increase in U.S. housing debt during the post-1980s debt boom. We show that the white middle class was the largest contributor to the extraction boom. Moreover, we show that equity extraction, which typically occurs in the middle of the life cycle, led to pronounced changes in the life-cycle profiles of debt. However, since the debt growth was backed by growth in housing values, household wealth remained similar across cohorts. These findings highlight the importance of incorporating portfolio adjustments, debt decisions, and asset price dynamics into structural models of the consumption-saving decision.

At the macroeconomic level, we demonstrate the tradeoff associated with the debt boom. Realizing capital gains expanded the household budget set but it also decreased the resilience of the U.S. household sector as it moved more households closer to critically high mortgage debt service levels that made more households susceptible to financial risk, especially in periods with rising interest rates as recently experienced.

## Appendix. Supplementary material

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.red.2025.101288.

## Data availability

Data will be made available on request.

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