The Anatomy of the Global Saving Glut *

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Abstract

This paper provides a household-level perspective on the rise of global saving and wealth since the 1980s. We calculate asset-specific saving flows and capital gains across the wealth distribution for the G3 economies – the U.S., Europe, and China. In the past four decades, global saving inequality has risen sharply. The share of household saving flows coming from the richest 10% of household increased by 60% while saving of middle-class households has fallen sharply. The most important source for the surge in top-10% saving was the secular rise of global corporate saving whose ultimate owners the rich households are. Housing capital gains have supported wealth growth for middle-class households despite falling saving and rising debt. Without meaningful capital gains in risky assets, the wealth share of the bottom half of the population declined substantially in most G3 economies.

JEL classification: D31, E21, E44, N32
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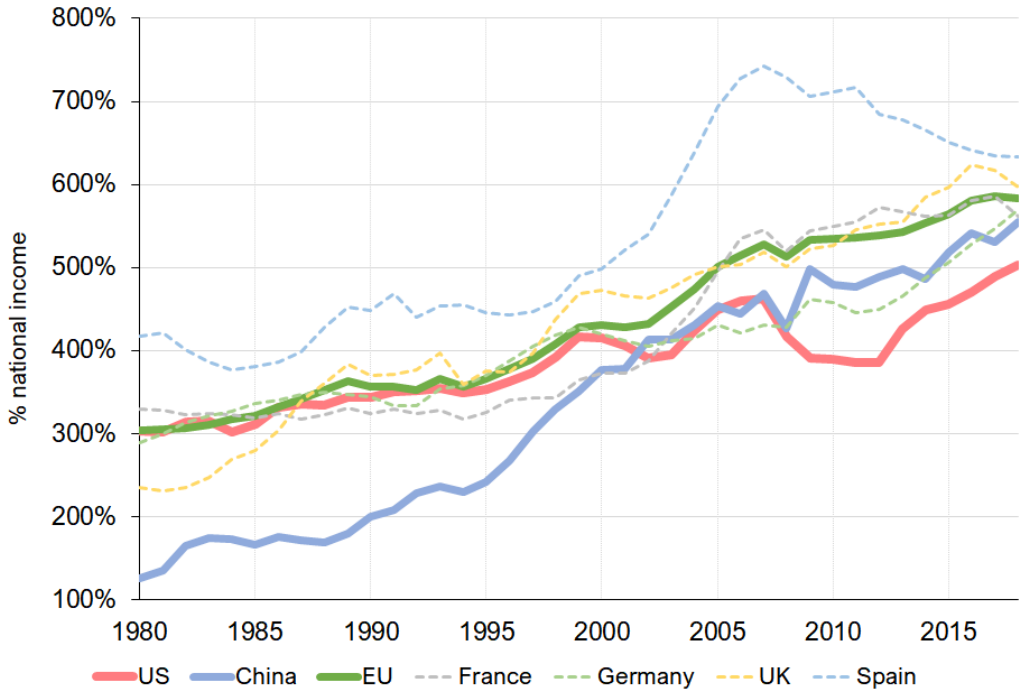
1 Introduction

This paper uses household data for the world's largest economies – the U.S., Europe, and China – to study the rise in global wealth over the past four decades. We calculate asset-specific saving flows and capital gains across the wealth distribution to expose the shifts in global saving supply that have occurred in recent decades. A prominent line of thought links the fall in real interest rates since the 1980s to changes in global saving and investment behavior, but the underlying forces and motivations remain much debated. The different hypotheses include: a rise in desired saving of households and emerging markets (Bernanke 2005; Rachel and Smith 2015; Mian et al. 2021a); a slowdown in growth and investment (Gordon 2014; Sajedi and Thwaites 2016); an increase in the demand for safe assets (Caballero et al. 2017; Caballero and Farhi 2018) as well as financial crises and the associated deleveraging (Lo and Rogoff 2015; Gourinchas and Rey 2022).

This paper contributes to the debate by providing a micro-level view of global saving dynamics for different asset classes and across the household distribution. Linking tax data, surveys and national accounts, we construct a new data set covering asset portfolios and saving flows from 1980 until today. The data set covers the United States, Europe (France, Germany, Spain and the United Kingdom), and China (shown in Table 1). It makes it possible, for the first time, to study the role of household saving and capital gains in individual asset classes – housing, fixed income, and equity and business assets – in driving global wealth accumulation in recent decades. Wealth-to-income ratios have risen substantially in the U.S., Europe, and China since the 1980s (Piketty and Zucman 2014, Novokmet et al. 2018). They now stand at 500-600% of national income, up from 250-300% in 1980. With a five-fold increase, the increase in the Chinese wealth-to-income was even stronger. The macro evidence on the rise in wealth-to-income ratios is summarized in Figure 1 and serves as the starting point for our analysis of saving and asset price dynamics.

We first disentangle the role of asset-specific capital gains and saving flows for aggregate wealth growth since 1980. We "unveil" indirect ownership of assets through pension and investment funds that has been an important driver of financial wealth growth in recent decades. This allows us to show that in the major world economies (what we label as "the G3"), capital gains

Figure 1: **Household Wealth-National Income Ratios, 1980-2018**



Notes: This figure displays the evolution of household wealth-to-national income ratios during 1980-2018 in three world regions: the U.S., Europe and China. Europe is the weighted average (by national income) of France, Germany, Spain and the U.K. Source: Own computations using official balance sheets for France, Germany, Spain, UK and the US. China is from Piketty et al. (2019).

and saving flows each account for about half of the increase in aggregate wealth since the 1980s. Saving flows were predominantly channeled towards financial assets, while capital gains were concentrated in housing markets, explaining about one-third to half of aggregate wealth growth since 1980.

In a second step, we study how these asset-specific saving flows and capital gains were distributed across different wealth groups. We show that new saving played the key role for wealth accumulation of the top-10% of households. Across the G3 economies, we observe a rising concentration of saving flows, with the share of private saving coming from the top-10% increasing by 60% over the past decades. In 1980, the richest 10% of households accounted for 64% of total private saving in the U.S., 60% in Europe and less than 50% in China. Around 2018, the same share reached 103% in the U.S., 78% in Europe, and 90% in China. An increase in saving inequality over

the past four decades reflects the rise of top-10% saving and the parallel decline of middle-class saving (i.e., saving of households between the 50th and 90th percentile or the middle-40%). The "saving glut of the rich", previously documented for the U.S. (Mian et al. 2021b; Saez and Zucman 2016), is a global phenomenon, as is the dissaving of the middle classes.

Building on our asset-specific saving data, we analyze the key drivers of rising top-10% saving. In all three economies, corporate saving (i.e., corporate retained earnings) have been the single most important source of rising saving of rich households. Growing corporate profits have been an important facet of the global economy in recent decades (Karabarbounis and Neiman 2014; Piketty and Zucman 2014; Barkai 2020; Kuvshinov and Zimmermann 2021). As dividend growth has not kept pace with surging corporate profits, corporate saving has risen considerably (Chen et al. 2017b; Gruber and Kamin 2016). Retained earnings on corporate balance sheets are apportioned to households (and the government) as ultimate owners of the corporations. As ownership of corporate equity is heavily concentrated among rich households, top-10% saving surged in parallel with increasing corporate earnings. Our paper exposes and discusses this important link between secular trends in global profit shares, retained earnings and rising global saving inequality.

Turning to the bottom-90% of the distribution, we expose a pronounced reduction of saving by middle-class households. In the U.S. and Europe, the decline in saving of middle-class households was particularly strong. In the U.S., middle-class saving decreased from 5% of national income in the 1980s to close to zero in the past decade. In Europe, the decline from 4% to about 1% in recent years was equally stark. By contrast, there has been little movement in saving in the bottom half of the distribution. The bottom-50% stayed at zero or slightly negative saving throughout. The decline in savings rates outside the top-10% was not driven by the poorest parts of the distribution, but by the middle class.

Yet despite the sharp decline in saving, middle-class wealth increased. Capital gains, especially in housing (net of mortgage debt), accounted for close to 60% of middle-class wealth accumulation. Across the G3 economies, the distribution of capital gains has been much more equal than new saving flows. Housing capital gains have been the single most important factor

moderating global wealth inequality in recent decades, in line with the findings of Kuhn et al. (2020) for the U.S. All else equal, in the absence of capital gains, the growing concentration of saving flows at the top would have led to a significantly larger increase in measured wealth inequality. Whether capital gains that are the result of falling discount rates are welfare-improving is a question subject to much debate (Moll 2020; Cochrane 2020). Our paper shows that capital gains moderated the increase in wealth inequality in recent decades. To the extent that this middle-class wealth growth was based on welfare-neutral increases in housing valuations, this would mask a much more substantial increase in welfare-relevant wealth inequality in recent decades.

We also show that the global wealth boom of the past four decades bypassed the bottom half of the wealth distribution, where wealth-to-income ratios stagnated. For most households in the lower half of the distribution, capital gains were minimal as home-ownership rates in this part of the distribution are low and holdings of risky financial assets small. The consequence was a marked polarization of wealth between the upper half and the lower half of the distribution, or between the "haves" and "have-nots". This divergence is not captured in widely used inequality measures such as top-wealth shares or the Gini coefficient despite its potentially important social and political implications.

In a final step, we combine the savings of the different wealth groups across the G3 and the government to understand the shifts in global saving flows in recent decades. Consistent with documented within-country trends, our analysis points to corporate saving as the single most important source of rising global saving, accruing predominantly to rich households in the top-10% of the wealth distribution. Linking household-level and national accounts data, therefore, shows that the "global corporate saving glut" (Chen et al. 2017b) was the main driver of the measured increase in global saving since the 1980s. We discuss the factors behind increasing corporate saving and its implications for saving inequality in the last section.

Related literature. Our paper is related to four strands in the literature. The first strand seeks to measure and analyze the long-run evolution of aggregate wealth. Piketty and Zucman (2014) constructed aggregate wealth and saving series for eight advanced economies. Follow-up studies

construct similar series for China (Piketty et al. 2019), Sweden (Waldenström 2017), India (Kumar 2019) or Spain (Artola-Blanco et al. 2020). Our paper is the first to study the contribution of asset-specific capital gains and saving for the accumulation of household wealth from a cross-country perspective after unveiling the indirect ownership of assets through investment and pension funds (Saez and Zucman 2016; Mian et al. 2021b).

The paper also relates to the literature studying the factors shaping the long-run dynamics of the wealth distribution (Alvaredo et al. 2018a; Garbinti et al. 2020; Kuhn et al. 2020; Saez and Zucman 2016; Martínez-Toledano 2020; Albers et al. 2020; Waldenstrom 2022). We construct new series of household wealth distribution that are consistent with aggregate wealth statistics in the U.K., China and, for the 1980s, in Germany (for the U.S., France and Spain we rely on existing series from Saez and Zucman 2016, Garbinti et al. 2020, and Martínez-Toledano 2020; we rely on the German series from Albers et al. 2020 for the period 1993-2018). Furthermore, we provide a new database of saving and capital gains in specific assets (housing, business assets, fixed-income assets, equity), for different wealth groups, in all countries covered in our study. Importantly, the capital gains we compute are consistent with market data for returns on different assets Jordà et al. (2019).

Our paper equally speaks to a rapidly growing theoretical and empirical literature on heterogeneous saving rates and asset portfolios for the dynamics of wealth inequality (Saez and Zucman 2016; Bach et al. 2020; Benhabib and Bisin 2018; Fagereng et al. 2020; Fagereng et al. 2021; Kuhn et al. 2020; Martínez-Toledano 2020; Garbinti et al. 2020; Mian et al. 2021b). Our study quantifies the contribution of capital gains and saving in all asset types for the wealth accumulation of different wealth groups and to evaluate their specific role for changes in the wealth distribution for the largest economies.

The final strand of the literature seeks to understand the link between the global saving supply (Bernanke 2005; Rachel and Smith 2015; Rachel and Summers 2019) and the fall of natural interest rates (Holston et al. 2017, Rees and Sun 2021). An important literature in recent years investigated this crucial macrofinance question, investigating the role of demographics (Eggertsson et al. 2019;

Carvalho et al. 2016; Gagnon et al. 2021; Coeurdacier et al. 2015; Auclert et al. 2021), inequality (Mian et al. 2021a; Mian et al. 2021c; Klein and Pettis 2020), and the rise of emerging countries with high demand for safe assets (Bernanke 2005; Caballero et al. 2008; Caballero and Farhi 2018). An important limitation of this literature was the absence of cross-country saving series decomposed by population groups over a longer time span that our paper provides.

The paper is organized as follows. Section 2 introduces the data, concepts and methods being used. We provide evidence on how the increase in wealth-to-income ratios was allocated across different wealth groups in section 3. Section 4 turns to the asset-specific analysis of household capital gains and saving flows. Section 5 studies the dynamics of global saving and its distribution since the 1980s. Section 6 concludes.

2 Concepts, data and methodology

Throughout this paper, we use concepts and definitions of personal wealth and saving from the international system of national accounts (SNA 2008) and employ distributional data consistent with official balance sheets of the household sector. We follow the guidelines of the Distributional National Accounts project (Alvaredo et al. 2021), which provide a framework to construct comparable wealth inequality series from a variety of data sources (e.g., income tax returns, estate tax, survey data, etc.) which are also coherent with the official national accounts. The countries included in this study are France, Germany, Spain, the UK, China and the US. To simplify the presentation of our analysis, we group results for France, Germany, Spain and the UK (taking the weighted average of the four countries) to represent a single region, Europe.

2.1 Main concepts

Household wealth. Our concept of wealth follows standard definitions. The wealth (sometimes also referred to as the net worth) of the household sector (W^H) is the sum of non-financial assets (ANF^H) plus financial assets (AF^H) owned by households, less liabilities owed by households

Table 1: **A new international database on unveiled households' saving and balance sheets**

Country	[1] Aggregate balance sheets	[2] Aggregate saving and capital gains	[3] Distributional balance sheets	[4] Distributional saving and capital gains
U.S.	1950-2018	1950-2018	1950-2018	1950-2018
China	1995-2018	1990-2018	1995-2018	1995-2018
Germany	1950-2018	1950-2018	1983-2018	1983-2018
France	1970-2018	1970-2018	1970-2014	1970-2014
U.K.	1967-2018	1967-2018	1980-2015	1980-2015
Spain	1980-2018	1980-2018	1984-2015	1984-2015

(L^H): $W^H = ANF^H + AF^H – L^H$. To decompose household wealth into different types of non-financial assets, financial assets and liabilities, we adhere to the classification of asset types in SNA-2008 and harmonize categories across countries. In table 2, we illustrate the decomposition of wealth into the different components used in this paper. Our basic decomposition includes 2 classes of non-financial assets, 4 types of financial assets, and 2 types of debt:

Table 2: **Household wealth**

SNA-2008 code	**Concept**
AN	Non-financial assets owned by households
AN111, AN21111	*Housing*
AN – (AN111+AN21111)	*Business assets*
AF	Financial assets owned by households
AF2+AF3+AF4+AF7+AF8	*Fixed-income assets*
AF51	*Equity*
AF52	*Investment funds shares*
AF6	*Life insurance and pension funds of households*
AF	Minus: Liabilities of households
AF41	*Long-term loans (housing debt)*
AF - AF41	*Other debt (non-housing debt)*
	Equals: Household wealth

- Non-financial assets: sum of housing and business assets. *Housing* is the combination of the market value of dwellings (structure) and land underlying dwellings: in practice, it is

generally easier to measure the sum (as in observed real estate transactions) than the two components separately. *Business assets* refer to non-residential fixed capital (structures, equipment, IP) and inventories, excluding durable goods. Durable goods are not considered an asset in the SNA, and thus, we do not include them within business assets. See the description of equity for a discussion of the treatment of unincorporated businesses.

- Financial assets: sum of fixed-income assets, equity, investment funds shares, and life insurance and pension assets. *Fixed-income assets* are the sum of cash, deposits, bonds, and loans. *Equity* is the sum of both listed and unlisted shares. It also includes unincorporated businesses functioning as "quasi-corporations" (i.e., businesses that "have an economic and financial behaviour that is different from that of their owners and similar to that of corporation", ESA-2010). *Investment funds shares* are participations in companies pooling capital belonging to numerous investors used to purchase securities collectively. *Life insurance and pension funds* correspond with the financial assets of policy holders or beneficiaries and liabilities of insurers or pension funds.

- Liabilities: sum of long-term loans and other debt. Throughout the paper, we treat long-term loans as "housing debt" and other debt as "non-housing debt", except in the US and China, where we distinguish housing and non-housing debt and use them directly (non-housing debt is the sum of consumer and business debt). *Long-term loans* are loans with a maturity longer than one year. Although not all long-term loans are housing debt, they constitute the vast majority.

Household saving. To define household saving, we follow the same principles as with household wealth. Namely, household saving (S^H) is the sum of saving in non-financial assets (S^H_{ANF}) and financial assets (S^H_{AF}), net of debt acquisitions (S^H_D) of the household sector: $S^H = S^H_{ANF} + S^H_{AF} - S^H_D$. As a result, each wealth component in table 2 is mapped by a saving flow (e.g., housing with residential investment).

In addition, we also include the share of corporate saving owned by households in our def-

inition of household saving. Corporate saving (also known as retained earnings or undistributed profits) is the share of after-tax corporate profits that is not distributed to equity owners as dividends. Firms can use corporate saving to invest, accumulate cash, repay debts, or buy back shares. Since households and governments ultimately own firms, corporate saving should be allocated to equity owners and considered as saving in equity (Alvaredo et al. 2021). Consistent with previous literature (Saez and Zucman 2016; Mian et al. 2021b; Garbinti et al. 2020), we allocate corporate saving to households in proportion to their equity holdings.[1]

We denote with an apostrophe the saving of households ($S^{H\prime}$) that already includes corporate saving, and express household saving as the sum of the household sectors' saving in financial and non-financial assets net of household debt acquisition, plus the share of corporate saving accrued to households: $S^{H\prime} = S^H_{ANF} + S^H_{AF} + \alpha S^C - S^H_D$, where α is the share of the corporate sector owned by households and S^C corporate saving.

2.2 Data

Data on aggregate wealth and saving. For European countries and the U.S., we use official national accounts to construct the series of aggregate household wealth, distinguishing further by all asset classes. We cover the period 1980-2018. These data were originally developed by Piketty and Zucman (2014) and later updated by Bauluz (2019). For Germany, we rely on corrected national accounts' estimates of housing wealth and business assets for the period 1990-2018, given that these two assets are undervalued in official balance sheets (Albers, Bartels and Schularick, 2020, pgs. 28-32). For China, we use the aggregate balance sheet of the household sector for the 1980-2015 period from Piketty et al. (2019), which we extend for the period 2016-2018 using Li and Zhang (2020). The aggregate wealth data are found in the annual statistics on the financial and non-financial assets and the liabilities of the household sector. In line with SNA-2008 guidelines,

[1] When allocating corporate saving, we take into account international cross-holdings of corporations. Namely, we exclude from retained earnings of domestic corporations the share owed to foreigners but include the share of foreign retained earnings owed to resident households. We are able to implement this adjustment thanks to recent estimates of net reinvested earnings from the World Inequality Database (Alvaredo et al. 2021).

all wealth components are measured at market values. The net worth of the household sector is defined as the sum of net financial wealth net of liabilities and non-financial assets.

To construct series of asset-specific saving flows, we use data on financial and non-financial saving of the household sector from official national accounts. Non-financial saving (i.e., saving in housing and in business assets) are obtained from the real accounts while saving on financial assets (including debt acquisitions) from the financial accounts. We follow the same approach with the corporate sector and use financial flows from financial accounts and non-financial flows from real accounts to compute corporate saving.[2] Our saving series start in 1980 for Europe and the US, and in 1995 for China (household saving by asset class are not available before 1995 in China).

Data on the wealth distribution. Data on the wealth distribution are available from existing studies or from our own construction. The time coverage of the distributional data is slightly less homogeneous, with series available since 1980 in France, the UK and the US, since 1983 in Germany, since 1984 in Spain, and since 1995 in China. Importantly, these data include information on the portfolio composition along the wealth distribution. Different methods were used to produce the series: income capitalization (France, US, Spain), estate multiplier method (UK), combined survey and national accounts data (Germany, China). The distributional data are considered to be of high quality, and have been previously used for comparison purposes in the literature (e.g., Alvaredo et al. 2018b; Blanchet et al. 2018). For all analyzed countries, the distributional series are consistent with aggregate household wealth from official balance sheets.

The French series were constructed by Garbinti et al. (2020); the U.S. series by Saez and Zucman (2016), later updated by Piketty et al. (2018)[3]; the Spanish series by Martínez-Toledano (2020). We construct the German series adhering to the same procedure followed by Albers et al.

[2]In practice, there are usually small differences between a sector's total saving in the financial and the real accounts. These differences are recorded in the national accounts as a "discrepancy". We prefer computing financial saving from financial accounts (instead of real accounts) for two reasons. First, only financial accounts disclose financial flows by asset class (equity, bonds, etc.). Second, only financial accounts measure financial saving from observed transactions. By contrast, the real accounts compute financial saving as a residual of the income of a domestic sector (e.g., households or corporations) minus its consumption and non-financial investment.

[3]We use the series that were updated on September, 2020 (see: http://gabriel-zucman.eu/usdina/; last accessed on December 14, 2020). These series make some adjustments to those in Piketty et al. (2018). See Saez and Zucman (2020).

(2020) to estimate the German wealth distribution for the period 1993-2018. We then extend these series back to 1983 using the same data source and methods. For the UK, we rely on estate tax data and the estate multiplier method, as implemented in Alvaredo et al. (2018a) (and previously by Atkinson and Harrison 1978). One important difference in our study compared to theirs is that we include pension assets using alternative sources. Pension assets are excluded from estate taxes in the UK and, for this reason, were not included in Alvaredo et al. (2018a)'s definition of personal wealth. However, for the purpose of our study, it is important to account for pension assets since these have become an important asset in the portfolio of British households since the 1980s. To impute pension wealth, we combine estate data and the Wealth and Asset Survey, which provides information on pension assets and other wealth components of individuals. Overall, our benchmark wealth inequality series follow closely those in Alvaredo et al. (2018a) (Figure C1). While the main results of the paper are not significantly affected by this imputation procedure, we acknowledge the lower precision of the UK series *vis à vis* those of other countries.

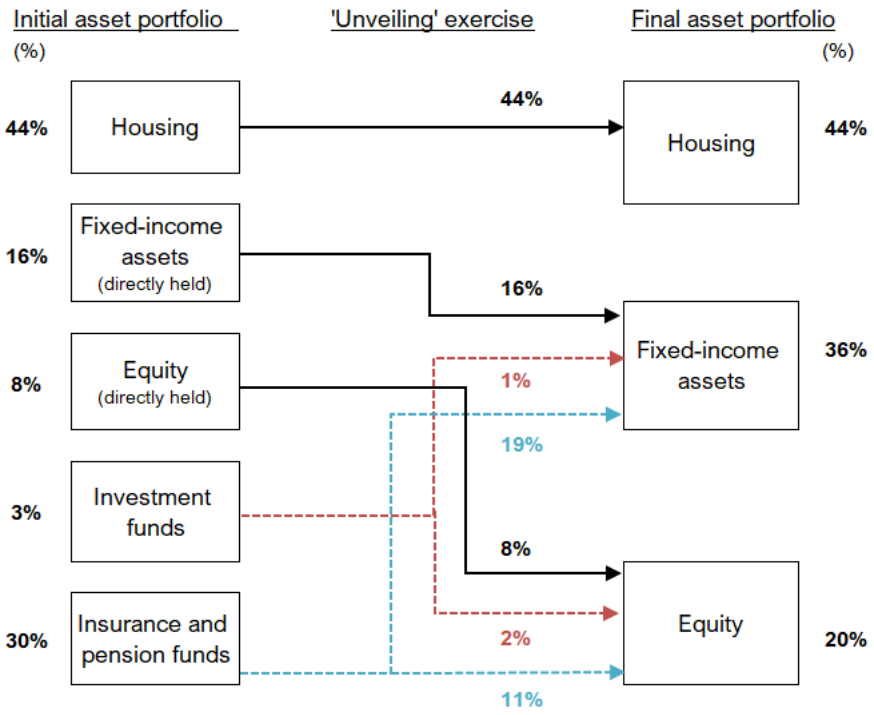
We construct wealth distribution series for China using available wealth surveys (CHIP survey for 1995 and 2002, biannual CFPS survey for 2012-2018). We make several adjustments to the raw survey data. Most importantly, we uprate each asset type to match the aggregate asset totals. We use a uniform uprate factor estimated as the ratio between the macroeconomic asset total and the survey asset total. This approach is a well-known method to correct surveys and is widely used in the literature on wealth inequality (Albers et al. 2020; Feiveson and Sabelhaus 2019; Bauluz and Meyer 2021; Mian et al. 2021c). This procedure primarily affects financial assets, for which the survey totals are significantly below the balance sheet totals. The resulting distribution is more unequal than the raw survey distribution since financial assets are strongly concentrated at the top of the distribution. Hence, this adjustment also indirectly accounts for the underestimation of the rich in the survey (whose portfolio is relatively dominated by financial assets). This is the reason why our wealth inequality series for China follows closely that in Piketty et al. (2019), (Figure Appenidix C1).

2.3 Unveiling indirectly held financial assets

To understand the role of specific assets in global wealth growth, we need to unveil households' indirect asset ownership and saving through pension and investment funds. We use the asset portfolio of investment and pension funds to infer the assets owned indirectly by households through their holdings of pension assets and investment funds shares. The stock and saving flows of pensions and investment funds can be obtained from official balance sheet for financial subsectors (e.g., SNA-2008 subsectors S.124, S.128 and S.129). The "unveiling" exercise allows us to decompose households' portfolios into three asset categories: housing, fixed-income assets (cash, deposits, bonds and loans) and equity (including unincorporated business assets). Importantly, the "unveiled" series of household assets and saving flows allows us to link undistributed corporate profits (a saving flow accrued to equity owners) with the stock of equity held directly and indirectly through investment and pension funds (see section 2.4).

We build on the work on indirect ownership through investment and pension funds in the U.S. (Piketty et al. 2018 and Mian et al. 2021b), but our study is the first to provide a database of households' stock of assets and saving flows on a global level. The mechanics of the "unveiling" exercise are illustrated in Figure 2, showing the example of the U.K. in 2018. The left side of the figure shows both directly and indirectly held assets of British households. The right side of the figure shows the "unveiled" household asset portfolio, simplified in three asset types: housing, fixed-income assets, and equity. Percentages refer to the share of each asset type in total household assets. Indirectly-held assets as investment funds and pension funds represent 3% and 30% of household assets, respectively. The center part of the figure depicts the unveiling exercise by showing the proportion of investment funds and pensions funds that is invested into fixed-income assets and equity. For example, in 2018, pension funds had 64% of their assets invested in fixed-income claims, and 36% in equity. We then apply this proportion to households' claims in pension funds (30% of their total assets), and obtain that U.K. households hold 19% of their assets in fixed-income claims through pension funds (i.e., 64% of 30%), and 11% in equity (i.e., 36% of 30%). This is illustrated by the garnet dotted lines in Figure 2. The same exercise is conducted

Figure 2: **"Unveiling" of households indirectly held assets in the U.K. in 2018**



Notes: This figure displays the unveiling of the assets owned by U.K. households. The left part of the Figure ("Initial asset portfolio") shows the share of each asset type in the aggregate portfolio of households, as documented in official balance sheets. The central part of the chart ("Unveiling exercise") displays the "unveiling process". It shows the share, in total household assets, of equity and fixed-income assets held indirectly through: i) investment funds and ii) insurance corporations and pension funds. The right part of the figure ("Final asset portfolio") shows the share of housing, fixed-income assets and equity held in the portfolio of U.K. households after unveiling the indirect ownership. The figure shows that, e.g., 19% of household assets are fixed-income claims held indirectly through insurance and pension funds.

for investment funds, which in 2018 held 35% of their assets in fixed-income claims and 65% in equity (blue dotted bars).

2.4 Wealth accumulation: saving vs. valuation effects

Aggregate wealth accumulation. To account for the dynamics of wealth accumulation, we decompose wealth growth into saving (volume effect) and capital gains (relative price effect). One important benefit of this method is that the same framework which is applied at the aggregate level (i.e., total household wealth) can be adopted at the distributional level. This allows full consistency between the macro and distributional results of our paper.

This method links the accumulation of wealth to the corresponding flow of saving, and obtains the role of asset prices as a residual (Piketty and Zucman 2014; Waldenström 2017; Artola-Blanco et al. 2020). We go beyond previous studies and link the accumulation of each asset class and debt type to its corresponding flow of saving.[4] That is, we analyze the influence of saving and prices in the evolution of different asset classes and debt categories, and determine the relative influence of asset-specific saving and capital gains for the aggregate dynamics of wealth. As explained in sub-section 2.1, in the case of equity, saving is the sum of corporate saving accrued to households and net acquisitions of equity by households (see also Appendix B.1). Note that this method requires us to use the "unveiled" series of household assets and saving flows, which in turn allows us to link corporate saving with the stock of equity held directly and indirectly through investment and pension funds.

More precisely, for a given wealth component (housing, business assets, fixed-income assets, equity, housing debt, other debt), we decompose our series using the following transition equation:

$$A_{t+1} = (1 + q_{t+1,A})A_t + S_{t+1,A} \tag{1}$$

where A_{t+1} and A_t are the real value at time $t+1$ and t of a given wealth component from the households' wealth. $S_{t+1,A}$ is the net-of-depreciation saving flow in wealth component A during year $t+1$. Finally, $q_{t+1,A}$ is the real capital gain or loss from wealth component A between time t and $t+1$. The capital gain part is obtained as a residual in the previous equation since we observe all the other elements (i.e., annual stocks of assets or debts and flows of net saving or net dissaving).

The previous law of motion (eq. 1) can be rewritten for the accumulation of net wealth:

$$W_{t+1} = (1 + q_{t+1})W_t + S_{t+1} \tag{2}$$

Where W is the sum of all asset classes, net of liabilities, and S is net-of-depreciation saving

[4] Artola-Blanco et al. (2020) do a similar decomposition for the accumulation of national wealth in Spain. While the focus of their study is on the accumulation of the stock of non-financial assets, in this paper, we focus on the accumulation of household wealth, which includes both financial and non-financial claims.

(i.e., saving in financial and non-financial assets, minus debt acquisitions). The capital gain q is the weighted average of capital gains in the different asset classes and debt, where the weights are given by the proportion of each wealth component in net wealth.[5]

Distributional synthetic saving. We apply the same framework to analyze the dynamics of the wealth distribution. Concretely, we use the synthetic saving method, introduced by Saez and Zucman (2016), and used extensively in the literature since (Piketty et al. 2018; Garbinti et al. 2020; Kuhn et al. 2020; Martínez-Toledano 2020; Mian et al. 2021b). The method adapts the accumulation equations introduced above (equations 1 and 2) to specific wealth groups.

For a given wealth group (e.g., the top-10%), we use the following law of motion specific to each wealth component (housing, business assets, fixed-income assets, equity, housing debt, other debt):

$$A^i_{t+1} = A^i_t(1 + q_{t+1,A}) + S^i_{t+1,A} \tag{3}$$

where A^i_{t+1}, and A^i_t denote the value of wealth component A in times $t+1$ and t, for wealth group i; $S^i_{t+1,A}$ is the synthetic saving in asset type A in year $t+1$ by wealth group i; and $q_{t+1,A}$ is the rate of capital gains on asset type A between t and $t+1$.

Synthetic saving are obtained residually from observed data on the asset or debt values of class A of group i, and the rates of change of asset prices observed for the household sector (obtained from equation 1). Note that Equation 3 above, when applied to equity assets, provides a (residual) saving in equity that already includes corporate saving (together with direct equity acquisitions and indirect equity acquisitions through investment and pension funds) since saving in equity in Equation 1 includes retained corporate earnings.[6] Importantly, the unveiling exercise is

[5] In the appendix (Figures C3 and C4), we compare the capital gains obtained with our method with the evolution of housing and equity prices from the Jordà-Schularick-Taylor Macrohistory Database (Jordà et al. 2019). Overall, both series of capital gains are highly correlated, although we find a lower role for equity capital gains in our series. This result should be expected since part of the rise in equity prices reflects the accumulation of corporate saving (as explained in section 2, we include as part of households' equity saving the share of corporate saving accrued to households). Moreover, equity price indices refer to listed equity, while our study covers both listed and unlisted shares.

[6] An equivalent approach is to estimate saving in equity separately for corporate saving and other saving in equity. In this case, saving in equity in Equation 1 excludes retained corporate earnings, which are allocated directly to equity

crucial since it allows us to distribute the share of corporate saving that is due to equity owners through pension and investment funds (see Section 2.3).

Accordingly, we can generalize Equation 3 to account for the accumulation of net wealth of a given group:

$$W^i_{t+1} = W^i_t(1 + q^i_{t+1}) + S^i_{t+1} \tag{4}$$

where W is the sum of all asset types, net of debt, of wealth group i. The capital gain becomes group-specific (q^i) since it is the weighted average of each wealth component A in the net worth of group i.

Note that the synthetic saving method relies on two assumptions. First, it assumes that individuals in a given wealth group in year t remain in this group in $t+1$. In practice, however, there is always mobility between wealth groups over time, although inter-group persistence is relatively high, at least for broad wealth groups such as the top-10%, the middle-40% and the bottom-50%. For example, available evidence for the US (Kuhn et al. 2020), Germany (Albers et al. 2020), Spain (Martínez-Toledano 2020) and Sweden (Bach et al. 2018) indicates that the probability of remaining in the top-10% of the wealth distribution in the subsequent survey wave is around 70 to 80%. For China, we also find relatively high inter-group persistence, being only slightly below the US (Table C1). Throughout the paper, we analyze three wealth groups: the bottom-50%, the middle-40% and the top-10%. Since these groups are relatively stable over longer horizons, we can follow them over time in a "pseudo panel".[7]

The method also assumes that different wealth groups experience the same capital gain for individual assets (e.g., housing, equity, etc.). As a result, variation in capital gains across wealth groups reflects portfolio heterogeneity. In the Appendix Figure C11, we document large portfolio differences across wealth groups, consistent with previous literature. Whether capital gains at the

owners. In both approaches, however, corporate saving is ultimately assigned to different wealth groups in proportion to their equity holdings and, hence, its allocation does not rely on the "synthetic saving method" (see Appendix B.1).

[7]We do not look at smaller groups within the top-10% (e.g., top-1% or top-0.1%) because intergroup mobility increases when the analysis is restricted to the top-1% (Bach et al. 2018).

asset-class level differ systematically across wealth groups is an open question. However, available evidence for the U.S., Spain and Norway suggests rather small within-asset class heterogeneity of capital gains rates (Mian et al. 2021b; Martínez-Toledano 2020; Fagereng et al. 2020). As a result, the well-known result that returns (i.e., the sum of the income flow and the capital gain) for individual assets differ across wealth groups (Fagereng et al. 2020, Bach et al. 2020, Xavier 2021), would largely reflect variation in income flows.[8]

The existing literature indicates that the synthetic saving method is relatively robust, whether compared to alternative methods to estimate saving rates (e.g. "income minus consumption approach": Mian et al. 2021b for the U.S., Albers et al. 2020 for Germany, Yang et al. 2012 for China) or implemented on panel data (Martínez-Toledano 2020). Moreover, it is important to recall that one specific saving flow – corporate saving – does not rely on the synthetic saving method since it is allocated directly to equity owners. This is explained in a considerable detail in Appendix B.1 (also in footnote 6). Given that equity owners are persistently over-represented at the top-end of the wealth distribution, the bulk of corporate saving is consistently allocated to the top-wealth groups. As we will see, corporate saving was a key determinant of household saving growth over the past decades. It is important to stress that this key finding regarding the central role of corporate savings does not rely on the synthetic saving method.

[8] In a recent paper, Fagereng et al. (2020) document that returns across Norwegian wealth groups vary at the asset class level. Since returns are the sum of capital gains and income flows, we asked the authors if the capital gain component drives the observed variation in returns. In an email exchange, the authors suggested that differences in asset-specific capital gains across wealth groups are fairly small, at least for housing and public equity (the two assets they could check). We are grateful to the authors for sharing this information. Martínez-Toledano (2020) looks at the variation in house prices in Spain across wealth groups (top-10%, middle-40%, bottom-50%) during the period 2005-2015, finding that capital gains varied in similar proportions across all household groups (despite the wild swings in house prices in Spain during the 2005-2015 period of a pronounced boom-bust cycle). Mian et al. (2021b), on the other hand, perform a robustness check of the synthetic saving method using variation in house prices across wealth groups, finding no substantial differences with respect to their benchmark saving rates (which use uniform capital gains for individual assets). Finally, Xavier (2021) analyses returns along the wealth distribution in the U.S. Her measure of return assumes (as we do) that capital gains in individual asset classes are the same across household groups.

3 The distributional anatomy of the global wealth boom

We start by investigating the distributional anatomy of the surge in global wealth-to-income ratios in recent decades. In a first step, we look at the rise of wealth-to-income ratios for different wealth groups. We then turn to asset-specific saving flows and capital gains in the next section. As discussed above, the European total is constructed as the (weighted) average of Germany, France, Spain and the United Kingdom. We follow the convention in the literature and study three broad wealth groups: households in the top-10%, households in the middle-40% ("middle class"), and households in the bottom-50% of the wealth distribution (see section 2.4).

Figure 3 shows the cumulative change of household wealth-to-national income ratios in the three world regions since 1980.[9] The wealth of the top-10% and the middle 40% increased substantially between 1980 and 2018, while the bottom-50% did not participate in the wealth boom. The group-specific accumulation patterns are presented in Table 3, in columns 1-3, which show wealth-to-national income ratios of the three wealth groups at the beginning and the end of the period (columns 1-2) and each group's share in the total wealth growth (column 3). The top-10% saw the largest wealth increase in all regions, capturing 57% of the total wealth growth in Europe, 69% in China and 74% in the U.S. Overall, wealth growth was shared between the rich and the middle classes in the proportions of about two-thirds to one-third. The developments in Europe were the most favorable to the households outside the top-10%, where the middle class increased their wealth by almost 100pp of national income (and captured 40% of the wealth growth). In the U.S. and China, the middle-40% captured 26% and 28% of the wealth growth, respectively.

A strong fact that stands out is the absence of wealth gains in the lower half of the wealth distribution. Wealth in the bottom half decreased markedly in the U.S. and China and stagnated in Europe. Half of the population did not participate in the global wealth boom of the past 40 years. While wealth-to-income ratios doubled globally, about half of the population saw either decreasing

[9] The graph shows the cumulative increase in household wealth (W^H) over national income (Y) in each year n after 1980 ($\frac{W^H_{1980+n}}{Y_{1980+n}} - \frac{W^H_{1980}}{Y_{1980}}$), as the sum of the wealth increase of each wealth group i relative to national income: $\sum_i \frac{W^i_{1980+n}}{Y_{1980+n}} - \frac{W^i_{1980}}{Y_{1980}}$.

or stagnating wealth-to-income ratios. The upshot is that the wealth gap between the lower and the upper half sharply widened, leading to a growing wealth polarization.

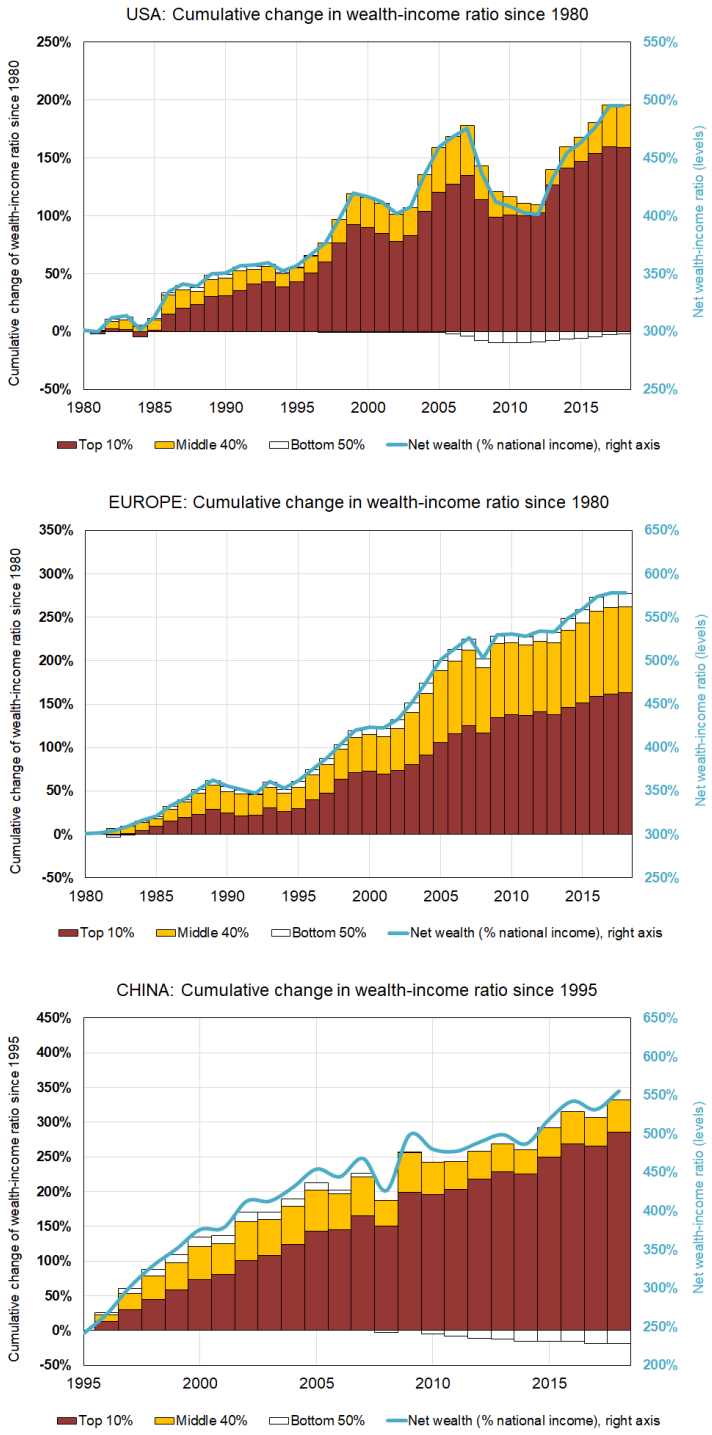
Table 3: **Wealth-to-national income ratio, share in total wealth growth, and share in total net wealth of three wealth groups (top 10%, middle 40% and bottom 50%) in the U.S. (1980-2018), Europe (1980-2018) and China (1995-2018)**

	[1] Wealth-income ratio b-o-p	[2] Wealth-income ratio e-o-p	[3] Share in total wealth growth	[4] Wealth share b-o-p	[5] Wealth share e-o-p
USA	301%	495%	100%	100%	100%
Top 10%	196%	354%	**74%**	65%	72%
Middle 40%	102%	140%	**26%**	34%	28%
Bottom 50%	3%	1%	**0%**	1.0%	0.2%
Europe	301%	578%	100%	100%	100%
Top 10%	160%	323%	**57%**	53%	56%
Middle 40%	124%	223%	**38%**	42%	39%
Bottom 50%	16%	31%	**5%**	5.4%	5.5%
China	242%	555%	100%	100%	100%
Top 10%	84%	370%	**69%**	34%	66%
Middle 40%	114%	160%	**28%**	48%	29%
Bottom 50%	44%	25%	**4%**	18%	4.5%

Note: This table shows group-specific wealth-to-national income ratios at the beginning and end years. (columns 1 and 2). Beginning and end years are 1980 and 2018 in the U.S. and Europe, and 1995 and 2018 in China. Column 3 illustrates the share of total household wealth growth captured by each group over the mentioned periods. Columns 4 and 5 show the wealth shares of three wealth groups (top-10%, middle-40% and bottom-50%) at the beginning and end years. Europe is the weighted average (by national income) of France, Germany, Spain and the U.K.

Columns 4-5 of Table 3 show changes in wealth inequality, looking at the development of the wealth shares of the three wealth groups. Trends were markedly different across the world regions. The surge in wealth-income ratios was accompanied by a relatively moderate increase of wealth inequality in Europe (the top-10% share increased by 3 percentage point), and a more substantial widening in the US (the top-10% share increased by 7 percentage points), but it went hand in hand

Figure 3: **Accumulation of household wealth, 1980-2018.**



Notes: The figure shows the cumulative increase in household wealth-income ratio in the US, Europe and China, decomposed between the top-10%, middle-40% and the bottom-50% of the wealth distribution. It shows, e.g., that the U.S. top 10% wealth group increased their wealth holdings, relative to national income, in about 150% national income since 1980. Europe is the weighted average (by national income) of France, Germany, Spain, and the U.K.

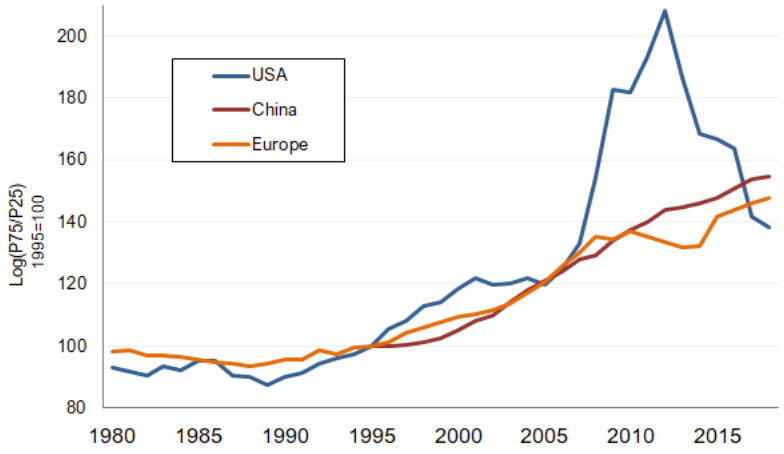
with a surge in wealth inequality in China (where the top-10% share almost doubled, increasing by 32 pp between 1995 and 2018). In other words, in all economies, the top-10% expanded their wealth shares in line with the evidence discussed in Saez and Zucman (2016) and Kuhn et al. (2020) for the U.S., a Garbinti et al. (2020), Albers et al. (2020), Martínez-Toledano (2020) and Alvaredo et al. (2018a) for the European countries, and Piketty et al. (2019) for China.

However, the commonly used inequality measures as the top 10% shares (or more generally top shares or the Gini coefficient) tend to overlook the growing polarization of wealth between the upper and lower half of the distribution. Since the bottom half of the population has little wealth, changes in top-wealth shares will largely reflect inequality among wealth holders (the "race between the middle classes and the rich") and will tend to overlook distributional dynamics at the bottom. This issue is even more pertinent to synthetic inequality measures such as the Gini coefficient. The fact that the bottom half of the population has been, by and large, left behind in the global wealth boom of the past decades, while wealth in the upper half rose substantially (albeit for different reasons, as we will see), has been often overlooked.[10]

Generally, no single inequality measure can effectively summarize all distributional dimensions and the choice depends to a large extent on the specific research interest (e.g., Atkinson et al. 1970; Sen 1973; Cowell 2011; etc.). For example, Case and Deaton (2020) have recently criticized the widespread use of the Gini coefficient and call instead for the use of inequality measures that reveal a more nuanced picture, such as percentiles ratios: "The best measures are those that match our purpose, or pick up on the places where important changes are happening." Figure 4 shows the inter-quartile ratio (75/25) of wealth and reveals the growing wealth gap between the upper and the lower half of the distribution. By this measure, wealth inequality has increased significantly more than top-10% wealth shares or trends in the Gini would suggest (see also Appendix Figure C2).

[10]The growing wealth gap between the upper and the lower half of the distribution in Figure 3 and columns 1-3 in Table 3 is what is measured as "absolute" inequality, as opposed to the predominantly used "relative" inequality (Kolm 1976). And as pointed out by Ravallion (2004), the absolute gap is what most people mean when talking about rising "gaps between poor and rich"; e.g. see Amiel and Cowell (1992)). Relative inequality measures are sensitive to proportional transformations, while absolute to additive transformations. That is, relative inequality will not change if all incomes/wealth increase proportionally, and absolute inequality will not change if all incomes/wealth increase in the same amount ("scale" versus "translation" independence).

Figure 4: **Interquartile wealth ratio ratio in the U.S., Europe and China (1995=100)**



Note: This figure shows the evolution of the log of the ratio of the 75th and the 25th percentile's wealth relative to 1995 (=100) in the U.S. (1980-2018), Europe (1980-2018), and China (1995-2018). The levels of log(75/25) in 1995 were 2.9 in the U.S., 2.5 in Europe and 1.2 in China. Europe here is the weighted average (by national income) of France and Germany.

4 Unveiling global saving flows and capital gains

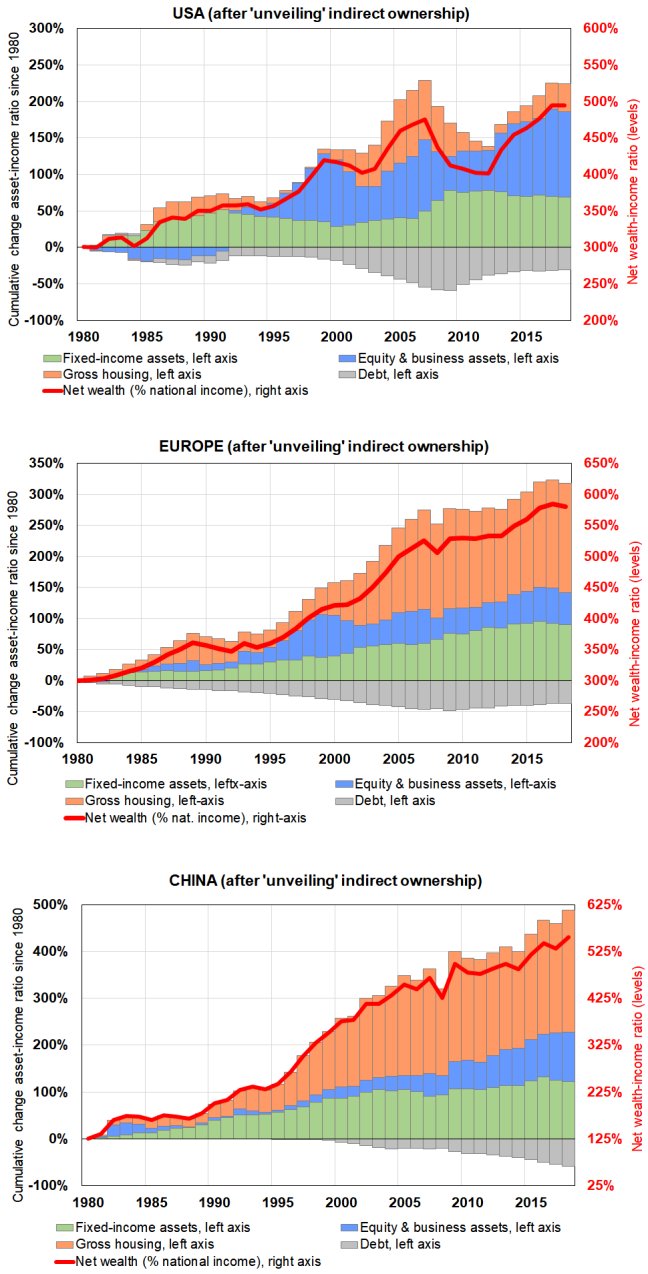
In this section, we will extend our analysis of the global wealth boom in the past 40 years along two important dimensions. First, we will distinguish between the role of saving and capital gains in *individual asset classes*. Second, we will study the contribution of saving and capital gains in individual asset classes to wealth growth *across different wealth groups*.

Figure 5 plots the change of different wealth components relative to national income since 1980, after "unveiling" indirectly-held assets through pension and investment funds. Figure C5 in the appendix shows the corresponding graph before "unveiling". We classify household assets into three basic types: housing, fixed-income assets, and equity (including unincorporated business assets).[11]

Figure 5 contains three important insights. First, there has been a notable increase in fixed-income assets in all three world regions, equivalent to around 100% of national income. Both in Europe and in the US, this increase took place almost entirely through pension and investment

[11]Conceptually, the frontier between corporate equity and unincorporated business assets is dependent on the legal and institutional context (Alvaredo et al. 2021). All results of the paper are obtained separately for equity and unincorporated business assets, but we decided to group the two together for ease of presentation.

Figure 5: **Cumulative change in asset-to-income ratios since 1980 (left-axis) and household wealth-income ratio in levels (right axis).**



This figure displays the cumulative change in asset-to-national income ratios (left scale) and the household wealth-to-national income ratio in level (right scale) for the U.S., Europe and China. It shows the cumulative change in asset-income ratios after "unveiling" the indirect asset ownership. Europe is the weighted average (by national income) of France, Germany, Spain and the U.K.

funds (i.e., the ratio of directly held fixed-income assets-to-national income in Appendix Figure C5 barely changed since 1980).

The second insight is that housing wealth was the main driving force for the wealth increase in Europe and China, experiencing an upsurge close to two times the national income since 1980. In the U.S., in contrast, housing has been relatively less important with the exception of the housing boom of the 2000s. Instead, the sustained increase in equity values was the main factor behind the rise in the wealth-income ratio in the U.S. The increase in the value of equity and business assets is consistent with the surge in stock market capitalization in advanced economies since the 1980s (Kuvshinov and Zimmermann 2021).

Finally, we document a significant increase in household indebtedness over the last decades. While this development was particularly strong in the U.S. and Europe until the 2008 financial crisis, it has accelerated in China since. In China, household debt increased from around 20% of national income in 2008 to close to 60% in 2018. On average, the rise in household indebtedness in the three world regions since 1980 has been equivalent to around 50% of national income. This corroborates previous findings in the literature, which document the steady increase in household debt-to-national income ratios in rich countries since the 1950s (Jordà et al. 2016; Bartscher et al. 2020).

4.1 Aggregate saving flows and capital gains

Wealth can rise because existing assets increase in value, households acquire new assets, or debt falls. To understand the respective role of these forces, we return to the law of motion for aggregate wealth described in section 2 (Equations 1 and 2). In Table 4, we present the results for the decomposition of household wealth accumulation into saving and capital gains over the 1980-2018 period. Overall, household wealth grew at a remarkably similar speed in Europe and the US (around 4% per year). In China, the wealth growth rate was three times faster (12.5%). In columns 2 and 7, we show the contributions of saving and capital gains in accumulating household wealth for each of the G3-economies. Saving and capital gains each contributed roughly half to wealth creation in all three economies.[12]

[12] Appendix Figure C6 quantifies the three components: initial wealth from 1980 (absent changes in real asset prices), cumulative new saving since 1980, and cumulative capital gains since 1980 on the initial wealth and on new

Table 4: **Decomposition of aggregate household wealth accumulation in the U.S. (1980-2018), Europe (1980-2018) and China (1995-2018)**

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	Real wealth growth	**% due to saving**	Net housing	Net fixed-income assets	Equity and business	*Of which: corporate saving*	**% due to cap. gains**	Net housing	Net fixed-income assets	Equity and business
U.S.	**4.0%**	**55%**	-6%	42%	19%	*24%*	**45%**	28%	-10%	27%
Europe	**3.9%**	**59%**	-4%	43%	20%	*18%*	**41%**	52%	-12%	1%
China	**12.5%**	**48%**	4%	28%	16%	*11%*	**52%**	44%	-8%	16%

Note: The table shows annual real household wealth growth (column 1) and decomposes the accumulation of household wealth into saving-induced and capital-gains-induced wealth growth (columns 2 to 10), since 1980. Household wealth consists of housing (net of mortgage debt), fixed-income assets (net of non-mortgage debt), and equity (including unincorporated business assets). The table shows that, for example, saving in net-fixed income assets accounted for 42% of household wealth accumulation in the U.S. since 1980. Europe is the weighted average (by national income) of France, Germany, Spain and the U.K.

In columns 3-5 (for saving) and columns 8-10 (for capital gains), we split aggregate wealth growth into the three main asset categories which, for ease of exposition, we express net of debt: housing (net of mortgage debt), fixed-income assets (net of non-mortgage debt), and equity (including business assets). The category "equity and business" includes the following asset types: (i) unincorporated business assets, (ii) direct equity acquisitions, (iii) indirect equity acquisitions through investment and pension funds, (iv) and corporate saving.

Fixed-income investments have played a central role for saving accumulation in all countries. They alone account for around 30-to-40% of overall wealth growth. This accumulation of fixed-income assets by households has mainly taken place through investment and pension funds and only becomes visible after unveiling their holdings. Saving flows into housing (net of housing debt) negatively contributed to wealth accumulation, reflecting the higher growth of housing debt relative to residential investment (in the U.S., in particular amid rising equity extraction). Saving in business equity accounts for around one-fifth of the overall wealth accumulation. Interestingly, most of the saving in equity happened through undistributed corporate profits (column

saving.

6). Corporate saving was almost negligible in the early 1980s but contributed around one-third of household saving in recent years (Appendix Table C2). These findings are consistent with other research showing the growing importance of corporate saving globally (Chen et al. 2017b; Gruber and Kamin 2016).

On the capital gains side (columns 7-10), both housing and equity have registered substantial appreciation. Together, they explain about 60% of the overall increase in personal wealth. Strikingly, capital gains on net housing capture around 40-to-50% of aggregate wealth growth. Taken at face value, this result implies that wealth-income ratios would have barely increased in the absence of the gains in this particular asset. The capital gains in net housing are also due to the decrease in real debt values with inflation. This is mirrored on the asset side by negative capital gains on fixed income assets, as inflation tended to reduce their real value (Garbinti et al. 2020).[13]

The central role of housing capital gains does not mean that capital gains on equity and business assets were unimportant (column 10). They account for about one-fifth of total wealth growth. Yet it is important to recall that the measure of equity capital gains used here is net of corporate saving in the form of retained earnings in recent decades (Piketty et al. 2018, Mian et al. 2021b, Kuvshinov and Zimmermann 2021, Greenwald et al. 2019). In our estimates, more than half of the surge in stock prices is driven by the increase in undistributed corporate profits and should, therefore, not be treated as a capital gain. However, capital gains on equity were heterogeneous across world regions. In the U.S., they accounted for close to one-fourth of overall wealth accumulation but played a smaller role in China and Europe.[14]

[13]The evolution of housing prices in China is notably impressive. According to our estimates, the annual capital gain in housing was slightly above 11% from 1995 to 2018. While this figure is substantially above official housing price indexes (which show no real increase in housing prices), it is in line with results from Fang et al. (2016) and Deng et al. (2016), which estimate the evolution of real housing prices across a large sample of Chinese cities since the early 2000s. By construction, our housing capital gains coincide with those estimated by Piketty et al. (2019). Deng et al. (2016) also show that rising urban land values, rather than construction costs, explain house price growth in China. See Appendix Figure C3 for a comparison of the capital gains in our study and the evolution of prices in Fang et al. (2016).

[14]Understanding the ultimate drivers of the different role of equity capital gains worldwide is beyond the scope of this paper, but one candidate explanation are regional differences in market power (e.g., De Loecker and Eeckhout 2018 and Philippon 2019).

4.2 Group-specific saving and capital gains

In this section, we study how saving flows and capital gains in individual asset classes were distributed across different wealth groups. We quantify wealth growth due to asset-specific saving and capital gains for different wealth groups. For comparison, Appendix Figure C7 shows that the resulting distribution of saving flows in the U.S. between the top-10% and the bottom-90% in this paper and in Saez and Zucman (2016) and Mian et al. (2021b) is very similar. But Table 5 goes beyond the previous literature and quantifies asset-specific wealth growth on a global scale. We omit results for the bottom-50% wealth group because its net wealth is close to zero or even negative. As before, the Table provides a complete decomposition of saving and capital gains for net housing (gross housing minus mortgage debt), net fixed income assets (gross fixed income assets minus non-mortgage debt) and equity and business assets.

The Table contains a number of important new insights. First, saving flows account for 72% of wealth growth of the top-10% in the U.S., 77% in Europe and 57% in China. In contrast, capital gains were the main source of wealth growth for the middle-40%, contributing to around two-thirds of the group's growth across the three economies. In line with the aggregate data (see Table 4), we find that saving in fixed-income assets accounted for the largest part of saving of all wealth groups, in particular of the "active" savers (the top-10% and the middle-40%).

Saving in equity and business has been concentrated in the top-10% and constitutes the second largest component of top-10% saving flows. We will discuss below that the importance of this component of saving increased substantially over time and that undistributed corporate profits account for the bulk of the saving in equity and business. Saving in net housing has largely been negative amid faster housing debt accumulation that outpaced investment in housing, especially for the middle classes in the US (see Bartscher et al. 2020).

The table also shows that housing capital gains (column 6) constitute the most significant part of total capital gains. Housing capital gains accounted for around 60% of total middle-class wealth growth in the last decades. Rising equity prices have been relatively more important in the U.S., contributing to the wealth growth of both the top and middle of the wealth distribution

Table 5: **Decomposition of wealth accumulation of aggregate household wealth and of two wealth groups (top 10% and middle 40%) in the U.S. (1980-2018), Europe (1980-2018) and China (1995-2015)**

	[1] **Wealth increase due to saving**	[2] Net housing	[3] Net fixed-income	[4] Equity and business	[5] *Of which corporate saving*	[6] **Wealth increase due to cap. gains**	[7] Net housing	[8] Net fixed-income	[9] Equity and business
U.S.	**55%**	-6%	42%	19%	24%	**45%**	28%	-10%	27%
Top 10%	**72 %**	3%	48%	21%	26%	**28%**	14%	-12%	26%
Middle 40%	**37 %**	-16%	41%	13%	27%	**63%**	49%	-13%	27%
Europe	**59%**	-4%	43%	20%	18%	**41%**	52%	-12%	1%
Top 10%	**77 %**	3%	41%	32%	24%	**23%**	35%	-9%	-2%
Middle 40%	**36 %**	-11%	39%	8%	6%	**64%**	69%	-7%	2%
China	**48%**	4%	28%	16%	11%	**52%**	44%	-8%	16%
Top 10%	**57 %**	2%	32%	23%	13%	**43%**	36%	-9%	16%
Middle 40%	**38 %**	12%	29%	-2%	2%	**62%**	53%	-7%	15%

Note: The table quantifies the accumulation of wealth into saving-induced and capital-gains-induced wealth growth (columns 1 to 8) for (i) all households, (ii) the top 10% wealth group, and (iii) the middle 40% wealth groups. We do not include results for the bottom 50% wealth group because their net wealth is close to zero (or even sometimes negative), which makes the interpretation of wealth growth not meaningful. Net wealth is decomposed into housing (net of mortgage debt), fixed-income assets (net of non-mortgage debt), and equity (including unincorporated business assets). The table shows that, e.g., saving in net-fixed income assets accounts for 48% of the total wealth growth of the top 10% in the U.S. since 1980. Results for Europe and the U.S. cover the period 1980-2018, and for China, 1995-2015. Europe is the weighted average (by national income) of France, Germany, Spain and the U.K.

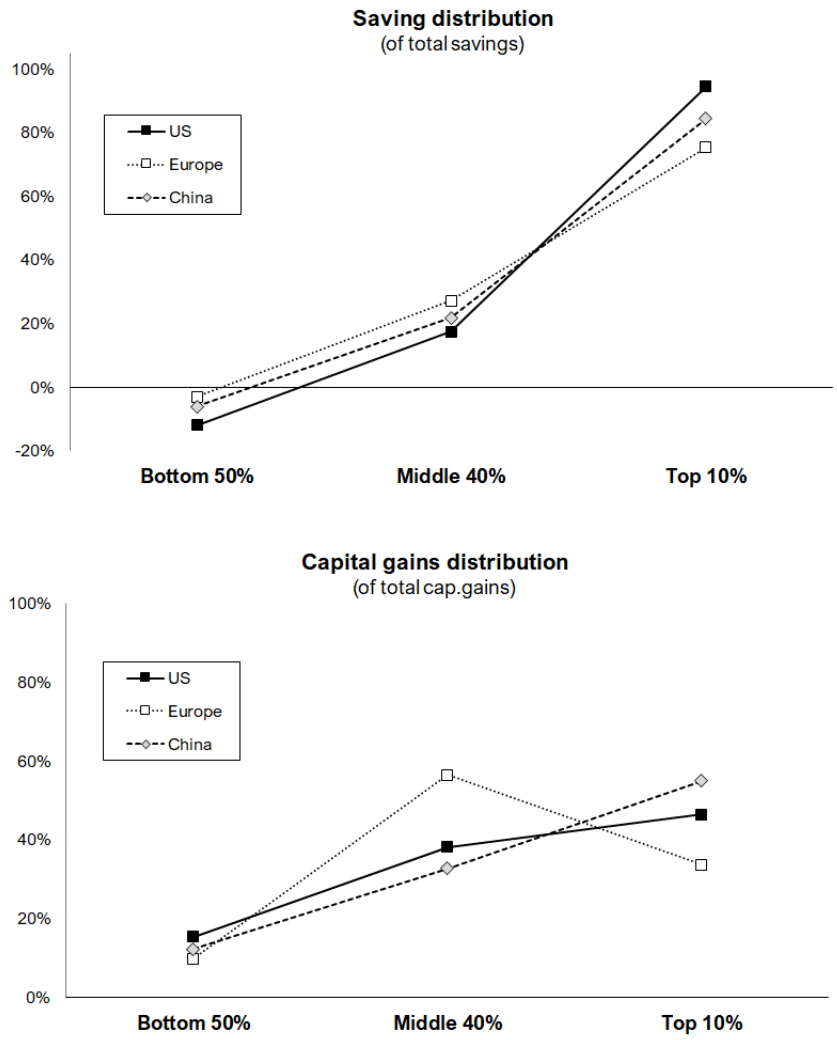
(around one-fourth of the wealth growth of each group).

An important theme emerging from our work is that the distribution of saving flows since was much more unequal than the distribution of capital gains. This is shown in Figure 6.[15] The top-10% wealth group accounted for as much as 94% of the total saving flows in the U.S. since the 1980s, 75% in Europe and 84% in China (Figure 6, upper panel). The remaining saving were made by the middle-40%, while the bottom-50% had zero or negative saving in all three economies.

The picture is markedly different on the capital gains side, where the top-10% accounted on average for around 45% of the total capital gains in the three economies (Figure 6, lower panel),

[15] Appendix Figures C8 and C9 further decompose saving and capital gains, respectively, in specific asset categories. In line with the results in Table 5, saving in fixed-income assets accounted for the largest part of overall saving (with, as said, a prominent role of saving in equity and business for the top-10% saving), while capital gains in housing for the largest part of capital gains in all regions.

Figure 6: **The distribution of saving and capital gains across wealth groups during 1980-2018 (US and European countries) and 1995-2018 (China).**

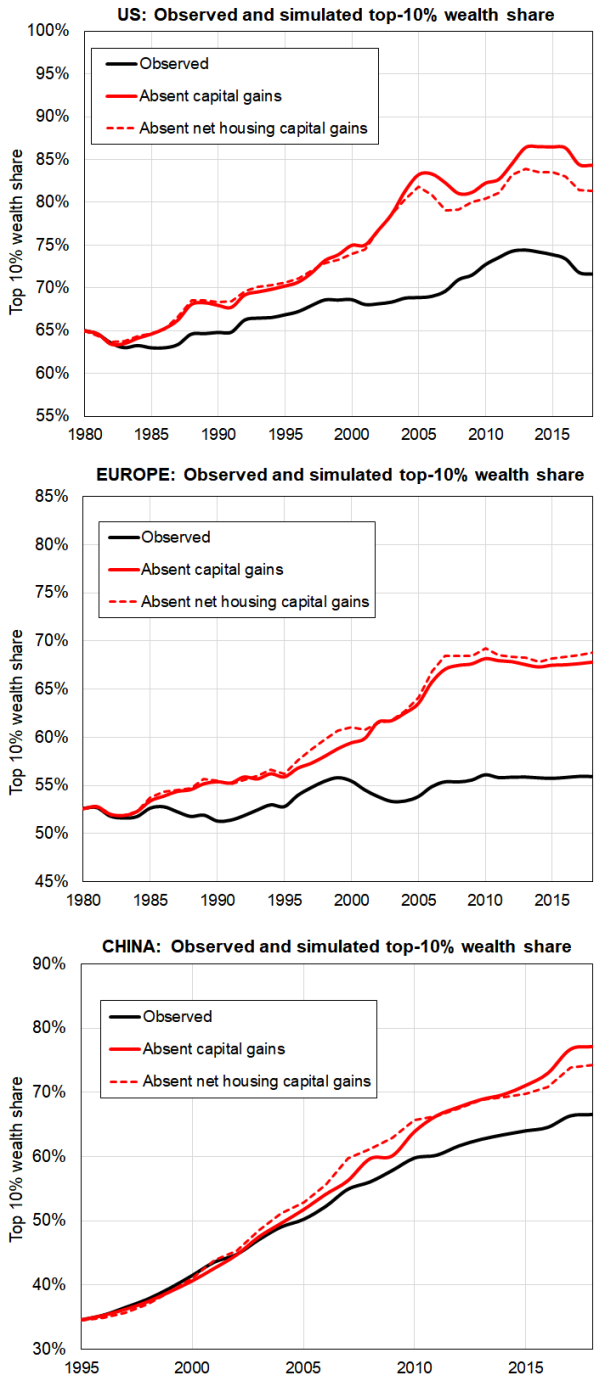


Notes: The figure shows the share of total aggregate household saving (upper panel) and aggregate household capital gains (lower panel) accumulated during the period 1980-2018 (USA and Europe) and 1995-2018 (China) accrued to three wealth groups: top-10%, middle-40% and bottom-50% wealth groups. Results for Europe correspond to the weighted average (by national income) of France, Germany, Spain and the UK.

with approximately the same share going to the middle-40%. The bottom-50% also obtained a positive share of capital gains that counteracted net borrowing on the saving flow side.

Overall, one of the key finding of this paper is that since the 1980s saving have been an unequalizing force for the wealth distribution, while capital gains have been an equalizing force. We illustrate the respective distributional roles of saving and capital gains by means of a counterfactual analysis (explained in detail in the Appendix B.2). Setting capital gains in all assets for all

Figure 7: **Observed and counterfactual top-10% wealth share of household wealth**



Notes: This figure shows the evolution of the top-10% share observed in the data (solid black line) and the top-10% share if determined by saving alone (solid red line). How to read: if the wealth accumulation of different groups depended exclusively on saving (assuming neutral capital gains), the top-10% in 2018 would have been 86% in the U.S. (as opposed to observed 72%), 68% in Europe (as opposed to observed 56%) and 77% in China (as opposed to observed 67%). Europe is the unweighted average of France, Germany, Spain and the U.K.

groups to zero since 1980, which is equivalent to assuming that all wealth groups i experienced the average capital gains of the economy (i.e., $q^i = q$ in Appendix Equation 13), and making the (admittedly stark) assumptions that households do not adjust saving behavior in response to asset prices, yields a counterfactual that illustrates to what extent capital gains have dampened the rise in wealth inequality. In this counterfactual world, the wealth share of the top-10% would have risen in the period 1980-2018 by another 15-20pp. in the three economies, as suggested by Figure 7. In particular, the figure reveals that capital gains in net housing played a critical role in moderating the wealth distribution since 1980.[16]

These findings are connected to the debate whether capital gains are welfare improving if they are driven by falling discount rates (Moll 2020; Cochrane 2020). We showed that the middle class was the main beneficiary of capital gains in housing that moderated the increase in wealth inequality. To the extent that some middle-class housing capital gains reflect welfare-neutral increases in market value, they could mask a more substantial increase in wealth inequality driven by the concentration of new saving flows at the top of the distribution.

5 Global saving dynamics since 1980

In this section, we study the dynamics of global saving since the 1980s. Our focus will be on shifts in the sources of saving flows across household groups. More precisely, we address two key questions: (i) which shifts have occurred in the intra-household sector saving distribution in the past 40 years?; (ii) which changes have taken place in the asset composition of saving accumulation? In a first step, we look at the dynamics of saving in each of the three major economies (U.S., Europe,

[16] As explained in detail in Appendix B.2, saving have been a strong unequalizing force for the wealth distribution in all three countries. This is because the distribution of saving was more unequal than the initial wealth distribution (see Appendix, Equation 14). As a result, new saving exacerbated relative differences between the wealth groups. In contrast, capital gains had a moderating impact on the wealth distribution in all countries, as the top-10% experienced a relatively lower average real capital gains rate on its wealth (Appendix Figure C10). This is the result of the heterogeneous portfolio of the rich and the middle classes, with the middle classes relatively more invested in housing and the rich in financial assets (Appendix Figure C11, left panel). The differential price effect is a result of the different price dynamics experienced by these assets. In line with the results in Section 4, housing saw the highest price increase, exceeding that of financial assets (Appendix Figure C11, right panel).

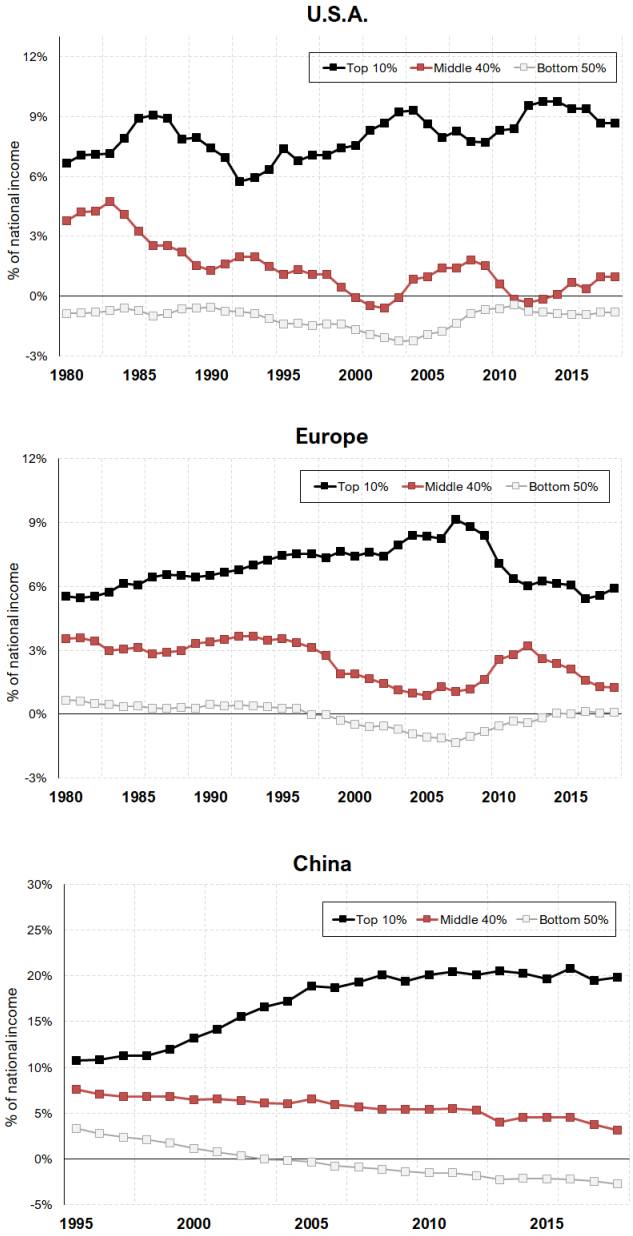
China) individually. In a second step, we combine the saving of the three regions into a single area, the "G3", in an effort to trace and understand the shifts in global saving dynamics in recent decades.

5.1 Concentration of saving at the top and middle-class dissaving

We begin by tracking the saving of three wealth groups within the individual G3-economies. Figure 8 shows the evolution of saving relative to national income for the top-10%, middle-40% and the bottom-50% of households in the U.S., Europe, and China. In all three economies, we observe a growing concentration of saving at the top, reflecting a widening gap in the saving between the top group and the rest. While there is some fluctuation over time, in all three economies, the gap between saving flows coming from the top-10% and the middle-class (i.e., the middle-40%) was considerably smaller at the beginning of the period than today. In the U.S., the difference between top-10% saving and the middle-40% stood at about 3pp. of national income in the early 1980s, and about 2pp. in Europe. By 2018, the gap had more than doubled to about 8pp. in the U.S. and 5pp. in Europe. The most remarkable surge in saving inequality took place in China. The gap between the top and the middle was around 3pp. in the mid-1990s and has widened to about 15pp. in the most recent years.

This trend of widening saving disparities was driven by two interconnected developments. First, an increase in saving of the top-10%. The exact size of the increase varies by region. For instance, in the U.S., the richest 10% of households saved about 7% of national income in the 1980s. In the past decade, top-10% saving climbed to 9-10% of national income. The trend towards higher saving at the top was even more pronounced in China and also in Europe until the global financial crisis. Our findings here underscore that the U.S. "saving glut of the rich" discussed by Mian et al. (2021b) was indeed a global phenomenon. In line with their work, our calculations also support the idea that surging saving of the top-1% played the key role in increasing top-10% saving. This is shown in Figure C12 in the Appendix. Saving of the "next-9"% (i.e., households between the 90th and 99th percentile) remained stable while top-1% saving surged. This being

Figure 8: **Saving out of national income by wealth groups**



Notes: This figure shows the development of saving of the top 10% and the bottom 90% wealth group in the U.S., Europe and China. Saving are scaled by national income. All series are 5-year moving averages. The period is 1980-2018 in the U.S. and Europe, and 1995-2018 in China. Europe is the weighted average (by national income) of France, Germany, Spain and the UK.

said, our analysis relies on broader wealth groups to reduce the issue of intra-group mobility (see section 2.4).

The second trend is the simultaneous dissaving of the bottom-90%, and especially of the

middle-40% of the distribution. In the U.S. and Europe, the decline in middle-class saving was particularly pronounced. In the U.S., middle-class saving decreased from 5% of national income in the 1980s to close to zero in the past decade. In Europe, the decline from 4% to about 1% was less pronounced, but still substantial. The bottom 50% had zero or slightly negative saving throughout, with little room to decline much further. With the exception of China, there has been little movement for the bottom half of the wealth distribution. In China, the data show a roughly commensurate decline of saving of the middle-40% and the bottom-50%.

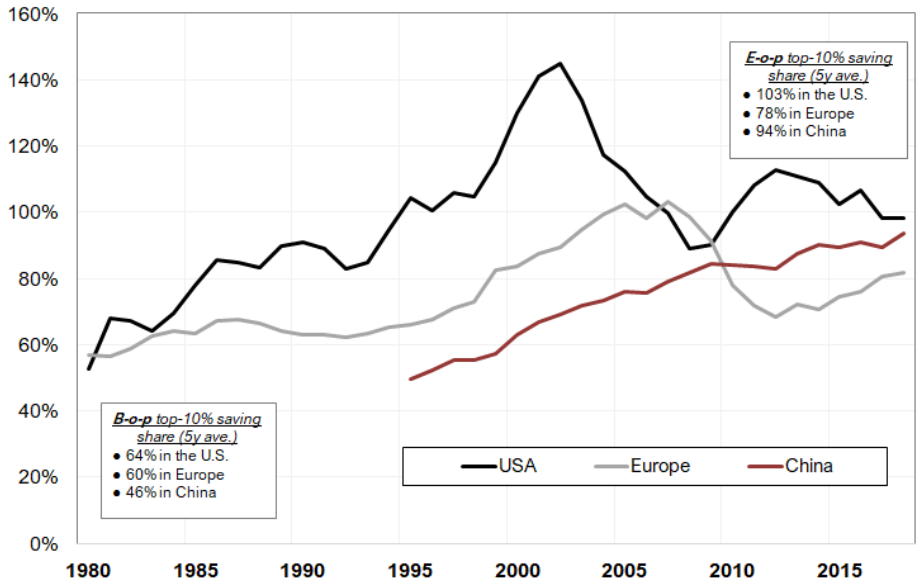
Putting the pieces together, the years 1980 to 2018 witnessed a marked shift in the household saving distribution in all G3 economies. An increasing share of saving was supplied by households at the top of the distribution. As shown in Figure 9, around 1980, the top-10% accounted for around 60% of all household saving in the U.S. This increased to about 100% by 2018. In Europe, the share increased from about 60% to 80%, and from about 50% to 90% in China. The surge in the top-10% share in total saving reflected the combination of a trend towards larger saving flows from the top and a collapse in middle-class saving in the U.S. and Europe (as shown in Figure 8).The results on saving patterns across the distribution are robust to alternative methodological approaches, notably the income less consumption method (see detailed exposition of the method and results in Appendix A.2)

A global perspective. To track the evolution of global saving and its distribution in recent decades, we collapse the individual G3 economies into one. [This is an intentional shortcut as distributional data are not available on a global level.] The resulting G3 economy accounts for a relatively stable share of 50% in world GDP since 1980 (see Appendix Figure C15).[17]

We treat the G3 as one integrated economy and aggregate national income and saving flows into a single area using market exchange rates. We assume that current accounts cancel out between these countries (Appendix Figure C17 confirms that this is a good empirical approximation). To obtain comprehensive coverage of global saving flows, we integrate public saving into the analysis.

[17]The rise of China (from 3 to 16% of the world GDP) more than compensated for the declining global GDP share of the advanced economies (from 47 to 37%; see Appendix Figure C15)

Figure 9: **Distribution of household saving flows, 1980-2018**



Notes: The figure shows the evolution of the top-10% share in the total household saving in the U.S., Europe and China. Europe is the weighted average (by national income) of France, Germany, Spain and the U.K. The series are 5-year moving averages.

[This allows us to compare shifts in the private saving distribution to changes in public saving.]

We start from the national accounts definition of national saving i as the sum of the saving of households (S_i^H), the corporate sector (S_i^C), and the government (S_i^G): $S_i^N = S_i^H + S_i^C + S_i^G$. We use an apostrophe to denote the saving of the government ($S^{G'}$) and households ($S^{H'}$) that already includes corporate saving, and express household saving as the sum of the saving of the top-10% and bottom-90% of the wealth distribution ($S_i^{H'} = S_i^{Top10} + S_i^{Bot90}$). We rewrite national saving in country i as the sum of government saving and the saving of the top-10% and bottom-90% of the wealth distribution: $S_i^N = S_i^{Top10} + S_i^{Bot90} + S_i^{G'}$. Finally, we define the G3 national saving as the sum of the national saving of each region i:

$$S_{G3}^N = \sum_i S_i^N = \sum_i S_i^{Top10} + \sum_i S_i^{Bot90} + \sum_i S_i^{G\prime}$$

Appendix Figure C18 shows that trends in the G3 are a good proxy for global developments. Gross (of depreciation) saving rates for the G3 and globally have evolved in lockstep since 1980

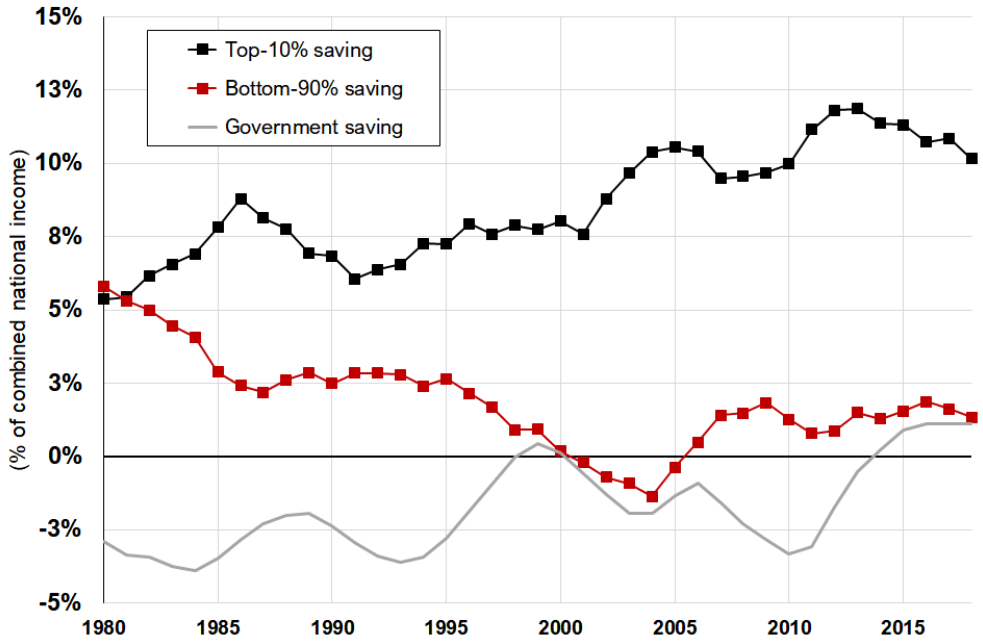
and increased about 4-5 percentage points.

Figure 10 sums the saving of the top-10% and bottom-90% groups in each of the G3 and divides by G3 aggregate GDP. The figure conveys our core finding: the past 40 years have witnessed a substantial reshuffling of saving flows within the global household sector. The global bottom-90% reduced their saving from 5% to around 1% while global top-10% saving doubled relative to G3 aggregate income. The rise of saving by rich Chinese households played an important role for the increase in the global supply of saving from the top, while the decline in saving of the global bottom-90% was mainly driven by declining saving in the U.S. and Europe (Appendix Figures C19 and C20). Put differently, the polarization of saving flows identified for the United States by Mian et al. (2021b) and Saez and Zucman (2016) was a global phenomenon, driven by rising saving at the top and declining saving for the bottom-90% of the distribution. Figure 10 also demonstrates that the role of the public sector saving swings in the overall dynamics of G3 saving was limited.[18]

Figure C13 makes clear in a rather unambiguous way which households were the main suppliers of saving to the global economy in the past four decades. 98% of all new saving since the 1980s were supplied by the richest 10% of households in the U.S., Europe, and China, while 25% came from middle-class households. The bottom-50% of households and the government have been net dissavers throughout the period. In the past four decades, global saving, the chart suggests, were first and foremost supplied by households at the top.

[18]During the 1980-2018 period, public saving co-moved with economic cycles, but overall stood at average saving rates of around -1 to -2% throughout the period. There was a small shift around the year 2000 when public saving turned positive for a couple of years. From 2013 to 2015, public saving has also been slightly positive, reflecting growing saving surpluses from China's public sector and smaller deficits of Western governments (see figure C22). The substantial positive public saving of China reflects to a large extent corporate retained earnings that accrued to the government (as before, we remove the "corporate veil" and allocate undistributed corporate profits to the owners (i.e., different households or the government) in proportion to their holdings of business equity) as around 60% of the Chinese corporate sector remain government-owned as of 2018 (Piketty et al. 2019; Huang and Veron 2022). China's non-corporate public saving has also been in surplus in recent years, contributing to the increase in overall (corporate and non-corporate) public saving (see Appendix Figure C23).

Figure 10: **G3 net national saving decomposition, 1980-2018**



Notes: This figure shows the development of the G3 top 10%, bottom 90% and government saving. G3 saving is the combination of top 10%, bottom 90% and government saving in the U.S., China and Europe. G3 saving is scaled by G3 national income. Cross-country combinations use market exchange rates to convert local currencies into US dollars. Series are 5-year moving averages.

5.2 The rise of corporate saving and the top-10% saving share

Using the asset-specific saving flow data constructed above, we can study the rise of top-10% saving and the decline of middle-class saving on the level of individual assets. We will distinguish three main asset categories: housing (net of mortgage debt), retained corporate earnings, and other financial assets (net of non-mortgage debt).

Figure C14 presents the breakdown of top-10% (left panel) and the bottom-90% saving (right panel) into the three asset categories. The charts reveal the central importance of retained corporate earnings for the increase in top-10% saving in the U.S. and Europe. In both economies, corporate saving account for almost the entire increase in household saving at the top. Without the contribution from corporate saving, top-10% saving would have stagnated or fallen in Europe and the U.S. In China, corporate saving increased alongside an increase in other financial saving at the top. On the other hand, the dissaving of the bottom-90% (and, particularly, of the middle classes) primarily

occurred through lower saving in financial assets and higher debt accumulation, the latter driven by the acquisition of mortgage debt (see Figure C14).

As discussed in section 2, corporate saving are allocated to the ultimate owners of the corporations in proportion to their equity holdings. The ultimate owners of companies are households and, in some cases, governments. The share of the corporate sector owned by the government is typically low today. In Europe and the U.S., corporations are predominantly owned by households while government ownership of corporations is still prevalent in China.[19] Around 60% of Chinese corporate equity is in the hands of the government (Piketty et al. 2019; Huang and Veron 2022).[20] Household equity ownership is heavily concentrated among rich households. As a consequence, corporate saving statistically accrue to the top-10% of households and reflect an increase in household saving of the owner-households (section 2).[21]

Switching to the global perspective, we can show that the increase in global top-10% saving was closely linked to the secular increase in global corporate saving. This is illustrated in the upper left panel of Figure 12 that shows the decomposition of G3 top-10% saving into retained earnings and other saving. Top-10% saving, expressed as a percentage of G3 national income, increased by around 4 percentage points since the 1980s. Nearly all of this increase came from the surge in undistributed corporate profits (see the upper right panel of Figure 12).[22] The lower panel in Figure 12 shows that accompanying dissaving by the global bottom-90% primarily occurred through lower saving in fixed-income assets and higher debt accumulation (the latter being more pronounced in the late 1980s and particularly stark during the early 2000s housing boom).

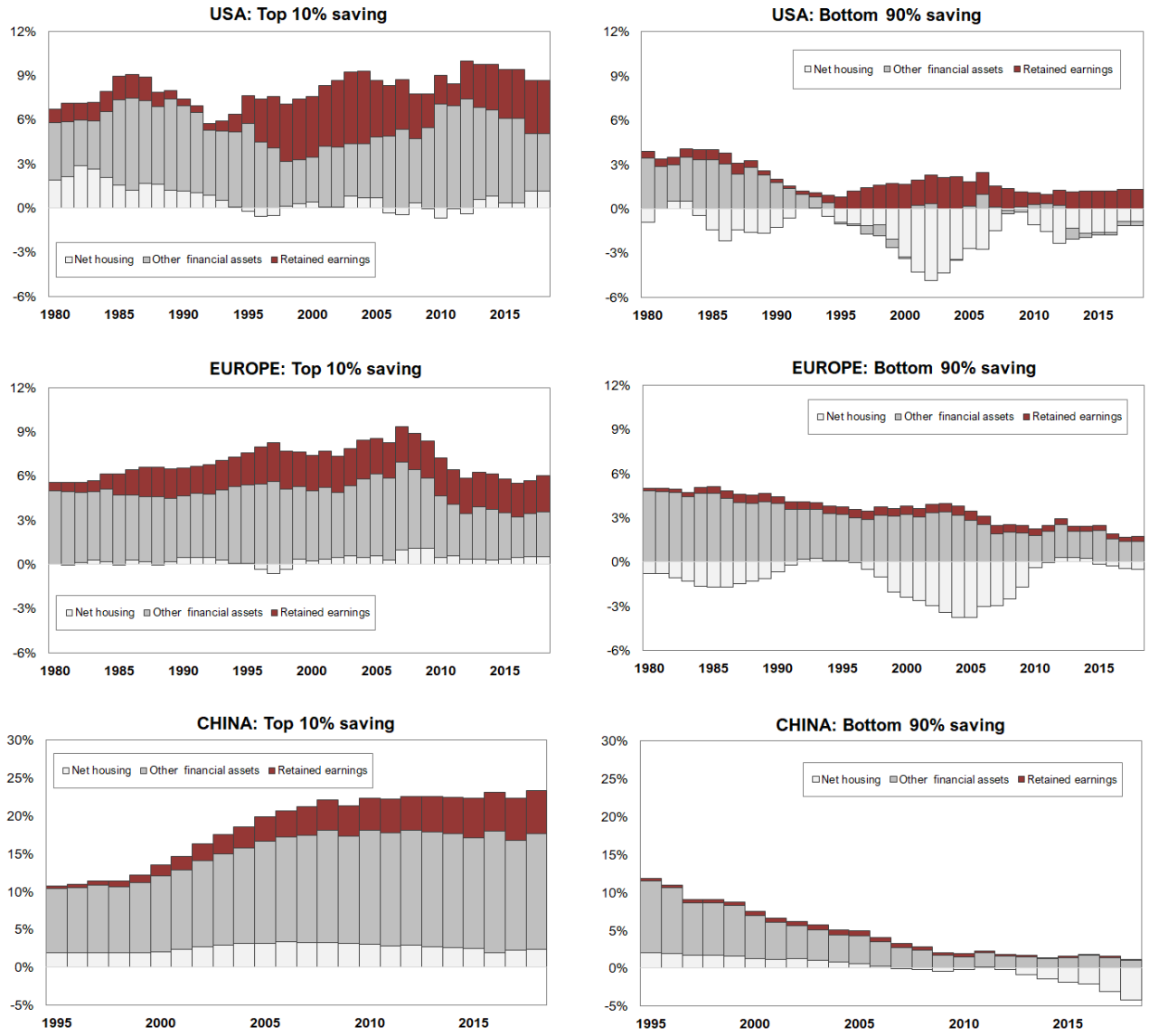
[19] While today government ownership of equity is low in Europe, it was substantial in the 1980s in countries like France where around 50% of corporate equity was held by the government.

[20] Note that the definition of corporate saving does not include the share of undistributed domestic profits owed to foreigners. Conversely, it includes the share of foreign undistributed profits owed to the domestic sectors (section 2).

[21] A related interesting question is to what extent are the households aware of corporations retaining earnings on their behalf (e.g., when households indirectly own equity through pension and investment funds). In practice, however, households experience an increase in the value of their equity holdings when corporations retain earnings.

[22] Therefore, the documented within-country trends – the rise in top-10% saving in conjunction with the boom in corporate saving – are more intense in China than in the developed countries, but not different. In other words, the quick conversion of China into a market economy with high inequality and strong incentives for corporations to save (with the latter still more pronounced in China given strong capital market imperfections; see Song et al. 2011, Bacchetta and Benhima 2015, Buera and Shin 2017), together with its growing share in the global economy, reinforced the global trend.

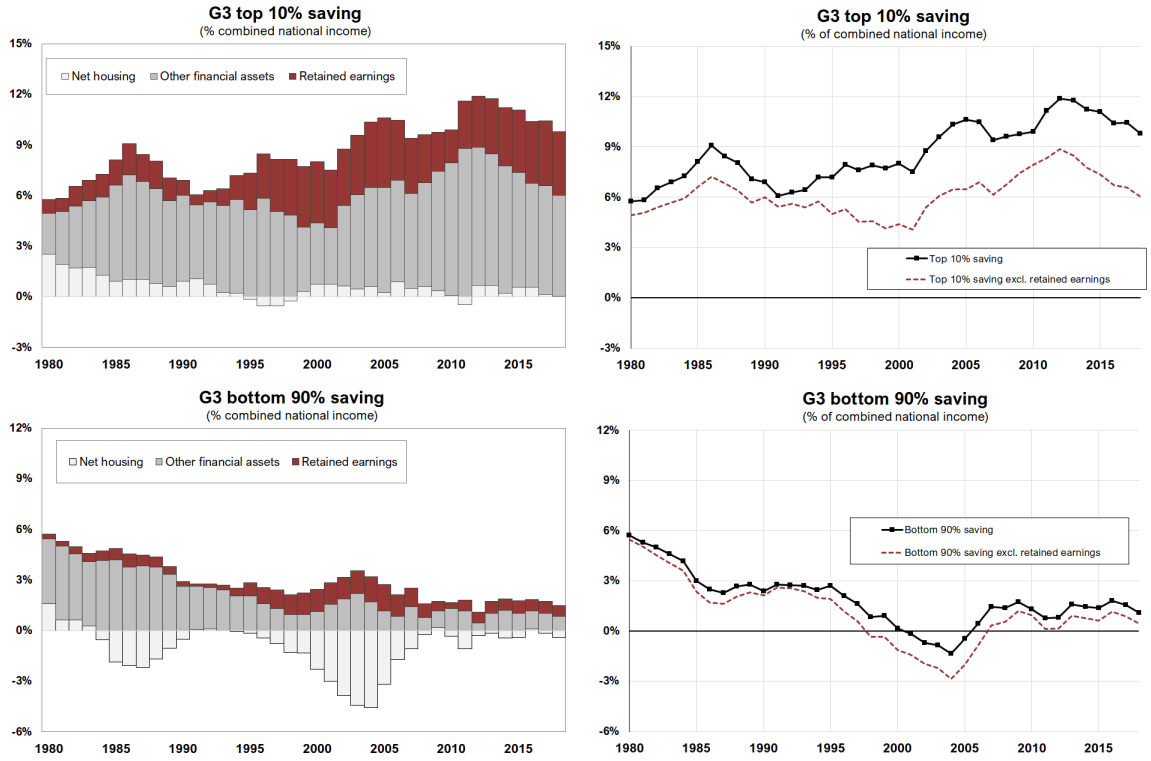
Figure 11: **Asset-specific saving of the top-10% and the bottom-90%**



Notes: This figure shows the development of saving of the top-10% (left panel) and the bottom-90% (right panel) wealth group in the U.S., Europe and China, distinguishing three asset classes: net housing, retained earnings and other financial assets. Saving in "Other financial assets" refers to saving in fixed-income assets and in other equity and business (excluding retained earnings), net of non-mortgage debt. Saving is scaled by national income. All series are 5-year moving averages. The period is 1980-2018 in the U.S. and Europe, and 1995-2018 in China. Europe is the weighted average (by national income) of France, Germany, Spain and the UK.

The corporate savings glut of the rich. Our analysis links the rise in rich household saving – the "saving glut of the rich" (Mian et al., 2021b) – to a different secular macro development, namely the so-called "corporate saving glut" (Chen et al. 2017b; Gruber and Kamin 2016). The rise of corporate saving is itself linked to the secular increase of corporate profits and the capital income

Figure 12: **G3 top-10% and bottom-90% saving by asset-type**



Notes: This figure shows the development of the G3 top-10% (upper panel) and the bottom-90% (lower panel) saving by specific asset categories: retained corporate earnings, net housing (housing net of mortgage debt) and other financial assets (fixed-income assets net of non-mortgage debt plus other equity and business). G3 top-10% (bottom-90%) saving is the combination of top-10% (bottom-90%) saving in the U.S., China and Europe. Cross-country combinations use market exchange rates to convert local currencies into US dollars. Saving is scaled by G3 national income. Series are 5-year averages.

share (Piketty and Zucman 2014; Karabarbounis and Neiman 2014; Flores 2021). As Chen et al. (2017a) put it: "The rise of corporate saving ... emerged as the decline in the labour share pushed up corporate profits and dividend growth did not keep pace."

While the sizeable role of corporate saving for the dynamics of saving inequality since the 1980s is an important insight, identifying the causes of rising corporate profits and retained earnings is another issue and beyond the scope of this paper. The academic debate on the growing corporate profits, earnings retention and lackluster dividend growth is lively. Several factors count as potential causes for the increase in corporate profits: automation (Moll et al. 2021), rising market power (De Loecker et al. 2020; Barkai 2020), the decline in worker power (Stansbury and Summers 2020), and the decline in the cost of capital (Chen et al. 2017b). Dividend stickiness

(Lintner 1956; Brav et al. 2005; Fama and French 2001), cash hoarding (Bates et al. 2009) and tax incentives (Stiglitz 1973; Auerbach 1988; Saez and Zucman 2019; Saez et al. 2021) have also been put forward as an explanation why dividends did not increase as much as profits, leading to the observed surge in corporate retained earnings.

Whatever the underlying drivers of the secular increase in corporate saving, it is important to point out that the corporate finance literature finds that households save more out of undistributed profits (i.e., corporate retained earnings) than out of other income sources, at least in the U.S. and Sweden (Di Maggio et al. 2020; Baker et al. 2007). This would imply that rising corporate saving would have led to a mechanical increase in global saving rates were this behavior systematically present across countries and over time.

6 Conclusion

This paper has introduced a new international database on households' asset portfolios, capital gains and saving flows at the macro and distributional levels for the largest world economies since 1980: the U.S., Europe (France, Germany, Spain and the U.K.), and China. The data set provides cross-country series for "unveiled" indirect asset ownership through pension and investment funds. We use the data set to expose the distributional anatomy of the global saving and wealth boom in the past four decades. We expose important shifts in the global saving and wealth distribution, and heterogeneous drivers of the global wealth boom.

First, we find that about half of the increase in aggregate wealth-income ratios during the last decades was due to capital gains, with new saving explaining the remaining half. Second, we show that saving flows have increasingly turned into an unequalizing force for the wealth distribution, while capital gains equalized the wealth distribution. Importantly, housing capital gains obtained by the middle classes have been the main channel through which the middle-class wealth kept up with the top, and were the most critical factor moderating wealth inequality in recent decades. Saving played the central role for wealth accumulation of the top-10% of households, in

particular saving in financial assets and rising corporate savings. Third, we present evidence that the gap between the "haves" and "have-nots" in the global wealth distribution widened as wealth-to-income ratios stagnated or fell for the bottom 50% but surged in the upper half. Typically used inequality measures like top wealth shares or the Gini coefficient tend to overlook this dimension, as they mainly capture the dynamics within the "haves" (e.g., the top-10% and the middle class).

Fourth, we expose an increase in saving inequality in major world economies since the 1980s, manifested in rising saving at the top and falling saving in the rest of the distribution. We find that the saving glut of the rich has been a global phenomenon, closely linked to the increase in global corporate saving: the "global saving glut of the rich" is the flip side of "the global corporate saving glut." The increase in retained corporate earnings accrues to equity owning households at the top of the distribution: "a global corporate saving glut of the rich" that underscores that the rise of profit shares and corporate earnings had major repercussions on global saving supply and its distribution.

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A Distributional saving

A.1 Heterogeneous housing capital gains

The synthetic saving method assumes that different wealth groups experience the same capital gain in an individual asset class (e.g., housing, equity, etc.). If this was not the case, our estimates of the group-specific saving and capital gains—estimated based on uniform capital gains for all wealth groups—would be biased. For illustration, if the top-10% experienced above-average capital gains (the bottom-90% below-average capital gains) in a given asset, this would imply that we mechanically overestimate saving of the top-10% (underestimate saving of the bottom-90%) in this asset. The issue of potentially heterogeneous capital gains is particularly relevant for housing, as the "popular" wealth more broadly shared within the population (at least more equally shared between the middle-40% and the top-10%; see Figure x below). Given the importance of housing in the portfolio across the distribution, there might be considerable scope for error in the synthetic saving method if different wealth groups experience (significantly) different housing capital gains. Equity, on the other hand, is strongly concentrated within the top-10%, and thus the issue of heterogeneous equity capital gains is less worrisome to estimate group-specific saving using the synthetic saving method (that is, once we focus on the accumulation patterns of broader groups, such as the top-10%).[23] Accordingly, in the following exercise we investigate the evolution of housing capital gains across the distribution.

We use household surveys for this purpose. In our sample of countries, there are several household surveys that contain the necessary information to chart the house price evolution of different households across the distribution. Specifically, we have used surveys that contain information on: i) the current market prices of the house, and ii) its accompanying area. By following the evolution of the house market value to its area over time, we can isolate the pure 'price effect' (that is, this way we can control for the new investment in housing). As said, we look at the price

[23] Furthermore, in countries in which the equity ownership of the bottom-90% is non-negligible (such as in the U.S. or the U.K.), this occurs predominantly through 'indirect' ownership through pension and investment funds. And there is no evidence (nor a compelling reason) that equity in the portfolio of pension and investment funds should experience lower capital gains than 'directly' held equity.

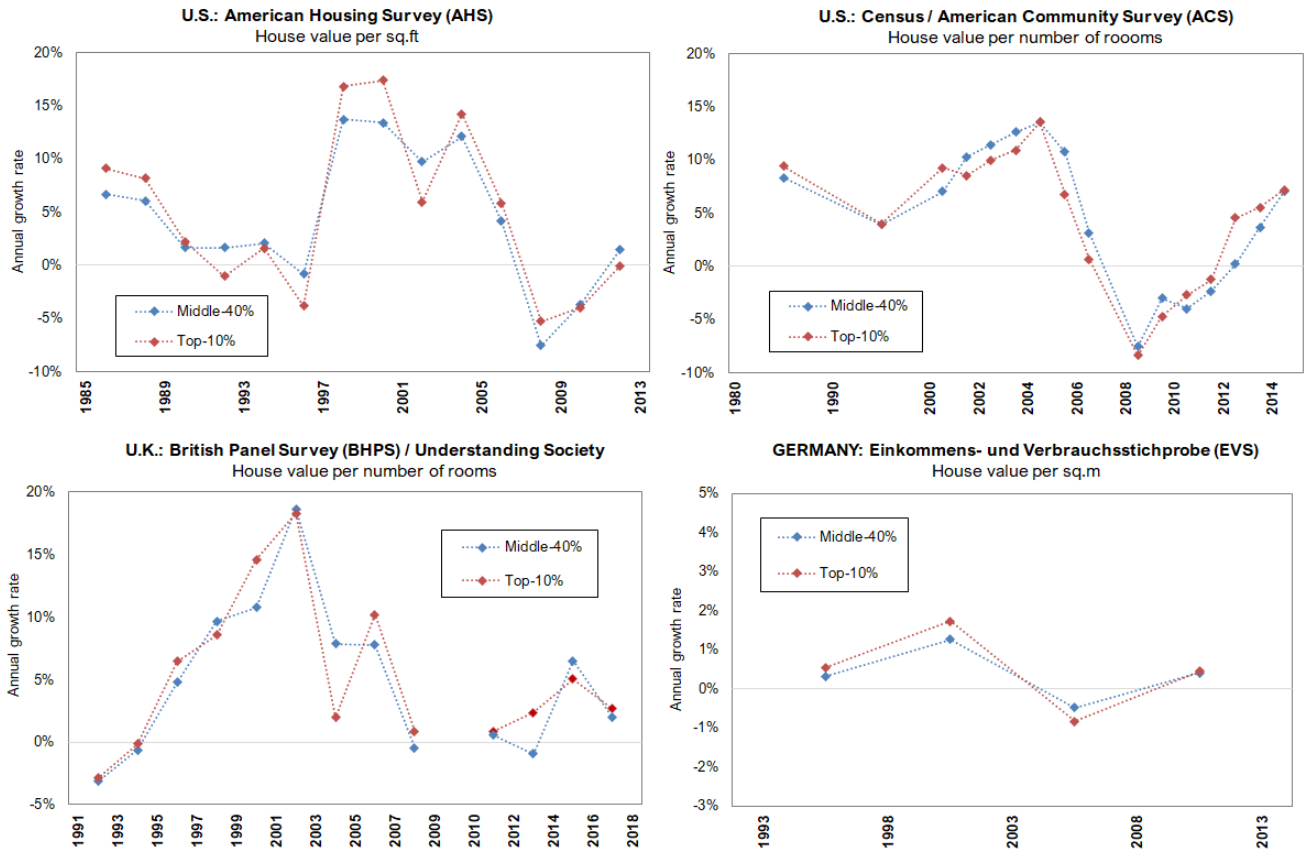
evolution of the top-10% and the middle-40%, which own the bulk of the housing stock in all countries under consideration.

First, we analyze the average house growth rates (the house market value per square meter/foot, or per number of rooms) for different groups of the income distribution. The rationale for ranking households according to their income is pragmatic, because the datasets with information on income (rather than on wealth) are more widely available. However, there is a strong correlation between the income and wealth distribution (e.g. Saez and Zucman 2016; Piketty, Saez and Zucman 2018; Kuhn et al. 2021 for the U.S.), which makes the results of this exercise suggestive of the price development for the counterpart groups of the wealth distribution. (We show below results for different groups of the wealth distribution, which corroborates this claim.)

We first present evidence for the U.S. Figure A13 (the upper panel) shows the results from the American Housing Survey (AHS) (left) and from the American Community survey (ACS) (right). It should be stated that AHS allows more precise assessment of the house price evolution since it provides the information on the dwelling area (in square feet). ACS, on the other hand, does not provide exact information on the dwelling area and we proxied it instead using the available information on the number of rooms. However, and most importantly, both surveys suggest that there are no systematic heterogeneities in the house price evolution between the middle-40% and the top-10%. What is further reassuring is that both charts show very similar average price evolution. The lower panel of Figure A13 shows the results of the equivalent analysis for the UK and Germany. It can be clearly seen that there are no systematic heterogeneities in the house price evolution between the middle-40% and the top-10% in Europe as well.

Figure A14 shows the house price growth rates for the two groups of the wealth distribution. This evidence is available from the Panel Study of Income Dynamics (PSID) for the U.S., Wealth survey (Enquetes patrimoine) for France, and both from CHIP and CFPS for China. PSID contains information on net wealth since the 1980s, and in contrast to more widely used the Survey of Consumer Finance (SCF) for the analysis of the wealth distribution, contains (at least) the information on the number of rooms.

Figure A13: **Housing growth rates across the income distribution**

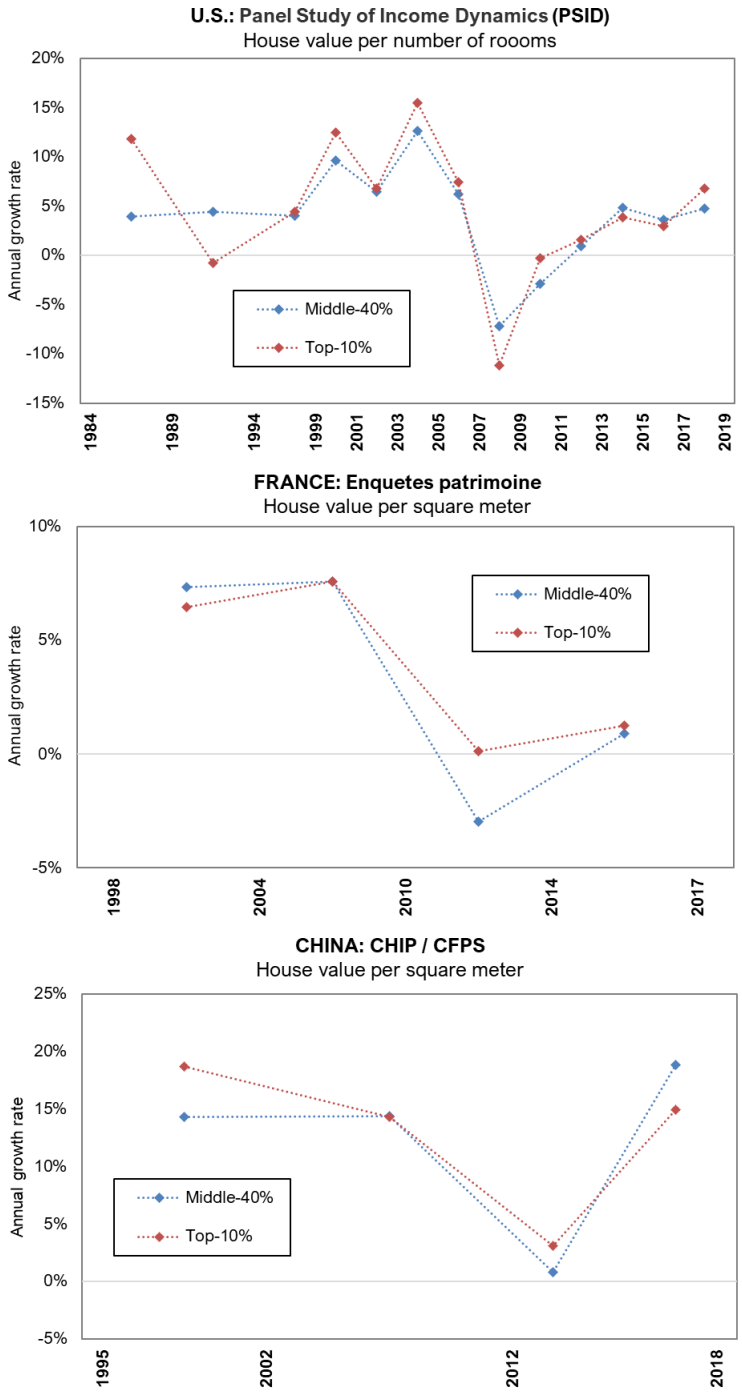


Notes: nominal growth rates refer to the owner-occupied dwellings, for which both information on the current market house value and the area (or number of rooms) is available

One final piece of evidence shows that the above-obtained results are not caused by mobility (which we generally found to be modest, see Table C1 for the U.S. and China). Specifically, we want to address a concern that the analysis based on a snapshot of cross-section of households at different time periods might bias the results if mobility somehow 'filters out' an underlying different house price development.

We investigate this issue by looking at the house price development for the same households between two consecutive waves using the panel dimension of PSID for the U.S. Figure A15 shows the house price evolution for the same households between two consecutive waves (that is, we look at the house price evolution of household i between waves t and $t+1$; wealth groups are defined based on their rank in the wave t). It shows, first, a remarkable price synchronization

Figure A14: **Housing growth rates across the wealth distribution**

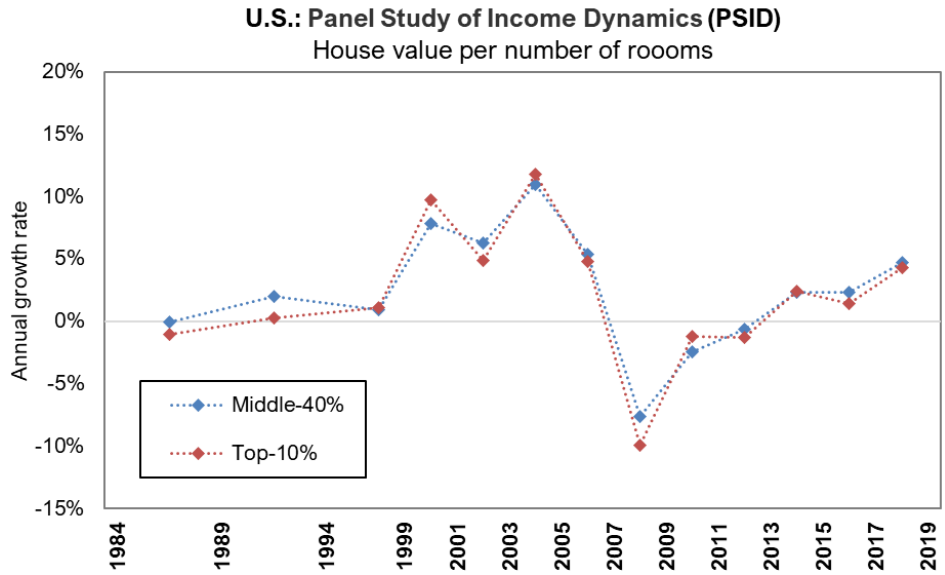


Notes:

experienced by households initially in different wealth groups, and, second, an almost identical price development as documented for cross-sections of households in Figure xx. We find this piece

of evidence particularly reassuring, because it directly confirms the validity of the assumption of homogeneous capital gains for the synthetic saving method.

Figure A15: **Housing growth rates in the U.S. (no mobility)**



Notes:

Finally, presented results alleviate concerns stemming from the often-advanced patterns of geographical sorting of the rich and the poor, for example, as conjectured based on a marked house price development within the U.S. (e.g. between New York or San Francisco, on the one hand, and Midwest areas, on the other), or within China between the so-called Tier-1 cities (Beijing, Shanghai, Guangzhou, and Shenzhen) and the 'lower-tier' cities (for example, in inland western provinces). One reason that this conjecture is not corroborated by the data is that there is apparently no perfect economic sorting in cities with relatively higher and lower house price evolution. For example, the top-10% in China do not exclusively live in Tier-1 cities and the bottom-90% do not exclusively live in Tier-3 cities, but there is a considerable 'cohabitation' of different income and wealth groups in both city types. It is indeed the case that an important proportion of the Chinese middle-class lives in the 'super-star' cities and has accordingly benefitted from the spectacular house price boom there.

A.2 The income less consumption method

The so-called income minus consumption approach is an alternative way to assess household saving patterns across the distribution. We have used it to assess the robustness of the paper's key result on the global households' saving patterns obtained by the synthetic saving approach. We have estimated distributional saving by following the approach of Mian et al. (2021b), which consists of three basic steps.

First, we take after-tax income shares, $IncSh_t^i$, from the Distributional National Accounts (DINA) available at WID.World. This is preferable to estimating income shares directly from the survey for two reasons. First, income is insufficiently captured in raw surveys, especially at the top (this issue is even more acute for the top of the wealth distribution). Second, some key income categories are not included in the income concept in raw surveys, notably retained corporate profits, which as we saw critically impacted global saving patterns. The income series in the World Inequality Database (WID) do not suffer from these issues. First, the WID series are constructed from the administrative tax data specifically suited to capture the top of the income distribution and thus alleviate the issue of poor coverage of high incomes in surveys. In addition, the WID series impute income categories that are missing in the surveys, notably undistributed corporate profits.[24]

Second, we estimate consumption shares, $ConSh_t^i$, across the income distribution from consumption surveys. For the U.S. we have used the Consumer Expenditure Survey (CEX) and the Panel Study of Income Dynamics (PSID); for the U.K. the Family Expenditure Survey (FEX) and its successor the Living Costs and Food Survey (LCFS); for France the Household Budget Survey (*Enquête Budget de famille*; BDF); for Germany the Survey of Income and Expenditure (*Einkommens- und Verbrauchsstichprobe*; EVS); for Italy the Survey on Household Income and Wealth (SHIW); and for China the Chinese Household Income Project (CHIP). These are widely

[24]Undistributed corporate profits in WID.world are generally imputed based on received dividends and/or realized capital gains reported in the personal income tax data (Piketty, Saez and Zucman, 2018; Blanchet et al. 2018). A preferable way to impute undistributed corporate profits would be to use the information on equity ownership of households (as done in this paper, see Section 2), but this type of information is missing in the personal income tax data and it is regularly missing in household income surveys.

used surveys to assess the living conditions of households, and the majority of mentioned surveys serve as the official data source for key national statistics measures such as the consumer price index or (expenditure-based) GDP statistics, household spending patterns, etc.

Note that we estimate consumption shares from surveys for all available years.[25] In this, we slightly diverge from Mian et al. (2021b) who use the raw survey to measure the consumption share of the top-1% income group in the U.S. in one baseline year (concretely in 2004), which is in turn used to extrapolate consumption shares in other years by assuming the constant consumption-to-income ratio over time. As they point out, this is a conservative assumption made because of a concern about potential undercoverage of consumption of high-income households in the survey. Given that we generally find relatively flat consumption shares across the income distribution (i.e., falling consumption-to-income ratios amid rising top income shares, as suggested by the WID series), our resulting saving series for different income groups suggest higher growth of saving dispersion (the larger savings glut of the rich) than Mian et al. (2021b). We believe that the assumption of the constant consumption-to-income ratio amid growing top incomes is not realistic (e.g., Dynan et al. 2004, Straub 2019) and we prefer to use instead the raw consumption shares from the survey.[26]

In a final step, we apply obtained income and consumption shares to the national accounts totals for disposable income ($IncSh_t^i$) and consumption ($Cons_{NA,t}$)[27] to estimate household saving across the income distribution:

$$S_{h,t}^i = \frac{IncSh_t^i \times Inc_{NA,t} - ConSh_t^i \times Cons_{NA,t}}{NatInc_{NA,t}}$$

[25] Surveys that we use are conducted annually (e.g., CEX or LCFS) or every few years (e.g., quinquennially in the case of BDF or EVS). In the latter cases, we linearly interpolate consumption shares, which are generally found to be quite stable over time.

[26] We are aware that this might involve a certain upward bias in saving dispersion in our series if there is a more considerable underestimation of consumption at the top in surveys (or, more precisely, if the consumption shares of top income groups have increased more than suggested by surveys). This is also probably part of the reason why an increase in the saving dispersion according to the income less consumption approach is somewhat higher than according to the synthetic saving method.

[27] The respective totals in the national accounts refer to the categories of disposable income (B.6) and consumption expenditure (P.3) in the household sector. One could alternatively use the categories of adjusted disposable income (B.7) and actual consumption (P.4), since both are equal to household disposable income and consumption expenditure adjusted for social transfers in kind (received by households from the government).

Figure A16 shows the resulting estimates for the three regions based on income less consumption approach. These results corroborate the rising dispersion of saving worldwide obtained with the synthetic savings method.

B Dynamics of wealth inequality: decomposition

B.1 Accumulation equations and the role of corporate saving

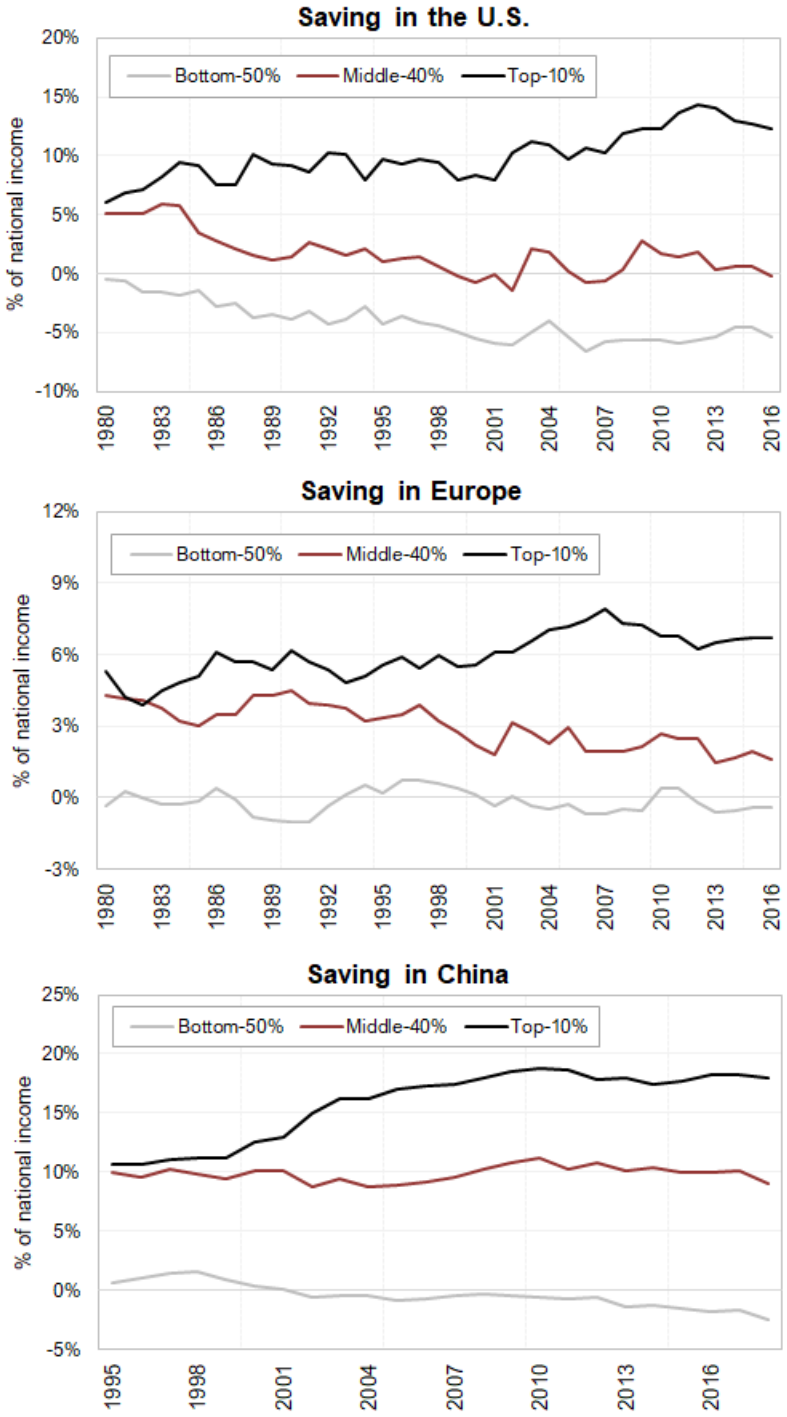
As explained in section 2, we use asset-specific accumulation equations to decompose the real growth of different asset classes into two components: a volume effect (due to saving flows) and a valuation effect (due to capital gains). In what follows, we briefly summarize this methodology and, after that, zoom in on the treatment of corporate retained earnings (i.e., corporate saving or undistributed profits) in this framework.

The general methodology follows a two-step approach. In a first step, we analyze individual asset classes (housing, equity, etc.) at the aggregate household level. Since we observe asset-specific saving flows together with the stock of individual assets, we back out asset-specific capital gains as a residual. In a second step, we analyze household groups, ranged by wealth (e.g., the wealthiest top-10%, the next-40%, etc.). Since we observe the value in specific assets of these groups (reported in our distributional series) and asset-specific capital gains obtained in the first step, we infer saving flows in individual assets at the group level as a residual (i.e., the "synthetic saving method"; Saez and Zucman 2016).

Recall that both at the aggregate and distributional levels, our series "unveil" the indirect assets held and the saving flows channeled through investment and pension funds (section 2.3). We identify two main categories of indirectly held assets: equity and fixed-income assets. As a result, we simplify the portfolio of households across six types of assets or debt: housing, business assets, fixed-income assets (directly and indirectly held), equity (directly and indirectly held), housing debt, and non-housing debt.

When looking within the household sector, each of the previous assets or debt types has a

Figure A16: **Saving based on income minus consumption method**



Notes:

corresponding flow: (i) housing and residential investment, (ii) business assets and non-residential investment; (iii) fixed-income assets (directly and indirectly held) and saving in fixed-income as-

sets (indirect and indirect investment flows); (iv) housing debt and net housing debt acquisitions; (v) non-housing debt and net non-housing debt acquisitions. For equity, there is a particularity. Namely, a given stock of equity (directly and indirectly held) corresponds with a saving flow in three (instead of two) categories: direct equity saving, indirect equity saving through investment and pension funds, and corporate retained earnings. Corporate saving is made by corporations on behalf of equity owners and generates an increase in equity values proportional to the corporate saving flow. Since households (and governments) are the ultimate owners of corporations, the increase in equity values due to corporate saving should be treated as a saving flow and not a capital gain.

The application of the two-step approach with equity works as follows. At the aggregate level (step 1), define E_t as the stock of equity (including both directly held and indirectly held through investment and pension funds) owned by households in year t. For ease of exposition, assume a closed economy (note that, in the paper, we incorporate the government and the foreign sector, as explained in section 2). In the same manner as with other assets or debt types, we decompose equity growth using Equation 1:

$$E_{t+1} = (1 + q^{net}_{t+1,E})E_t + S_{t+1,E} \tag{5}$$

Differently from other asset types, saving flows in equity ($S_{t+1,E}$) are the sum of two components: (i) saving flows made by households, both directly and indirectly through pension and investment funds, ($S^{hh}_{t+1,E}$), and (ii) saving flows made by corporations, ($S^{corp}_{t+1,E}$). From this equation we obtain capital gains as a residual. Let's refer to this capital gain as a capital gain "net of corporate saving" ($q^{net}_{t+1,E}$). As a result, Equation 5 can be rewritten as:

$$E_{t+1} = (1 + q^{net}_{t+1,E})E_t + S^{hh}_{t+1,E} + S^{corp}_{t+1,E} \tag{6}$$

Next, we explain how the previous equations would be estimated if we disregarded corporate saving. Namely, we only include saving by households in Equation 1 and obtain a residual capital

gains. In that case, we would obtain the following law of motion:

$$E_{t+1} = (1 + q^{gross}_{t+1,E})E_t + S^{hh}_{t+1,E} \tag{7}$$

where capital gains are "gross of corporate saving" ($q^{gross}_{t+1,E}$). From equations 6 and 7 it follows that capital gains "gross of corporate saving" are the sum of "net capital gains" ($q^{net}_{t+1,E}$) and the increase in equity values due to corporate saving ($\frac{S^{corp}_{t+1,E}}{E_t}$):

$$q^{gross}_{t+1,E} = q^{net}_{t+1,E} + \frac{S^{corp}_{t+1,E}}{E_t}$$

In the second step, we look at the distribution. Using the synthetic saving approach, we follow the equity values of wealth group i over time. We apply the same law of motion in the case of equity as with other assets and debt types (equation 3). Since our goal is to obtain a measure of equity saving that includes both household and corporate saving, we use capital gains "net of corporate saving" from equation 6 (q^{net}_{t+1}):

$$E^i_{t+1} = (1 + q^{net}_{t+1})E^i_t + S^i_{t+1,E} \tag{8}$$

where $S^i_{t+1,E}$ is obtained as residual and is the sum of two components: (i) saving flows made by group i, both directly and indirectly through pension and investment funds, ($S^{hh,i}_{t+1,E}$), and (ii) saving flows made by corporations on behalf of group i, ($S^{corp,i}_{t+1,E}$).

Note that the previous equation involves one key assumption. Namely, we assume that capital gains "net of corporate saving" apply equally to different households groups i. For this to be true, however, corporate saving should be distributed proportionally to equity holdings: $S^{corp,i}_{t+1,E} = \frac{E^i_t}{E_t} \cdot S^{corp}_{t+1,E}$ This appears as a reasonable assumption given the analysis in Chen et al. (2017b) (and has also been used by the literature on synthetic saving before; e.g., Saez and Zucman 2016; Mian et al. 2021b). In their study, Chen et al. (2017b) carry a comprehensive analysis of corporate saving across both rich and developing countries over the last decades, using firm-level microdata (Compustat Global and Compustat North America). Importantly, Chen et al. (2017b) "do not find

evidence that trends in firm saving relate significantly to firm size and age. Increases in corporate saving within industry, age, and size groups, rather than shifts... between these groups, account for the majority of the global rise of corporate saving". This result supports the assumption that corporate saving accrues to equity owners in proportion to their equity holdings.

We can accordingly write the previous equation splitting equity saving across the previous two components:

$$E^i_{t+1} = (1 + q^{net}_{t+1})E^i_t + S^{hh,i}_{t+1,E} + S^{corp,i}_{t+1,E} \tag{9}$$

Given the assumption that corporate saving is proportional to equity holdings, splitting equity saving of group i ($S^i_{t+1,E}$) across the two saving types (i.e., household equity saving and corporate saving) is straightforward. It simply involves using the proportions of each saving flow at the aggregate level. Group's i household equity saving ($S^{hh,i}_{t+1,E}$) and corporate saving ($S^{corp,i}_{t+1,E}$) are defined, respectively, as:

$$S^{hh,i}_{t+1,E} = S^i_{t+1,E} \cdot \frac{S^{hh}_{t+1,E}}{S_{t+1,E}}$$

$$S^{corp,i}_{t+1,E} = S^i_{t+1,E} \cdot \frac{S^{corp}_{t+1,E}}{S_{t+1,E}} \tag{10}$$

An equivalent approach to obtaining each component of Equation 9 is to add corporate saving separately, without relying on the synthetic saving method. In a first step, total equity saving of group i ($S^i_{t+1,E}$) is obtained from equation 8. In a second step, corporate saving ($S^{corp}_{t+1,E}$) is allocated to each household group i in proportion to their equity holdings ($\frac{E^i_t}{E_t}$):

$$S^{corp,i}_{t+1,E} = \frac{E^i_t}{E_t} \cdot S^{corp}_{t+1,E} \tag{11}$$

Finally, household equity saving of group i ($S^{hh,i}_{t+1,E}$) are obtained as a residual of all other components in equation 9.

The two approaches are equivalent as long as corporate saving allocated to each household group i is the same in equations 10 and 11. This would be true if $\frac{E_t^i}{E_t} = \frac{S_{t+1,E}^{corp,i}}{S_{t+1,E}^{corp}}$, which is precisely the assumption we use to distribute corporate saving proportionally to equity holdings: $S_{t+1,E}^{corp,i} = \frac{E_t^i}{E_t} \cdot S_{t+1,E}^{corp}$.

B.2 Simulations

This appendix section explains the simulation exercise conducted in section 4 (figure 7) to account for changes in wealth shares driven by saving. These simulations follow previous work using a similar framework, in particular, Saez and Zucman (2016) and Garbinti et al. (2020).

We conduct a simulation exercise in which we first simulate the wealth shares if wealth accumulation was driven by saving flows only. For simplicity, we assume that capital gains in all assets were zero, which is equivalent to assuming all wealth groups experienced the average capital gain of the economy. As a result, capital gains are neutral for the wealth distribution. More precisely, we start from the initial wealth holdings of each group, cumulate their saving (in fixed-income assets, housing, and equity and business assets; all components are net of debt), and estimate the wealth distribution. Subsequently, allowing for differential price effects along the wealth distribution will 'return' the simulated distribution based on saving alone to the empirical wealth distribution.[28]

This procedure may be explicitly outlined using the wealth group-specific law of motion (Equation 4) together with the law of motion for aggregate household wealth (Equation 2, Section 4). In particular, using Equations 2 and 4, we characterize the law of motion of the share of wealth owned by a group i in total household wealth. We define $sh_{W,t}^i$ as the share of wealth owned by group i in year t. Taking the ratio between Equations 4 and 2, we obtain:

$$sh_{W,t+1}^i = \frac{(1 + q_{t+1}^i)W_t^i + S_{t+1}^i}{(1 + q_{t+1})W_t + S_{t+1}} \tag{12}$$

[28] We stress that this a purely 'arithmetical' exercise, which assumes no behavioral responses (or more generally, it involves no equilibrium analysis).

Defining the differential saving rate $sh^i_{S,t+1}$ as the ratio of group i's saving over total household saving in year $t+1$: $\frac{S^i_{t+1}}{S_{t+1}}$, equation 12 can be expressed as:

$$sh^i_{W,t+1} = \frac{1+q^i_{t+1}}{1+q_{t+1}} \frac{sh^i_{W,t} + sh^i_{S,t+1}\frac{S_{t+1}}{W_t}}{1+\frac{S_{t+1}}{W_t}} \tag{13}$$

This equation shows the dynamics of the wealth share of group i as a function of the relative capital gain $\frac{1+q^i_{t+1}}{1+q_{t+1}}$, the initial wealth share $sh^i_{W,t}$, the differential saving $sh^i_{S,t+1}$, and the aggregate wealth formation ratio $\frac{S_{t+1}}{W_t}$ (see Saez and Zucman (2016), Equation 3).

Correspondingly, the simulation of the dynamics of wealth shares based on saving is captured by the second term on the right-hand side. Note that the saving component comprises two effects: the saving differential $\frac{S^i_{t+1}}{S_{t+1}}$ and the aggregate saving-induced wealth formation $\frac{S_{t+1}}{W_t}$. Intuitively, this implies that the effect of relative saving rate is mediated by the aggregate importance of the new saving (relative to the initial wealth). The other term is the relative price effect $\frac{1+q^i_{t+1}}{1+q_{t+1}}$, which is estimated on the real wealth holdings (thus both on the initial and new wealth). This term conveys that the relative price effect can modify the wealth distribution in the presence of differential price effects. As we look below, differential price effects along the wealth distribution stem from differences in the portfolio composition.

It follows that the condition for saving to be an unequalizing force is that the distribution of saving is more unequal than the initial wealth distribution. To see this, start from equation 12. After applying some straightforward transformation we obtain that the conditions for wealth shares to increase when there are no differential capital gains ($q^i_{t+1} = q_{t+1}$) is that the proportion of new saving going to group i exceeds the initial wealth share of the group i:

$$\ln\left(\frac{W^i_{t+1}}{W_{t+1}}\right) - \ln\left(\frac{W^i_t}{W_t}\right) > 0 \Leftrightarrow \frac{S^i_{t+1}}{W^i_t} - \frac{S_{t+1}}{W_t} > 0 \Leftrightarrow \frac{S^i_{t+1}}{S_{t+1}} > \frac{W^i_t}{W_t} \tag{14}$$

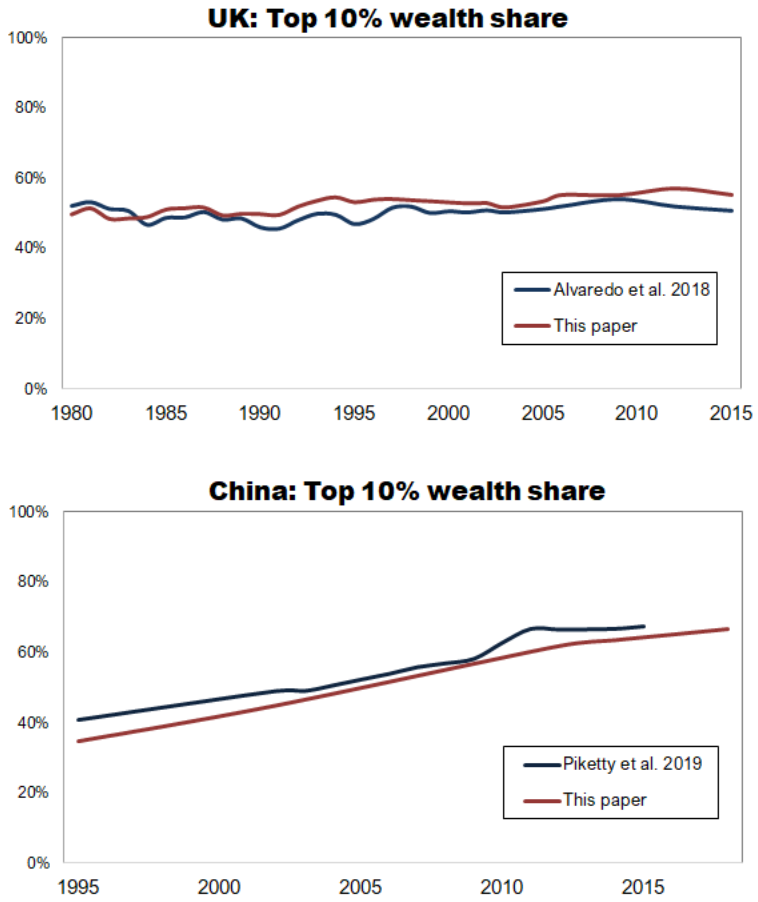
Likewise for capital gains, only that the condition refers to capital gains on the initial wealth.

As explained by Saez and Zucman (2016), in steady state, wealth shares are stable, $sh^i_{W,t} = sh^i_{W,t+1}$. Assuming no relative capital gain effects (which, as pointed out by Garbinti et al. (2020),

must ensue at one point) Equation 13 becomes $sh^i_W = \frac{S^i}{S}$, coveying that the inequality of wealth converges with the inequality of saving.

C Appendix figures and tables

Figure C1: **Comparison of the top 10% wealth share**



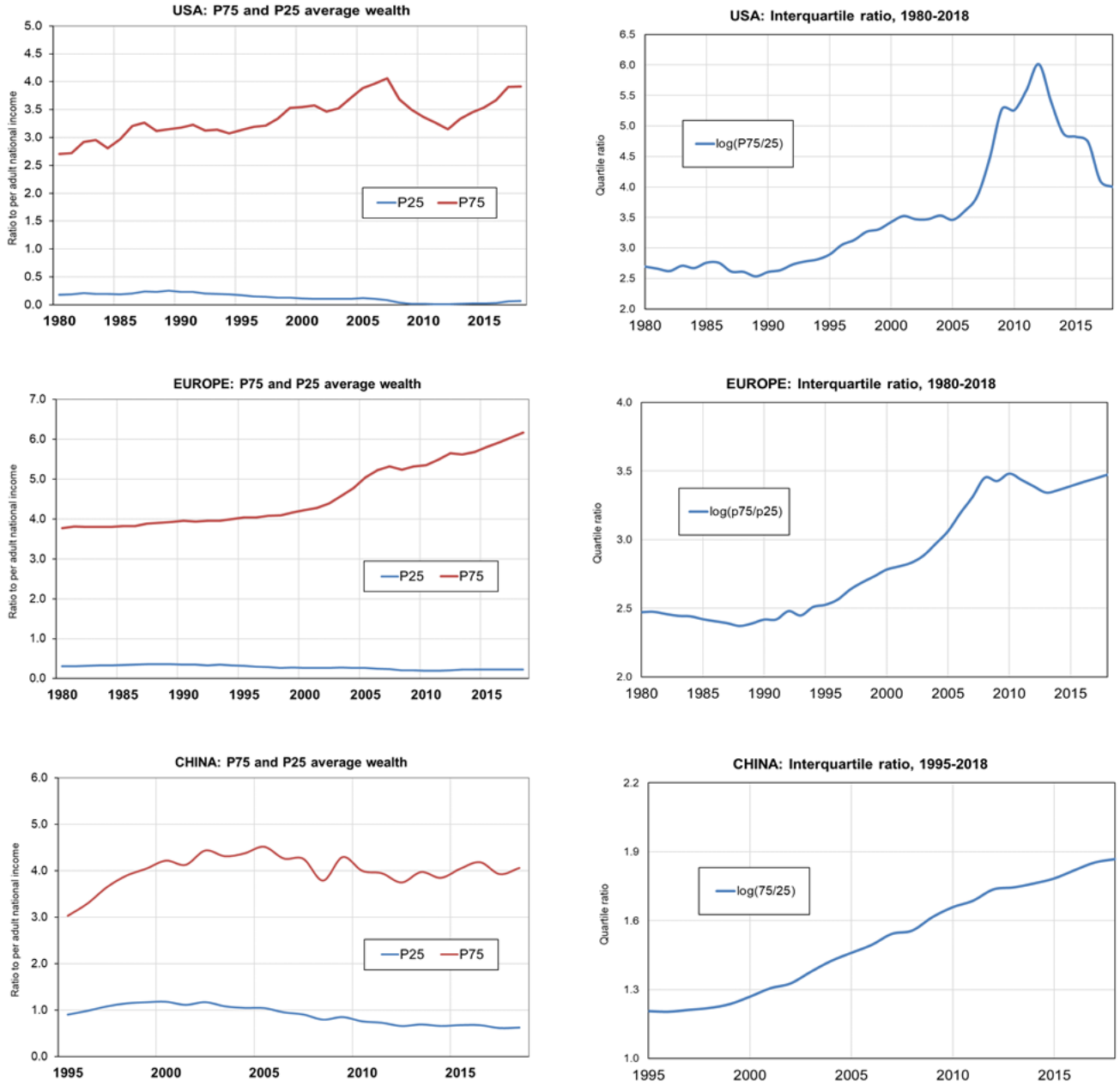
Notes: This figure compares the development of the top 10% wealth share constructed in this paper with the alternative estimates: for the UK with Alvaredo et al. 2018a (top panel) and for China with Piketty et al. 2019 (bottom panel)

Table C1: **Mobility in the U.S. and China**

	Bottom 50%	Middle 40%	Top 10%
U.S. (1998-2010)	0.838	0.797	0.727
China (2012-2018)	0.755	0.638	0.617

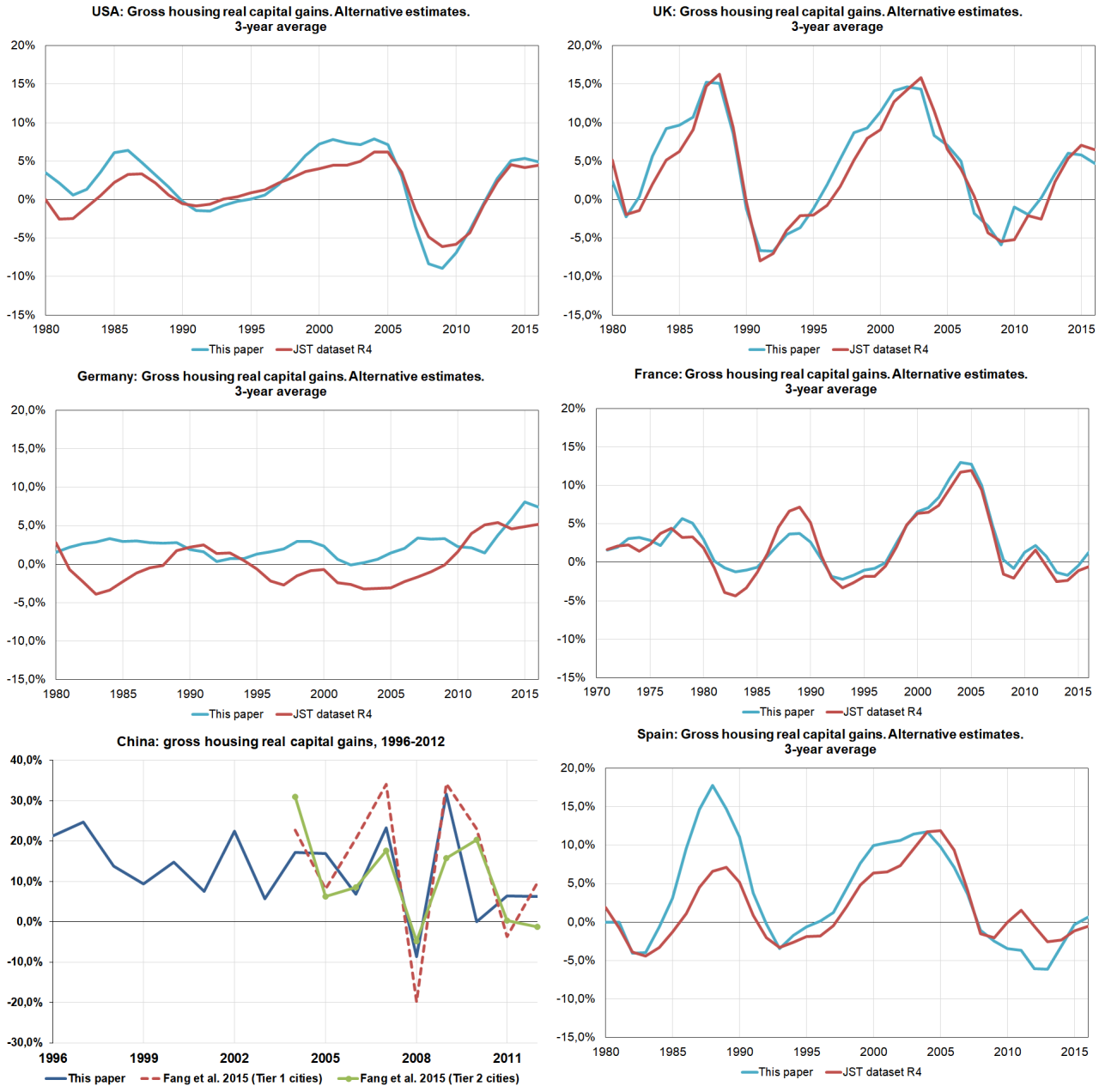
Note: This table shows the average 2-year intra-group persistence for three wealth groups (expressed as a share of households who remain in the wealth group between two survey dates). Estimates for the U.S. from Kuhn et al. 2020 (Tab. C.2) based on the Panel Study of Income Dynamics (PSID); China: own estimate from the China Family Panel Studies (CFPS).

Figure C2: **P25 and P75 wealth in the U.S., Europe and China**



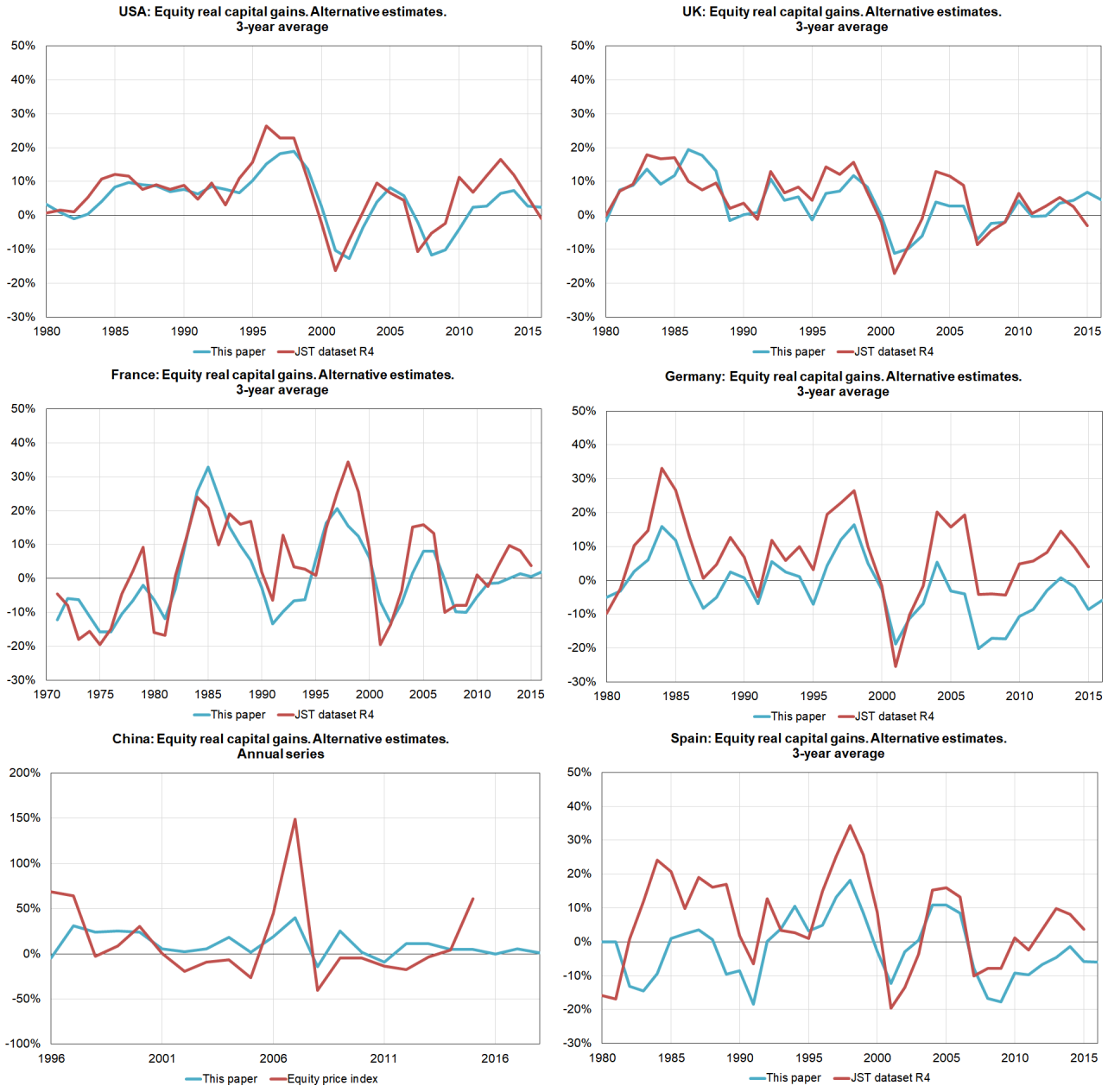
Note: The left panel shows the wealth of the 25th and 75th percentiles relative to per-adult national income in the U.S. (1980-2018), Europe (1980-2018), and China (1995-2018). The right panel shows the log of the ratio of the 75th and the 25th percentiles' wealth in the U.S. (1980-2018), Europe (1980-2018), and China (1995-2018). Results for Europe are the unweighted average of France and Germany (for Spain and the U.K., we do not have detailed information on the wealth of different percentiles within the bottom-50% wealth group).

Figure C3: **Housing real capital gains: Alternative estimates**



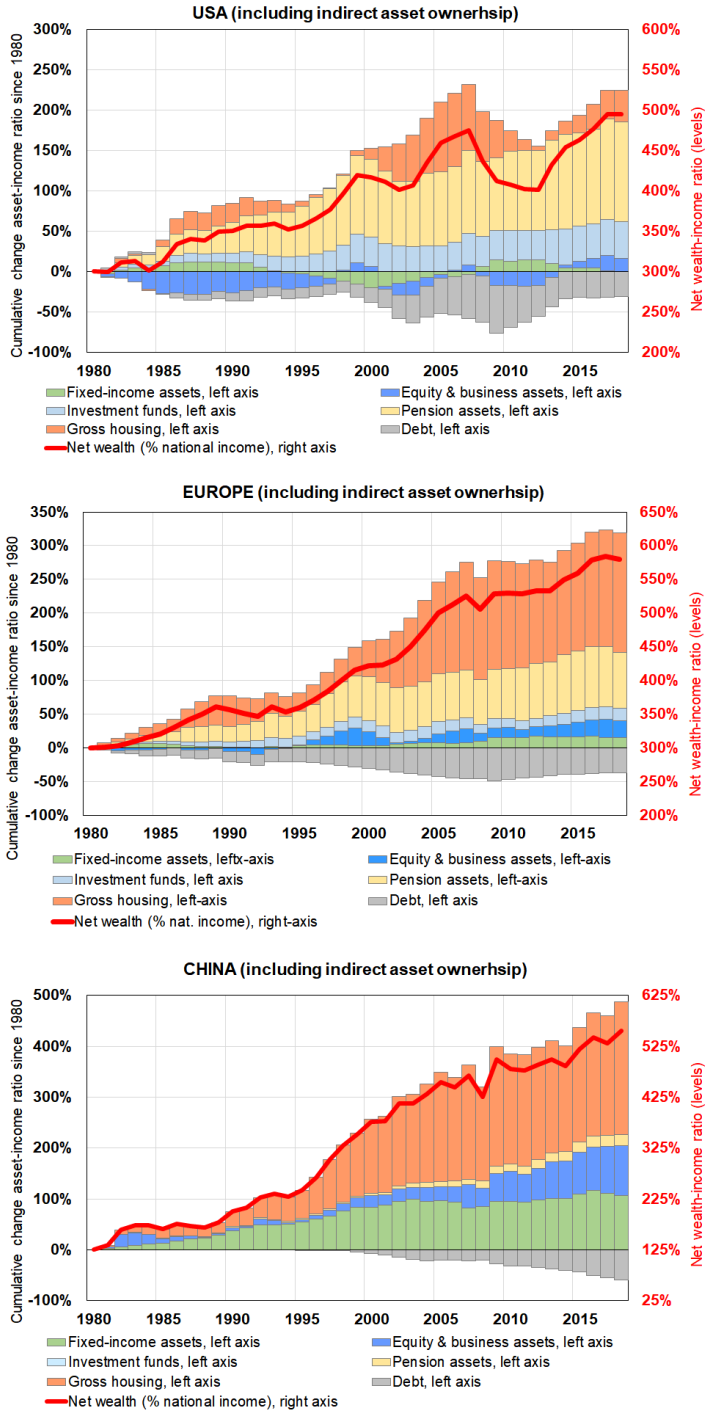
Notes: This figure compares the annual real capital gains in gross housing in this paper with those from the Jordà-Schularick-Taylor Macrohistory Database for the USA and European countries and from Fang et al. (2016) for China's Tier 1 and Tier 2 cities.

Figure C4: **Equity real capital gains: Alternative estimates**



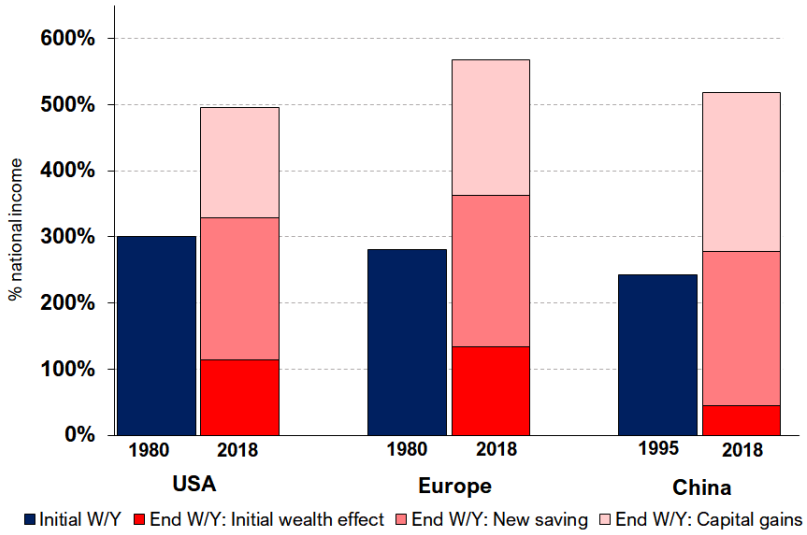
Notes: This figure compares the annual real capital gains in equity in this paper with those from the Jordà-Schularick-Taylor Macrohistory Database (JST Macrohistory Database) for the USA and European countries and from the Shanghai Stock Exchange (1998-2015) and Shenzhen Stock Exchange (1996-1997) for China. Note that equity capital gains from JST and China's stock exchanges refer to listed firms and include valuation changes due to corporate retained earnings. By contrast, equity capital gains in this paper are net of valuation changes driven by corporate saving and cover both listed and unlisted firms.

Figure C5: **Cumulative change in asset-income ratios since 1980 (left-axis) and household wealth-income ratio in levels (right axis).**



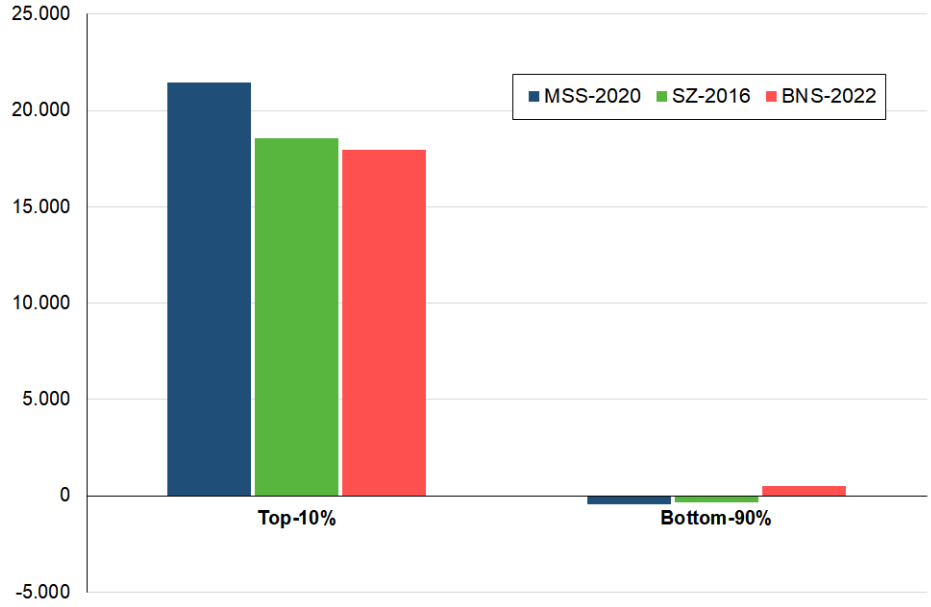
This figure displays the cumulative change in asset-to-national income ratios (left scale) and the household wealth-to-national income ratio in level (right scale) for the U.S., Europe and China. It shows the cumulative change in asset-income ratios before "unveiling" the indirect asset ownership. Europe is the weighted average (by national income) of France, Germany, Spain and the U.K.

Figure C6: **Accumulation of household wealth, 1980-2018.**



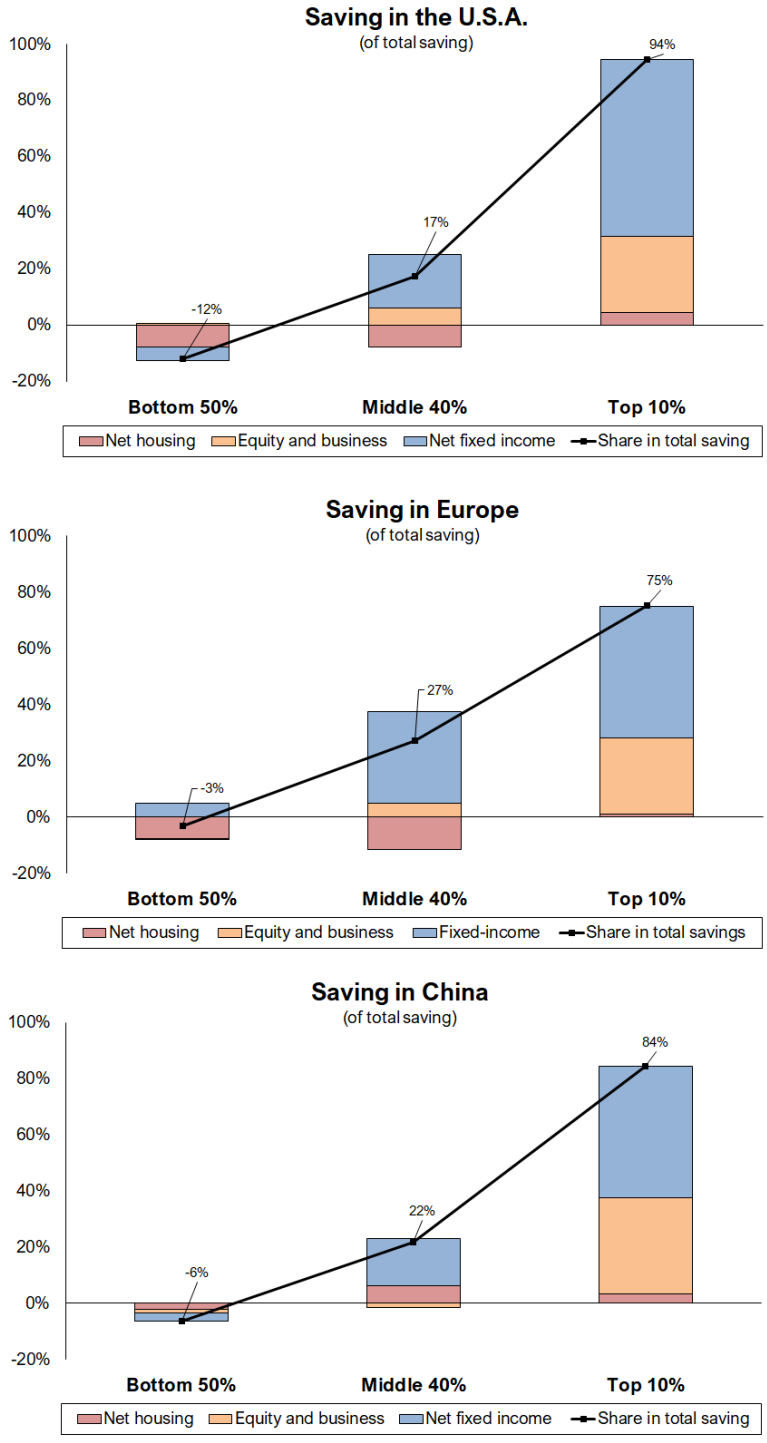
Notes: This figure shows household wealth-to-national income ratios at an initial and end period, for three world regions: the U.S., Europe and China. The initial and end periods are 1980 and 2018 for the U.S. and Europe, and 1995 and 2018 for China. The end-of-period wealth-income ratios are further decomposed into three sub-components: wealth from the initial year (absent capital gains in asset prices), new saving between the two periods, and capital gains (on both the initial wealth and the new saving). Europe is the weighted average (by national income) of France, Germany, Spain and the U.K.

Figure C7: **Cumulated household saving, in billions of U.S. dollars, 1980-2011**



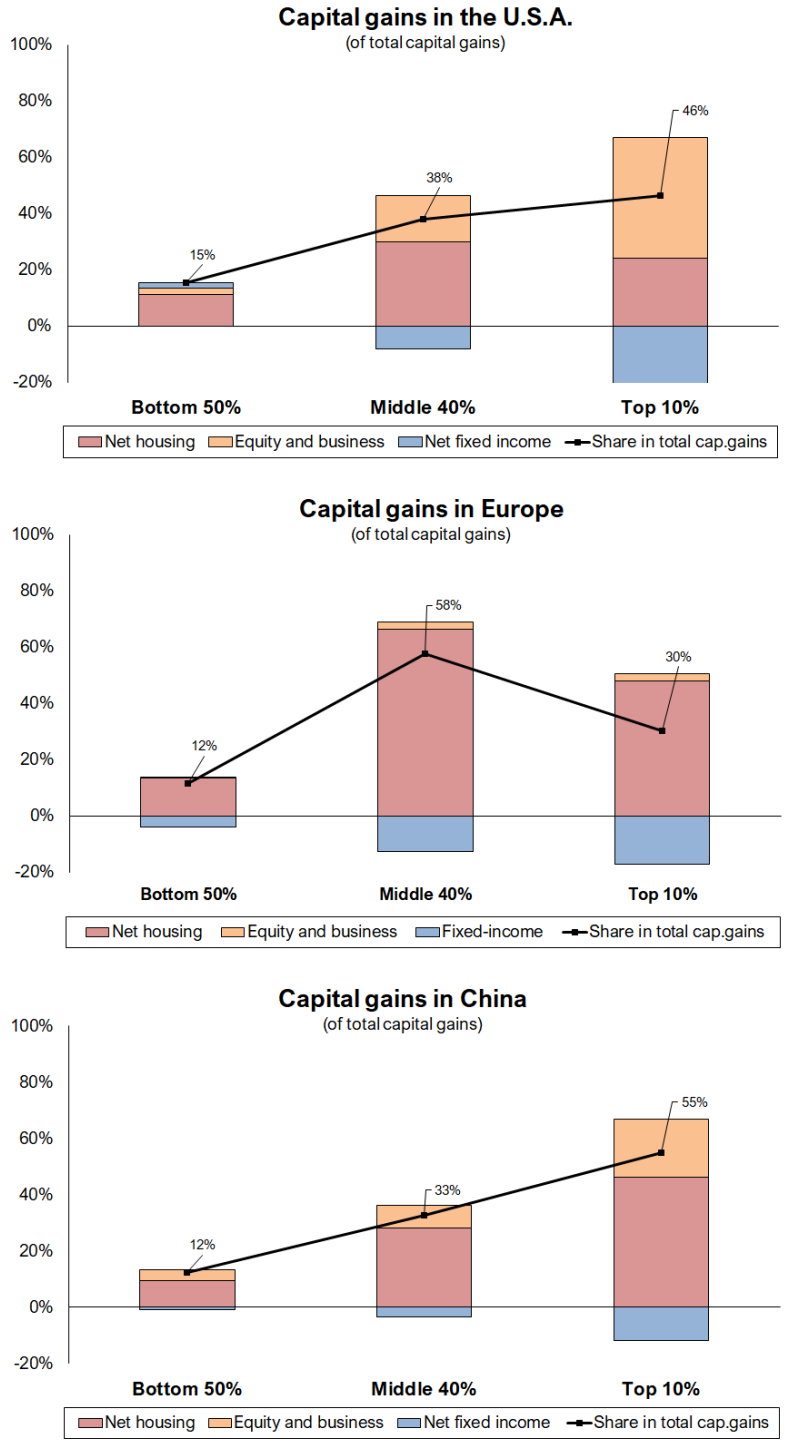
Notes: This figure shows the absolute volume of saving cumulated by the top-10% and bottom-90% wealth groups in the U.S. between 1980 and 2011 in three different studies: Mian et al. 2021b (MSS-2020), Saez and Zucman 2016 (SZ-2016), and this paper (BNS-2021). Numbers are expressed in billions of current U.S. dollars.

Figure C8: **Distribution of saving by asset types in the U.S., Europe and China**



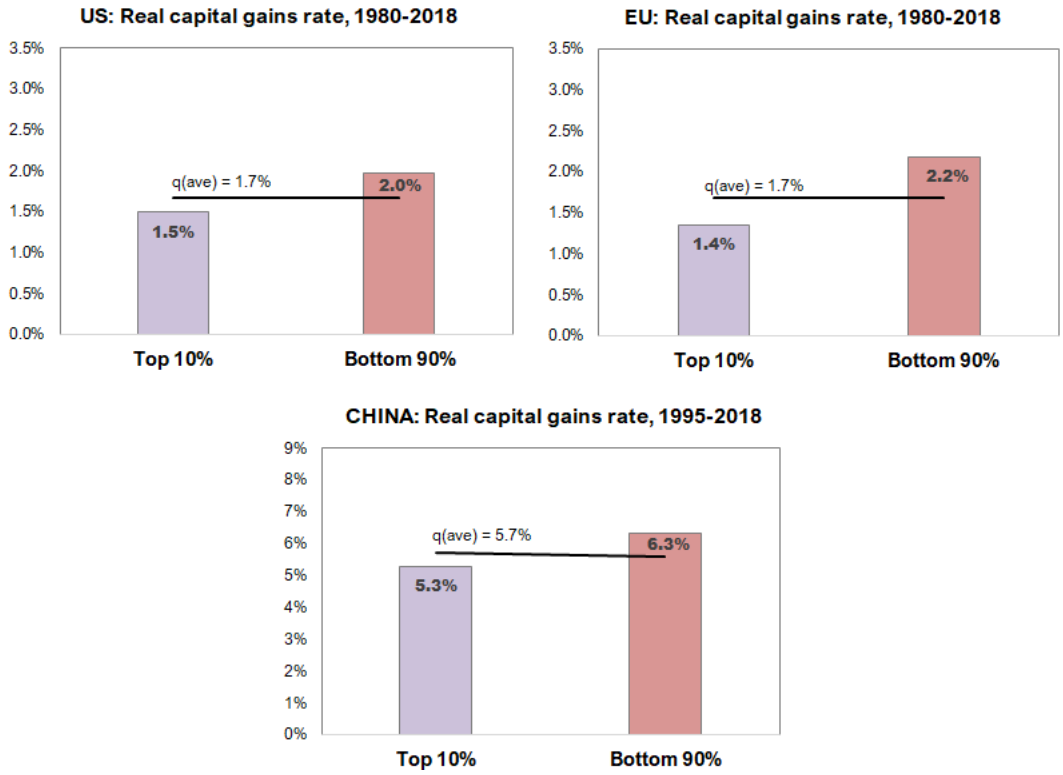
Notes: This figure shows the share of total aggregate household saving accumulated in the U.S. during the period 1980-2018 (upper panel), in Europe during the period 1980-2018 (middle panel) and in China during the period 1995-2018 (lower panel) accrued to three wealth groups (top-10%, middle-40% and bottom-50% wealth groups) and distinguishing saving in specific asset categories: net housing (housing net of mortgage debt), net fixed-income assets (fixed-income assets net of non-mortgage debt) and equity and business. Results for Europe correspond to the weighted average (by national income) of France, Germany, Spain and the UK.

Figure C9: **Distribution of capital gains by asset types in the U.S., Europe and China**



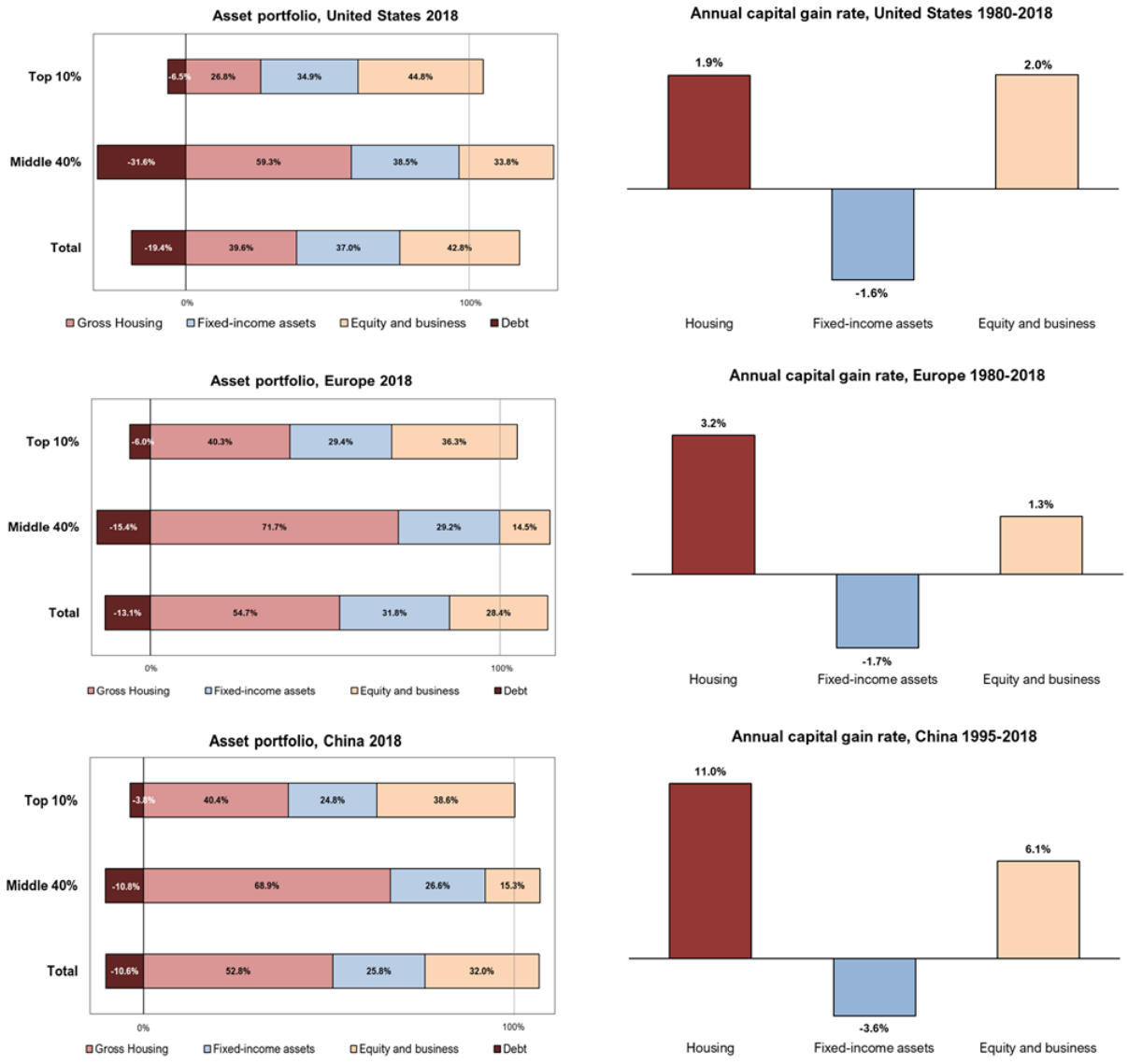
Notes: This figure shows the share of total aggregate household capital gains accumulated in the U.S. during the period 1980-2018 (upper panel), in Europe during the period 1980-2018 (middle panel) and in China during the period 1995-2018 (lower panel) accrued to three wealth groups (top-10%, middle-40% and bottom-50% wealth groups) and distinguishing capital gains in specific asset categories: net housing (housing net of mortgage debt), net fixed-income assets (fixed-income assets net of non-mortgage debt) and equity and business. Results for Europe correspond to the weighted average (by national income) of France, Germany, Spain and the UK.

Figure C10: **Capital gains rate**



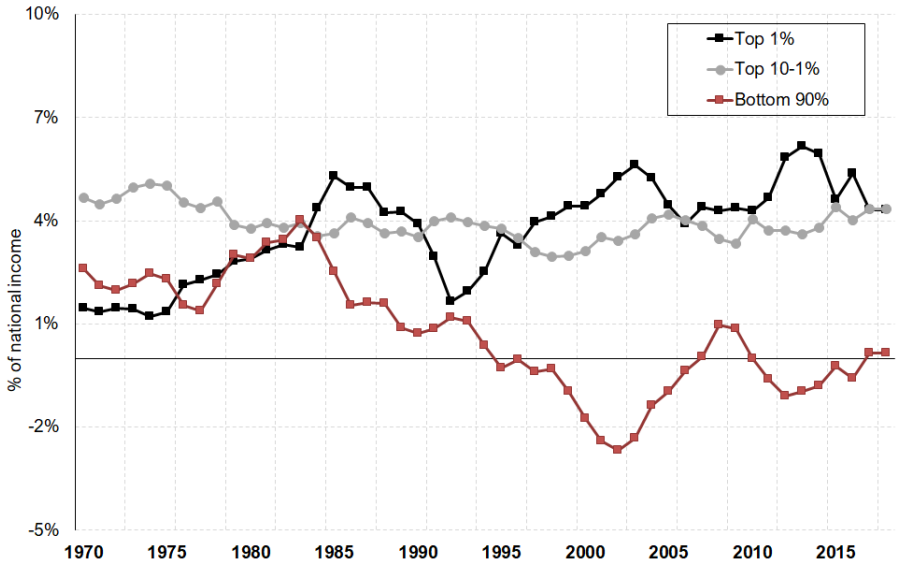
Notes: This figure shows the average real capital gain rate, the real capital gain rate of the top-10% and the bottom-90% in the U.S., Europe and China. The results for the U.S. and Europe are averages for the period 1980-2018, and for China for the period 1995-2018. Europe is the weighted average of France, Germany, Spain and the U.K

Figure C11: **Asset portfolio and average annual capital gain in the U.S., Europe and China.**



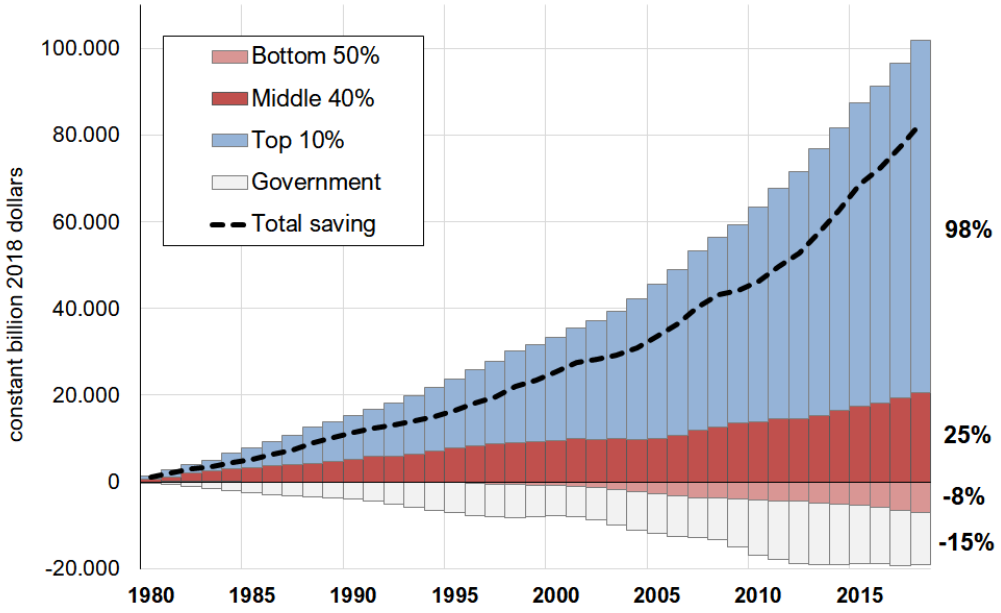
Notes: *Left*: Portfolio composition of the top-10%, the middle-40% and of the total population in the U.S., Europe and China; *Right*: Annual capital gain rate in housing, in fixed-income assets and in equity and business in the U.S., Europe and China. Average annual capital gains are computed over the period 1980-2018 in the U.S. and Europe, and over 1995-2015 in China. Europe is the unweighted average of France, Germany and the U.K. See appendix for details.

Figure C12: **Household saving decomposition across wealth groups in the USA, 1970-2018**



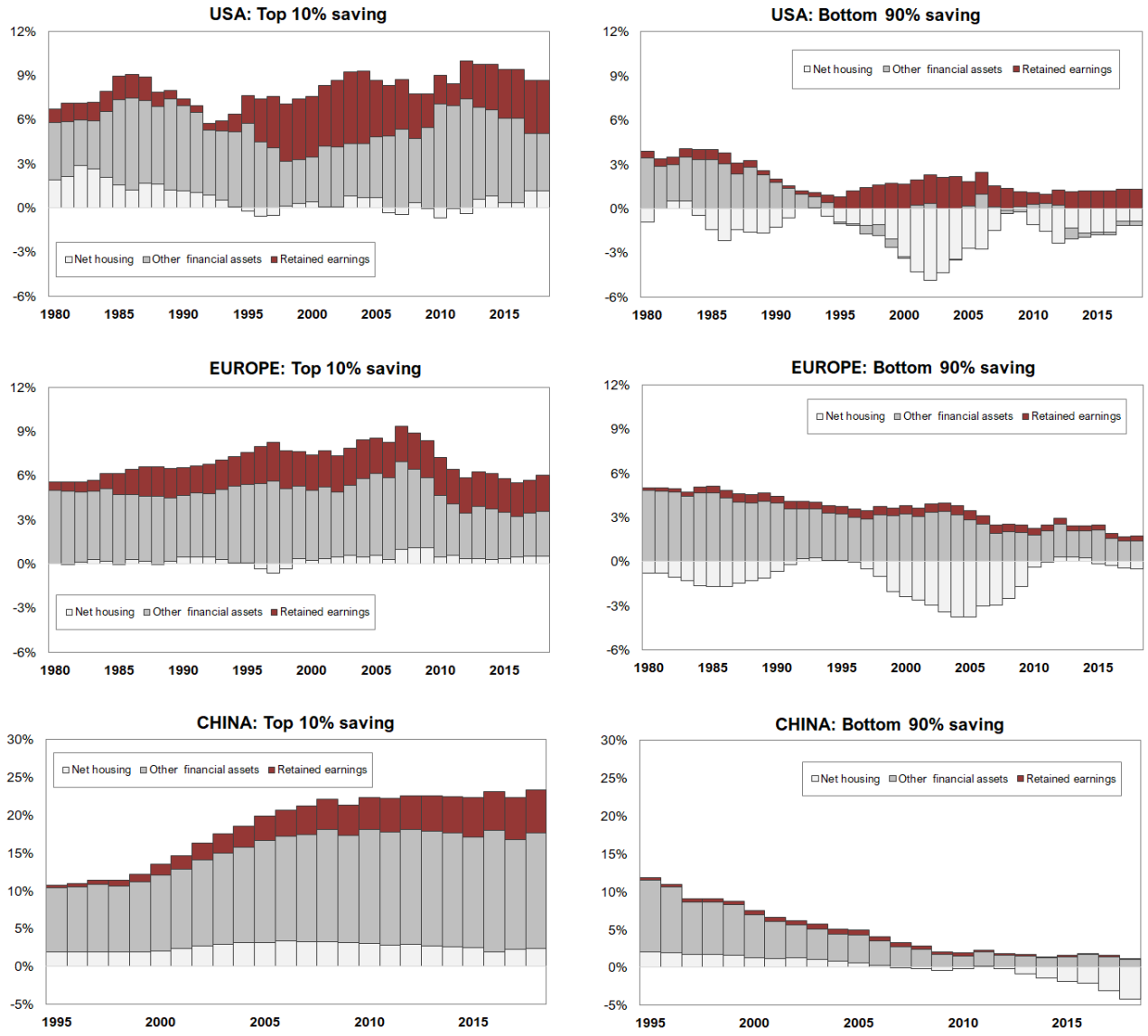
Notes: This figure shows the evolution of saving of the top-1%, "next-9%" (top 10-1%) and the bottom-90% wealth group in the U.S. between 1970 and 2018. The series are 5-year moving averages.

Figure C13: **Accumulation of saving in the G3 from 1980 until 2018**



Note: This figure decomposes the cumulative flow of saving since 1980 across the government and three household wealth groups: the top-10%, the middle-40% and the bottom-50%. Results are expressed in constant billions of 2018 dollars. Percentages on the right axis refer to the share of each group in the total cumulative saving since 1980. For example, it says that saving from the top-10% represents 98% of total saving in the G3 since 1980. G3 is the combination of the U.S., China, and four European countries (France, Germany, Spain and the UK).

Figure C14: **Asset-specific saving of the top-10% and the bottom-90%**



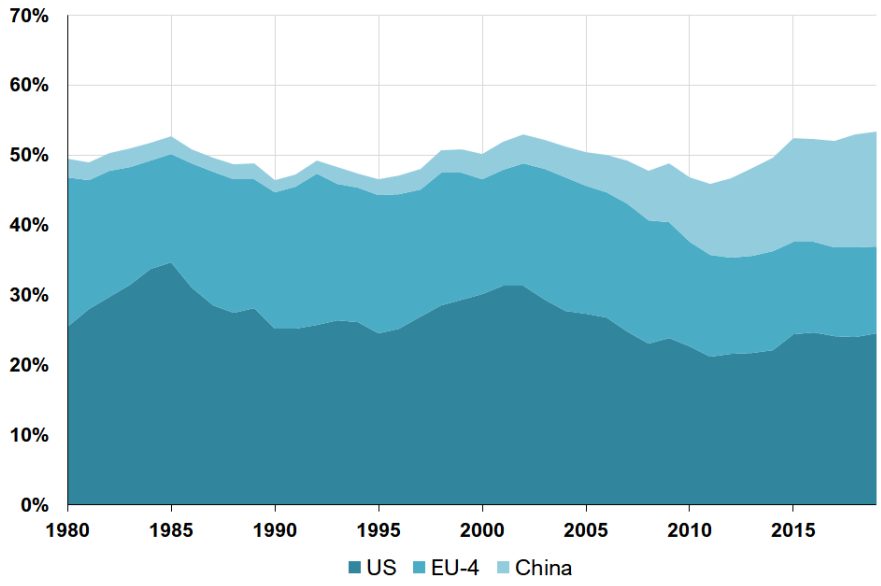
Notes: This figure shows the development of saving of the top-10% (left panel) and the bottom-90% (right panel) wealth group in the U.S., Europe and China, distinguishing three asset classes: net housing, retained earnings and other financial assets. Saving in "Other financial assets" refers to saving in fixed-income assets and in other equity and business (excluding retained earnings), net of non-mortgage debt. Saving is scaled by national income. All series are 5-year moving averages. The period is 1980-2018 in the U.S. and Europe, and 1995-2018 in China. Europe is the weighted average (by national income) of France, Germany, Spain and the UK.

Table C2: **Households: asset-specific saving decomposition**

	US				
	Total	Retained earnings	Other financial asset	Housing	Debt
			Levels		
1980-1992	9.9%	1.6%	7.6%	6.1%	-5.5%
1993-2005	6.3%	4.1%	7.0%	2.6%	-7.4%
2006-2018	8.8%	4.7%	5.0%	2.1%	-3.0%
			Δ to 1980-92		
1980-1992	0.0%	0.0%	0.0%	0.0%	0.0%
1993-2005	-3.5%	2.5%	-0.6%	-3.5%	-1.9%
2006-2018	-1.0%	3.1%	-2.6%	-4.1%	2.5%
	EUROPE				
	Total	Retained earnings	Other financial asset	Housing	Debt
			Levels		
1980-1992	10.0%	1.7%	10.6%	3.0%	-5.3%
1993-2005	9.8%	2.9%	9.0%	2.7%	-4.8%
2006-2018	8,4%	2.8%	5.9%	1.9%	-2.2%
			Δ to 1980-92		
1980-1992	0.0%	0.0%	0.0%	0.0%	0.0%
1993-2005	-0.2%	1.2%	-1.6%	-0.3%	0.5%
2006-2018	-1.6%	1.1%	-4.7%	-1.1%	3.1%
	CHINA				
	Total	Retained earnings	Other financial asset	Housing	Debt
			Levels		
1995-2005	22.7%	2.3%	17.4%	5.5%	-2.5%
2006-2018	23.4%	5.6%	18.8%	6.1%	-7.1%
			Δ to 1995-2007		
1995-2005	0.0%	0.0%	0.0%	0.0%	0.0%
2006-2018	0.7%	3.3%	1.4%	0.5%	-4.5%

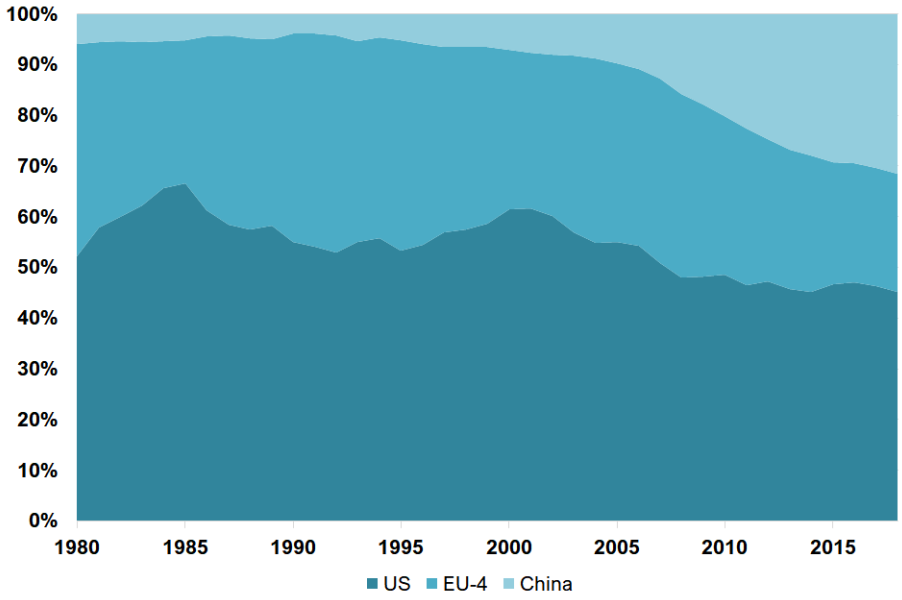
Note: Saving expressed relative to national income. Saving in "Other financial assets" refers to saving in fixed-income assets and saving in other equity and business (excluding retained earnings). Europe is the weighted average (by national income) of France, Germany, Spain and the U.K.

Figure C15: **Share G3 in world GDP, 1980-2019**



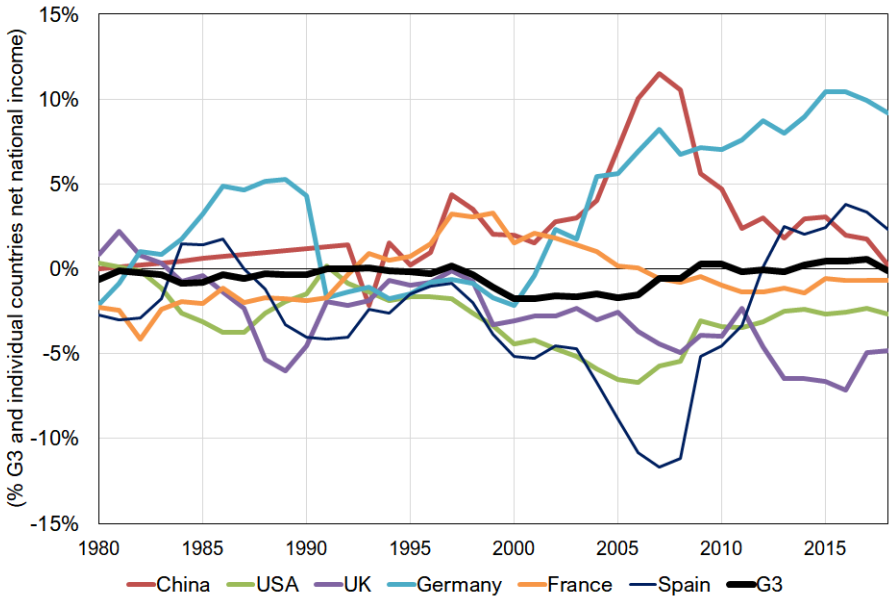
Notes: Share of US, China and EU-4 (France, Germany, Spain and the UK) in world GDP. Source: IMF World Economic Outlook April 2021.

Figure C16: **G3 national income decomposition across the U.S., China and EU-4, 1980-2019**



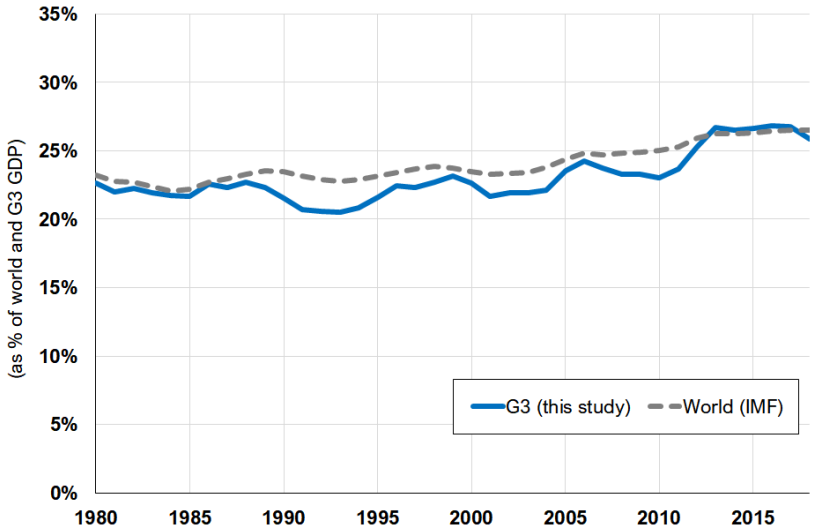
Notes: Share of individual regions of the G3 – i.e, US, China and EU-4 (France, Germany, Spain and the UK)– in G3's net national income. Source: Own calculations using national accounts.

Figure C17: **Net foreign saving: G3 bloc and individual countries**



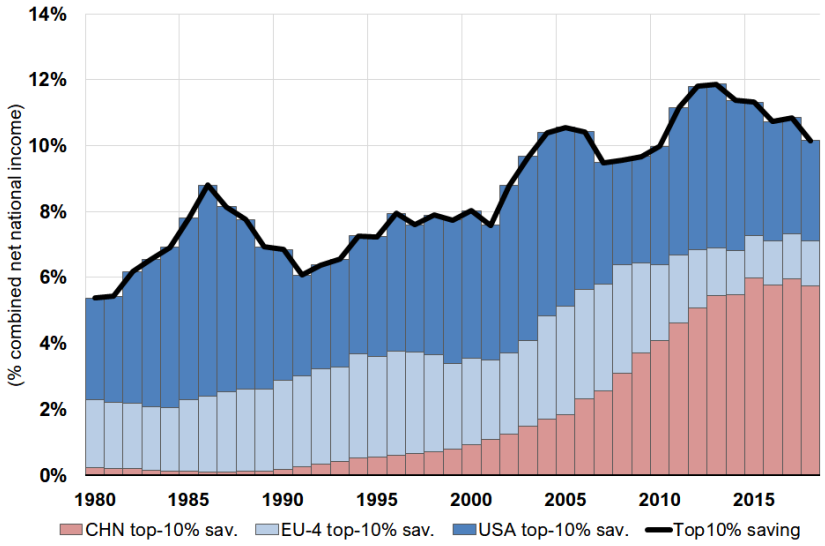
Notes: This figures shows net foreign saving as % of each region's net national income. Accordingly, the combined net foreign saving of the G3 (US, China, UK, Germany, France and Spain) is expressed as a % of the combined national income of G3 countries. Source: own calculations using national accounts.

Figure C18: **World and G3 gross national saving, 1980-2018**



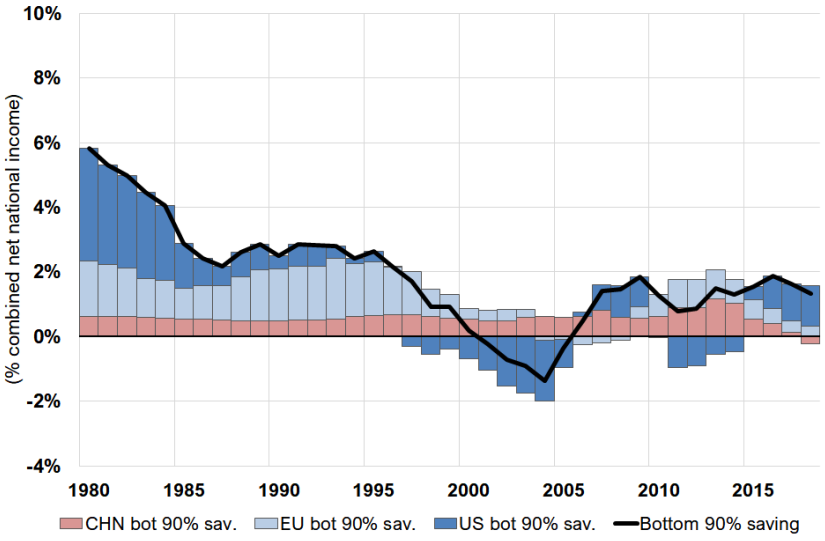
Notes: This Figure compares the development of gross saving (saving gross of consumption of fixed capital) for the G3 group of countries (from this study) and for the world (from the IMF World Economic Outlook of April 2021). G3 is the combination of the U.S., China, and four European countries (France, Germany, Spain and the UK). Annual saving are scaled by annual GDP. Series are 5-years moving averages.

Figure C19: **G3 net saving by top 10% wealth groups, 1980-2018: regional decomposition**



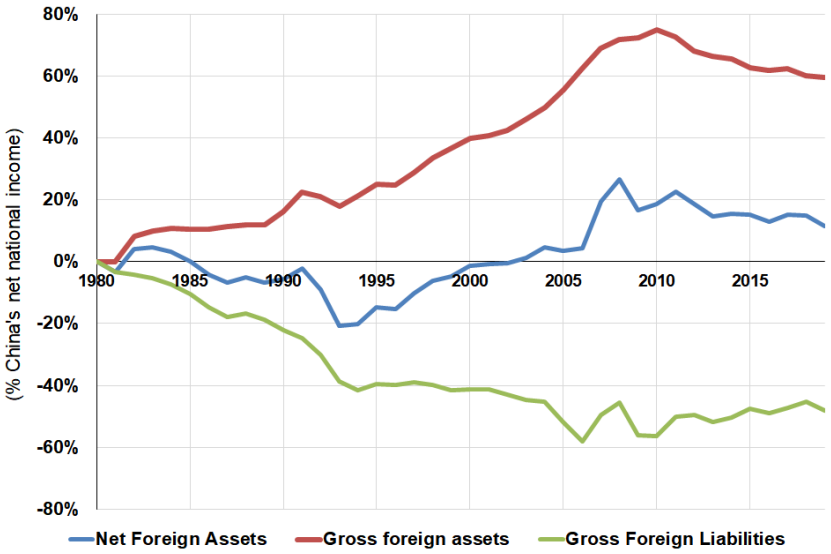
Note: This figure shows the net saving of the top 10% wealth groups from the US, China ("CHN"), and EU-4 (France, Germany, Spain and the UK). Top 10% groups are defined as the wealthiest 10% in each individual country/region. The saving of each of the three regions is expressed as a percentage of the G3 net national income (i.e., the combined income of the 3 regions). Europe is the sum of France, Germany, Spain and the UK. Cross-country combinations use market exchange rates to convert local currencies into US dollars. Series are 5-year moving averages.

Figure C20: **G3 net saving by bottom 90% wealth groups, 1980-2018: regional decomposition**



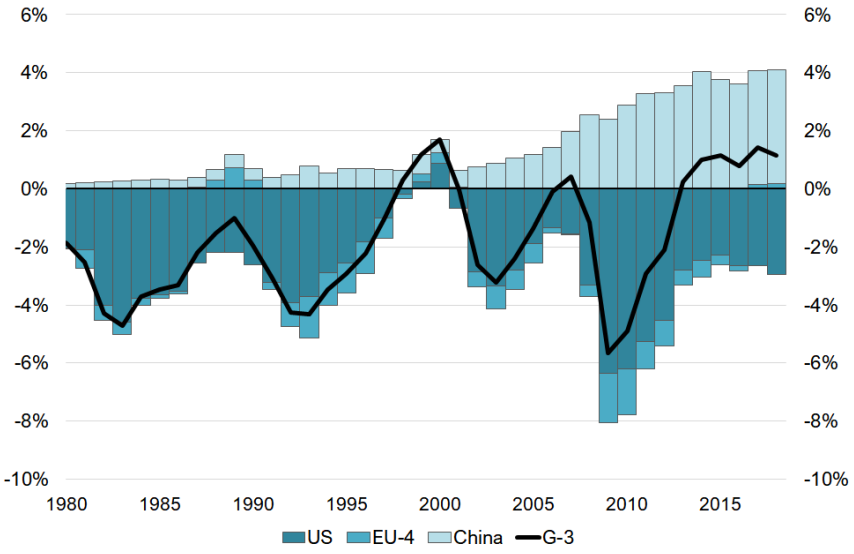
Note: This figure shows the net saving of the bottom 90% wealth groups from the US, China ("CHN"), and Europe ("EU"). Bottom 90% groups are defined as the poorest 90% in each individual country/region. The saving of each of the three regions is expressed as a percentage of the G3 net national income (i.e., the combined income of the 3 regions). Europe is the sum of France, Germany, Spain and the UK. Cross-country combinations use market exchange rates to convert local currencies into US dollars. Series are 5-year moving averages.

Figure C21: **China: International Investment Position, 1980-2018**



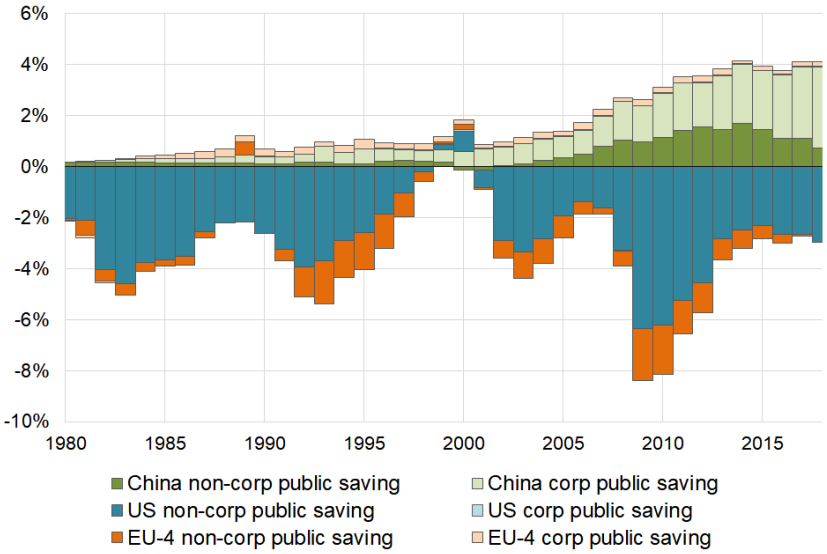
Note: This figure shows gross foreign assets, gross foreign liabilities, and net foreign assets of China with the rest of the world, expressed as a percentage of China's net national income. Source: Piketty et al. (2019) and Bauluz et al. (2021)

Figure C22: **G3 net public saving, 1980-2018: regional decomposition**



Note: This figure shows the net saving of the general government sector in the US, China, and Europe ("EU-4"). The saving of each of the three regions is expressed as a percentage of the G3 net national income (i.e., the combined income of the 3 regions). Europe is the sum of France, Germany, Spain and the UK. Cross-country combinations use market exchange rates to convert local currencies into US dollars. Series are 5-year moving averages.

Figure C23: **G3 net public saving: role of corporate saving**



Note: This figure shows the net saving of the general government sector in the US, China, and Europe ("EU-4"), decomposed into public corporate saving and public non-corporate saving. The saving of each of the three regions is expressed as a percentage of the G3 net national income (i.e., the combined income of the 3 regions). Europe is the sum of France, Germany, Spain and the UK. Cross-country combinations use market exchange rates to convert local currencies into US dollars. Series are 5-year moving averages.