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Abstract

We estimate the ratio of private wealth to national income, *βpt*, for Switzerland from 1900 to 2020. Our results indicate that over the 20th century, *βpt* did not follow a U-shaped pattern as in most European countries. Instead, its was exceptionally stable at around 500%. We argue that this consistently high *βpt* was the result of geopolitical factors combined with Switzerland's capital friendly policy-making. Since the turn of the century, however, *βpt* has been on a rapid rise to reach 793% in 2020. This considerable increase is mainly driven by large capital gains, especially in housing wealth.

JEL-Codes: N340, D310, D330, E010.

Keywords: wealth-income ratio, distribution, economic growth, housing prices.

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1 Introduction

How important wealth is relative to income in an economy, how their relationship changes over time and why are fundamental economic questions. The wealth to income ratio is a key steady state variable in macroeconomic models. It is also indirectly related to the evolution of inequality, as it is linked to the capital share of income. Furthermore, if wealth is gaining importance relative to income, wealth inequality as well as inherited wealth is likely to play a bigger role for the overall inequality of economic resources. In their seminal contribution, Piketty and Zucman (2014) find that over the 20th century, wealth-income ratios have followed a U-shaped pattern in many industrialized economies, returning back to their high pre-World War I levels. This indeed suggest that wealth is becoming more important relative to income than it was in the postwar period, which was characterized by high growth and low inequality in most industrialized economies. At the same time, wealth concentration has been on the rise in recent decades, especially in the U.S. (Saez and Zucman, 2016) and Switzerland (Föllmi and Martínez, 2017).

In this paper, we put together new historical wealth and income series to estimate wealth-income ratios for Switzerland over the 20th century, a case of great interest. In contrast to most other countries studied in the literature, Switzerland was only a bystander in the military conflicts that shaped the history and economic development of the Western world in the 20th century. As a result, Switzerland, unlike other nations, did not substantially increase tax progressivity after the First World War (Dell et al., 2007). The low taxes by international standards and special provisions for foreigners have further attracted a large number of very wealthy taxpayers (Baselgia and Martínez, 2022). The large and prominent financial sector is well known for its long history of banking secrecy and its important role in the tax sheltering of large fortunes (Zucman, 2013). Moreover, while most other industrialized countries pursued anti-capital policies after World War I, as Piketty and Zucman (2014) put it, Switzerland had significantly less tight financial market regulations than its neighbors. Particularly, Switzerland allowed imports as well as exports of capital—which most European countries strongly limited in the interwar and postwar periods.[1] All these factors turned Switzerland into a safe harbor

[1]The open capital market was an important prerequisite for the development of Switzer-

for wealth and capitalists. Hence, Switzerland is a particularly intriguing case study to investigate how long-run wealth accumulation unfolds in the absence of more progressive taxation and anti-capitalist policies. It allows us to test the hypothesis put forth in Piketty and Zucman (2014) that these policies contributed to the observed postwar decline in wealth-income ratios in other countries. Switzerland's experience may therefore also be informative of how wealth and income will evolve in the 21st century, given that policy-making has been embracing free market policies over the past decades.

We make three major contributions. First, we provide an estimate of the ratio of private wealth at market value to national income in Switzerland, covering the period 1900–2020. Second, for the post-1990 period, we decompose total national wealth into different components and show their relative importance for total wealth. Third, we show how savings and capital gains in both, financial assets and housing have contributed to the evolution of the wealth-income ratio, highlighting the role of capital gains.

We start with the long-run evolution of the ratio of private wealth at market value to national income in Switzerland over the period 1900–2020 (Section 5). We follow Piketty and Zucman (2014) and divide total wealth by annual national income. The resulting ratio, β, indicates how many years of work (and saved capital incomes) would be needed to accumulate the total wealth owned in the economy if none of the income was spent on consumption. To obtain consistent long-run time series of aggregate private wealth and national income at market values, we combine state-of-the-art national accounts data with various historical sources. Thereby, we do not simply rely on historical estimates of wealth levels, which suffer from undervaluation of some asset classes, but recur to growth rates. This allows us to compute consistent estimates of β for Switzerland at market values dating back as far as 1900.

Our results suggest that the evolution of the wealth-income ratio in Switzerland did not follow a U-shaped pattern like previously assumed, but rather that the evolution was extraordinarily stable over the 20th century. After the First World War, the wealth-income ratio in Switzerland oscillated around 500% until the eve of the Great Recession. This stable evolution came to an abrupt end in 2010. Since 2010, we are witnessing a steep upward trend: by 2020,

land's strong, internationally competitive financial sector over the 20th century (Müller, 2012).

the wealth-income ratio had reached nearly 800%. This is the highest level since the beginning of our records in 1900, when wealth was worth six times national income.

Our finding of a stable pattern differs significantly from results presented in Brülhart et al. (2018). They document a U-shaped pattern of the Swiss wealth-income ratio over the 20th century (with a decline starting in the interwar period, and a steep increase since the 1990s), and find overall lower levels of this ratio. We show that the differences stem from differences in total wealth estimates. Our updated wealth series are more likely than earlier estimates to capture total private wealth at market values for two reasons. First, we do not rely directly on taxable wealth which underestimates real estate values. Second, our series account fully for private pension wealth, while Brülhart et al. (2018), whose focus are inheritance flows, exclude the non-bequeathable part of private pension wealth.

We put these new, long-run developments into historical perspective and draw international comparisons. We provide an extensive overview and discussion of the conservative, pro-capital policy-making that has characterized Switzerland over the past 120 years. The Swiss case study supports the hypothesis put forth by Piketty and Zucman (2014) that pro-capital, free market policies are related to higher wealth-income ratios. This is further pronounced in periods of low income growth, as we observe it since the Great Recession.

Next, we study how different components of national wealth have evolved since the 1990s (the earliest date data on different wealth components becomes available). This analysis presented in Section 6 reveals a number of findings that let Switzerland stand out and, again, point towards the influence of macroeconomic policies on wealth-income ratios. While public wealth is only a small fraction of total national wealth, we show that since 2005 it has been increasing as well. This finding stands in contrast to the experience of other countries: in terms of national income, public wealth more than tripled from 20% to over 70%. Around one third of this increase can be attributed to capital gains, the remainder is the result of increased public saving. The latter is likely the result of "debt breaks" introduced at the federal level and in sub-federal states (the Swiss cantons). However, public finances also benefited from low and, since 2014, even negative interest rates, which both reduced the interest burden and boosted capital gains.

Decomposing private wealth into private pension wealth, net financial wealth, and housing

wealth allows us to shed light on the role of housing wealth in Switzerland. Prior research by Martínez-Toledano (2020) as well as Piketty and Zucman (2014) has pointed out the importance of housing price bubbles for short- and medium-run fluctuations in wealth-income ratios. We find that the steep increase in the Swiss private wealth-income ratio observed since 2010 can by and large be attributed to rising housing wealth. The increase corresponds to an observed increase in real housing prices and hence, capital gains.[2] Again, these capital gains are presumably rooted in the extremely low interest rates prevailing since 2010.

Finally, we provide a detailed decomposition of national wealth accumulation into a savings and a real capital gains component by asset class. This allows us to investigate the role of capital gains in housing more thoroughly. The analysis provides useful insights into recent macroeconomic dynamics, and highlights the importance of real estate prices for aggregated wealth accumulation. Over the entire period 2000–2020, growth in housing wealth exceeded growth in financial wealth as well as total wealth growth. While in the first decade of the millennium, two thirds of growth in housing wealth were due to savings, after 2010 only half of the increase is attributed to savings, the other half consisting of capital gains.

These results support the hypothesis by Piketty and Zucman (2014) that asset price bubbles drive wealth-income ratios in the short- and medium-run. They are also consistent with the findings by Artola Blanco et al. (2021), who document how the Spanish real estate bubble that burst in 2008 is clearly reflected in β. Together with our results, this consolidates the evidence that rising private wealth-income ratios may be considered a warning signal indicating the buildup of an asset price bubble.[3] This in turn helps designing appropriate financial and

[2]We present an additional analysis in Appendix C that provides novel cross-country evidence on the relationship between wealth-income ratios, housing and/or financial asset prices. In a panel regression framework with 12 countries spanning over 45 years, we find that the relationship between real price changes and wealth-income ratios has become stronger over time.

[3]As documented in Jordà et al. (2015), with the rise in lending, notably mortgage lending, after World War II, asset price and housing bubbles have become both more frequent and larger in magnitude in the second half of the 20th century.

monetary policies.

Our results also imply that following the Harrod-Domar-Solow formula and therefore abstracting from capital gains when determining the wealth-income ratio as $\beta = s/g$, i.e., the ratio between savings and growth, is likely misleading. Even more so, in times of weaker financial regulations and potentially larger asset price bubbles.

The remainder of the paper is organized as follows. Section 2 gives an overview of the literature. In Section 3 we introduce the key theoretical concepts which we aim to measure in the empirical part. Section 4 describes the data. We present our results in three steps. Section 5 presents our historical estimates of the evolution of private wealth-income ratios in Switzerland over the course of the 20th century. For the recent period 1990–2020, we decompose the national wealth-income ratio into different subcateogries. These results are shown in Section 6. To identify potential drivers of the recent increase of the wealth-income ratio, in Section 7 we investigate the role of income growth, savings, and capital gains by asset class. Section 8 concludes.

2 Previous Work on the Role of Wealth in the Economy

The literature on national wealth and how it compares to national income in the long-run is still very young. Its emergence is closely tied to data availability: it was only in 1993 when the System of National Accounts (SNA) first included guidelines to take stock of national wealth in a systematic and internationally comparable manner. Not all countries have immediately adopted the guidelines and the scope of these wealth estimates varies considerably across countries: while some provide very complete and long series of national balance sheets, others only report partial results. This is in fact the case for Switzerland, as we shall see. In their seminal contribution, Piketty and Zucman (2014) were the first to make use of these new balance sheets as well as historical data from eight major developed economies (namely Australia, Canada, France, Germany, Italy, Japan, UK, and the U.S.), to study the evolution of the ratio of total aggregate wealth to national income. Waldenström (2017) compiled series going as far back as 1810 for Sweden, and Artola Blanco et al. (2021) present series for Spain starting in 1900.

To put our results into perspective, we compare them to the evolution of the wealth-income

ratios in these developed economies.[4] In the meantime, all the countries covered in Piketty and Zucman's (2014) original study have adapted their national accounts to the revised System of National Accounts 2008 (European Commission et al., 2009, SNA-2008). Bauluz (2019) updates Piketty and Zucman's (2014) original series, and we use these updated series when we compare wealth-income ratios across countries. Alvaredo et al. (2017) provide guidelines on the use of national balance sheets to compute wealth-income ratios as well as distributional national accounts, (another strand of the literature that has emerged in response to improved national accounts data). To ensure comparability, we follow these guidelines as closely as possible.

It is important to note that we are not the very first to provide estimates of the aggregate wealth-income ratio in Switzerland. Brülhart et al. (2018) study inheritance flows in Switzerland for the period 1911–2011. Along with estimates of the ratio of bequests to national income (in analogy to Piketty, 2011, for France), the authors present estimates of private net wealth as a fraction of net national income. In contrast to our findings of a stable evolution of the private wealth-income ratio over the 20th century, their estimates show a strong increase in the private wealth-income ratio since the 1970s (similar to the evolution observed in other European countries). Section 5.1 provides a detailed discussion of how our approach differs in significant ways from their analysis. For recent decades (1990–2020) we further decompose national wealth into public, private, and net foreign wealth, and we study the evolution of private pension, housing, and financial wealth (see Section 6).

Our paper further relates to a growing literature focusing on the role of increasing house prices for wealth inequality and the observed rise in total private wealth. Already in their seminal paper, Piketty and Zucman (2014) have pointed out the importance of capital gains in

[4]We focus on wealth-income ratios in Switzerland and other developed economies. Other authors have contributed series on emerging economies and young democracies, such as Piketty et al., 2019, for China, Novokmet, 2018, for the Czech Republic, Charalampidis, 2018, for Greece, Kumar, 2019, for India, Novokmet et al., 2018, for Russia, or Orthofer, 2015, for South Africa; Madsen, 2019, compiles wealth-income ratios for pre-industrial UK, covering the period 1210–2013.

the housing sector. Stressing the scarcity of land and housing, Rognlie (2015) and Knoll et al. (2017) also attributes major importance to the upward trend in house prices observed in many economies. Artola Blanco et al. (2021) provide a thorough review of the literature that studies house price phenomena. They find that the Spanish housing boom of the early 2000s led to an unprecedented rise in Spain's wealth-income ratio. We study the relationship between housing prices and wealth-income ratios in a multi-country panel regression framework. This extension can be found in Appendix C.

3 Definition of Wealth and Income Components

Building on the work of Piketty and Zucman (2014), Alvaredo et al. (2017) have developed a unified framework (the "DINA Guidelines") to compute national wealth and income series based on the internationally used 2008 System of National Accounts (SNA-2008) (European Commission et al., 2009). To ensure comparability, we follow this framework as close as possible, depending on the availability of the corresponding data for Switzerland.

Private wealth is denoted by W_{pt} and consists of net wealth (assets minus liabilities) of private households.[5] It can be decomposed as follows:

$$W_{pt} = K_{pt} + F_{pt} - L_{pt} \ , \tag{1}$$

where K_{pt} are non-financial assets, F_{pt} are financial assets, and L_{pt} are financial liabilities of private households. Financial assets include bank accounts, stocks and bonds, as well as life insurances and funded pension wealth. In contrast, pay-as-you-go social security pension wealth (called "Old Age and Survivors Insurance" (OASI)) and any other claims on future government expenditures are excluded, as well as durable goods. The exclusion of claims on future

[5]Nonprofit institutions serving households (NPISHs) are included in the household sector, since the frontier between individuals and private foundations is not always clear. In the Swiss national account system, NPISHs and private households are reported together as one single category. Net wealth of NPISHs is usually small (e.g., in France about 1% of total net private wealth in 2010 (Piketty and Zucman, 2014)).

government expenditures is justified by the fact that these household assets count as liabilities for the government sector and would therefore cancel out when looking at national wealth—the more meaningful concept (see Piketty and Zucman, 2014, for a detailed discussion).

In the literature, non-financial assets K_{pt} are usually decomposed further into:

$$K_{pt} = H_{pt} + A_{pt} + D_{pt} \tag{2}$$

Housing assets H_{pt} are defined as the sum of the market value of dwellings and land underlying dwellings. A_{pt} denotes the value of agricultural land, and D_{pt} stands for other domestic capital, i.e., all non-financial assets except housing and agricultural land, such as unincorporated business assets.

Public (or government) wealth, W_{gt}, is defined as net wealth of all public administrations and government agencies. Analogous to Equation (1), public wealth can be decomposed into public non-financial and financial assets, K_{gt} and F_{gt}, respectively, and financial liabilities of the public sector, L_{gt}.

The market-value of national wealth W_{nt} is the sum of private and public wealth. National wealth can be split up into market-value domestic capital, K_{nt}, and net foreign wealth, NFA_{nt}:

$$W_{nt} = W_{pt} + W_{gt} = K_{nt} + NFA_{nt} \tag{3}$$

We use income net of depreciation, i.e., gross national income minus consumption of fixed capital, as recommended by Alvaredo et al. (2017). In line with the production approach, net national income, Y_t, is defined as the sum of net domestic output Y_{dt} (GDP minus consumption of fixed capital) plus net foreign income, $r_t NFA_t$:[6]

$$Y_t = Y_{dt} + r_t NFA_t \tag{4}$$

[6]In the results section, we use the term national income which always refers to net national income.

The private wealth-income ratio, β_{pt}, is defined as:

$$\beta_{pt} = \frac{W_{pt}}{Y_t} \tag{5}$$

Analogously, β_{nt} denotes the national wealth-income ratio:

$$\beta_{nt} = \frac{W_{nt}}{Y_t} \tag{6}$$

In a closed economy, β_{nt} equals the domestic wealth-income ratio $\beta_{kt} = \frac{K_t}{Y_{dt}}$. Moreover, if public wealth is zero, it holds that: $\beta_{pt} = \beta_{nt} = \beta_{kt}$.

Next, we turn to the accumulation of wealth. Between time t and $t+1$, the accumulation of national wealth W_{nt} can be split into a volume effect and a relative price effect:

$$W_{nt+1} = W_{nt} + S_t + KG_t \ , \tag{7}$$

where S_t is the net-of-depreciation national saving flow (volume effect), and KG_t are capital gains or losses (relative price effect). In the long-run, where relative price effects balance out, at least theoretically, such that $KG_t = 0$, the steady-state national wealth income ratio is given by the Harrod-Domar-Solow formula:

$$\beta_{nt} \longrightarrow \beta_n = \frac{s}{g} \tag{8}$$

where s is a fixed long-run saving rate, and g is a fixed growth rate of national income. That β_{nt} converges to β_n in the steady state relies on the assumption that there is no change in the relative price of assets and consumption goods over time.[7] Although this may be a plausible assumption in the long-run, in the short and medium run, relative price effects, i.e., capital gains, turn out to be crucial.[8] We thus decompose the evolution of national wealth-

[7]For a critical discussion concerning the use of the Harrod-Domar-Solow formula see Krusell and Smith Jr (2015).

[8]This rationale can be readily supported theoretically with a one-good and a two-good model of wealth accumulation. For a detailed discussion, see sections III.B and III.C in Piketty

income ratios into two multiplicative components—the volume and the relative price effect—as follows:

$$\beta_{nt+1} = \frac{(1+g_{st}^{w})(1+q_t)}{1+g_t}\beta_{nt} \ , \tag{9}$$

where $1+g_{st}^{w}$ is the savings-induced wealth growth rate, $1+q_t$ the capital gains induced wealth growth rate and $1+g_t$ the growth rate of national income. The savings-induced wealth growth rate, $1+g_{st}^{w}$, equals $1+\frac{s_t}{\beta_{nt}}$. The rate of capital gain or loss can then be estimated as a residual.

4 Data

We combine various data sources for our empirical analysis of the wealth-income ratio. To ensure comparability with other countries, we follow the approach and methods developed by Piketty and Zucman (2014) and established in Alvaredo et al. (2017) as closely as possible. Switzerland's national accounts are based on the European System of National Accounts 2010 (European Union, 2013, ESA-2010), which is compatible with the SNA-2008, but Switzerland's national accounts are considerably less detailed than those of larger European countries. We pay particular attention to the construction of a consistent, long-run estimate of total private wealth, starting in 1900. Other wealth aggregates, such as public wealth and hence national wealth, are only available from official sources for more recent decades, starting in 1990. For a detailed description of the data and list of all sources, we refer to Appendix A.

Private Wealth (W_{pt}). Remember from equations (1) and (2) that net private wealth consists of the following components:

$$W_{pt} = F_{pt} + H_{pt} + A_{pt} + D_{pt} - L_{pt}$$

To obtain consistent long-run series of total private wealth, we distinguish two sub-periods, which are characterized by different data sources

1981–2000. For this period, we use financial accounts data from the Swiss National Bank

and Zucman (2014).

(SNB; years 2000–2020) and Schmid (2013; years 1981–1999). The estimates by Schmid (2013) are based on internal SNB data and were the precursors of the official statistics published later by the SNB. [9] The financial accounts of Switzerland provide reliable data on aggregate private net wealth W_{pt} at market value. This can be broken down into financial assets F_{pt} (currency and transferable deposits; debt securities, i.e., short-term, long-term and structured products; shares and other equity; units in collective investment schemes; insurance and pension schemes), financial liabilities L_{pt} (loans; mortgages; other outstanding liabilities), and housing wealth at market value, H_{pt}.

The other non-financial assets, agricultural land, A_{pt}, and other domestic capital, D_{pt}, are not included and also not available as separate series. We come back to the question missing agricultural land other domestic capital below.

1900—1980. Prior to 1981, data on market value W_{pt} is nonexistent and we have to take an alternative approach. Following Föllmi and Martínez (2017), we combine total wealth estimates based on wealth tax statistics published in Dell et al. (2007), with historical estimates of total pension fund assets published in Leimgruber (2008). Wealth tax statistics contain all private wealth, with the exception of pension wealth, which is non-taxable. We therefore add pension wealth to total wealth from tax statistics. With the exception of household effects, all types of assets are (and have always been) subject to the wealth tax: real estate, land, non-incorporated business assets, financial assets (including cash, shares, bonds, private loans, etc.), cars, as well as art, jewelry, and collectibles. Moreover, the Swiss wealth tax applies to global wealth, i.e., taxpayers are legally required to report assets held abroad. Some of these assets, in particular real estate held abroad, are not taxed in Switzerland, but must be reported to account for tax progressivity and obtain the correct tax rate. All Swiss residents above the legal age (18 years since 1996, 21 years before) are required to file a tax return and report their global income and wealth, even if their wealth may be below the exemption level (for more details on the wealth series based on tax data from Dell et al. (2007), see Appendix A.1).

[9] At the time, Schmid had access to internal data at SNB. As Appendix Figure B1 shows, in the overlapping period 2000–2010, his series are virtually identical to the official statistics published later by the SNB. We are very grateful to him for sharing this data with us.

The problem is that this wealth sum falls short of total private wealth reported in financial accounts. Taxable wealth does not always reflect market values properly (see Appendix Figure B2.a), in particular due to systematic undervaluation of real estate. We assume though that the annual growth rate of this tax-plus-pension wealth series reflects actual changes in total private wealth. Indeed, growth rates in both series track each other extremely well—including the years around the outbreak of the Great Recession in 2008, which are characterized by large changes from year to year (see Appendix Figure B2.b). We therefore use the growth rate to extrapolate the earliest market value observation of private wealth from Schmid (2013) in 1981 all the way back to 1900.

Our approach to measure total private wealth pre-1981 deviates from the methodology proposed by Piketty and Zucman (2014) and established in Alvaredo et al. (2017), which is based strictly on national accounts data. Note, however, that we refrain from the perpetual inventory method, which cumulates past investment flows. As discussed in (Piketty and Zucman, 2014, p.1265), this method falls short of appropriately measuring the capital stock for several reasons. Our approach, in contrast, is based on changes in actual measures of total private wealth.

To our knowledge, there exist no other long-run time series on private wealth in Switzerland—apart from Brülhart et al. (2018) and our own estimates. This is because since the 1930s, national income rather than wealth has increasingly served as main indicator for (economic) well-being (Landolt, 2014). At the beginning of the 20th century, however, several attempts were made to record Switzerland's national wealth. Estimates for the early 1910s vary considerably between 30 and 40 billion nominal Swiss francs (see Figure B3 in the Appendix, which illustrates various historical wealth estimates between 1910 and 1920). Geering and Hotz (1914) estimated the value of Swiss national wealth around 1914 at 30 billion Swiss francs.[10] Later valuations resulted in somewhat higher estimates, such as Landmann (1916), who estimated Swiss national wealth for the year 1913 at 34.6 billion Swiss francs and Fahrländer (1919), also for the year 1913, at 41.96 billion Swiss francs (all estimates in nominal terms). Some of

[10]Geering and Hotz (1914) do not give a particular date for their estimate. The data used also come from different years. The authors state, however, that national wealth may be estimated at 30 billion "**today**".

these estimates also include certain assets that are excluded from our definition of wealth, in particular durable goods. For instance, the estimate of Landmann (1916) includes fire insured movable property worth 9.9 billion Swiss francs. Without these movable assets, national wealth would fall considerably to around 24.7 billion Swiss francs. This is very close to our own estimate of private wealth for 1913 of around 26 billion nominal Swiss francs. By comparison Brülhart et al. (2018) estimate private net wealth in 1911 at around 18 billion Swiss francs. In Section 5.1, we discuss in greater detail how our approach and resulting estimates differ from those of Brülhart et al. (2018) and why.

Missing agricultural land and other domestic capital. Recall that we do not observe A_{pt} and D_{pt} in the total private wealth estimates which we extrapolate backwards (and consequently, we exclude A_{pt} and D_{pt} from the short-run international comparisons in Section 6). One concern may be that we misrepresent the evolution of β_{pt} in in the first half of the 20th century, as agricultural land was likely more important in the past (Piketty and Zucman, 2014; Piketty, 2014). Thanks to our extrapolation approach, A_{pt} and D_{pt} are nevertheless covered in our long-run series to a large extent. Let $\phi_t = (A_{pt} + D_{pt})/W_{pt}$ denote the fraction of total private wealth that are missing in our data source for the years 1981–2000. Arguably, ϕ_{1981} must have been fairly small, as the importance of agricultural wealth and other domestic capital was dwindling relative to financial and housing wealth. Under the assumption that the growth rate of our tax-plus-pension wealth series reflects the growth rate of private wealth in the economy, our backward extrapolated series will always only miss this fraction ϕ_{1981}. Importantly, this implies that the observed, stable pattern of β_{pt} we find for Switzerland, is not driven by an omission of agricultural land and other domestic capital.

By definition, we do not know how large ϕ_{1981} is. However, we can try to obtain a ballpark estimate of ϕ_{1981} . International evidence suggests that across 12 countries, $A_{pt} + D_{pt}$ was worth 7 to 26 percent of total private wealth in 1981.[11] Using a capitalization approach—presented in Appendix A.2—we further tried to estimate the value of agricultural land. Although the results of this capitalization method should be treated with great caution, they suggest that in 1981, agricultural land would have been worth merely 1.5 percent of total private wealth reported in

[11] Source: own calculations based on data from wid.world.

Schmid (2013) (see Appendix Figure A3). While we refrain from putting an exact number on ϕ_{1981}, we conclude that the fraction of total private wealth missing from our long-run historical wealth series must be small and that this omission is most unlikely to drive our main results presented in Section 5.

Public Wealth (W_{gt}). The analyzed data on public wealth W_{gt} for Switzerland between 1990 and 2020 can all be taken from the "Government Finance Statistics Model" (GFS Model) of the Federal Finance Administration. Since these statistics comply with the financial statistics standard of the International Monetary Fund (IMF), international comparability is ensured. However, no comparable data on public wealth exist prior to 1990. We examine several historical sources of public wealth—described in detail in Appendix A.3—to provide evidence that our historical focus on the long-run evolution of private wealth in Section 5 is warranted.

National Wealth (W_{nt}). Equation (3) shows that national wealth is the sum of W_{pt} and W_{gt}, therefore no additional data is required to obtain W_{nt}. As no consistent data on public wealth is available for the pre-1990 period, results for national wealth are presented only after 1990.

Net Foreign Wealth (NFA_{nt}). W_{nt} can further be split into domestic capital K_{nt} and net foreign assets NFA_{nt}. For the period 1990–2020, net foreign wealth is provided by the SNB as part of the Swiss balance of payments.

Net National Income (Y_t). As with private wealth, we have to rely on three different sources to obtain long-run series of national income covering the entire 20th century as no uniform series exists for Switzerland. For the period 1995–2020, we use national income data as published by the Federal Statistical Office (FSO) in the Swiss National Accounts, which are fully compatible with the SNA-08 framework. Between 1929 and 1994, we use historical national income time series provided by the Historical Statistics of Switzerland (HSSO) database. Unfortunately, income concepts vary slightly between these sources. We therefore use growth rates to extrapolate income backwards from 1995 (see Appendix A.5 for details). For the years prior to 1929, finally, we have to resort to growth rates of historical GDP estimates (rather than NNI) by Stohr (2016).

Additional Macroeconomic Data. Occasionally, we present results not as wealth-income

ratios, but as aggregated real or as per capita real variables, for which we additionally use population (see Appendix A.6) and price data (see Appendix A.7). In order to split changes in total wealth into a savings and a capital gains/loss component (see Equations (7) and (9)), we use supplementary data on savings (see Appendix A.8). Detailed methodological explanations of this decomposition can be found in Appendix A.10. Where meaningful, we compare our results for Switzerland internationally. The international wealth data presented in our analysis can be directly obtained from the World Inequality Database (WID.world; see Appendix A.9). Internationally comparable real house price and stock price indices were obtained from the OECD (see Appendix A.11 resp. A.12).

5 Switzerland's Private Wealth-Income Ratio, 1900–2020

In this section we present our estimates of the evolution of Switzerland's private wealth-income ratio, β_{pt}, over the 20th century. We first describe how we compute our estimates of private wealth-income ratios for Switzerland and why they differ significantly from the previous estimates by Brülhart et al. (2018) (Section 5.1). Next, we explain the extraordinary trajectory of β_{pt} in Switzerland over the 20th century and how it compares to other countries in Section 5.2. In Section 5.3 we put our findings into Switzerland's particular economic history, which differs considerably from other countries.

Before turning to the analysis, note that in principle we would prefer to study the development of the *national* wealth-income ratio, since this concept more adequately reflects the importance of total wealth in a country (Piketty and Zucman, 2014). As explained in the data description, however, no comprehensive and internationally comparable data on public wealth is available prior to 1990, and hence our long-run estimates are limited to private wealth. Yet, based on evidence we present in Section 6, we find that public wealth played a subordinate role compared to private wealth in Switzerland, so that our focus on the long-run evolution of private wealth to income seems justified. In addition, note that we always use private wealth-income

ratios for all other countries, too, when we make long-run cross-country comparisons.

5.1 Comparison with Prior Estimates

The solid black line in Figure 1 shows our estimates of Switzerland's private net wealth in terms of national income, β_{pt}, since 1900. For comparison, the dashed gray line shows the private wealth-income ratio presented in Brülhart et al. (2018). In both series, the highlighted data points (hollow dots and gray triangles, respectively) indicate the years for which total aggregate wealth estimates were available. In between these data points, the lines depict the corresponding linear interpolation.

Comparing these series, two principal differences stand out. First, there is a significant level difference in β_{pt}. Our own estimate is consistently higher, and the difference recorded in 1987 spans roughly throughout the entire twentieth century. The parallel evolution stems from our methodological approach of backward extrapolation of private net wealth at market values with growth rates from historical tax and pension wealth data, described in Section 4.

Second, and most importantly, while both series show a steep rise in the private wealth-income ratio toward the end of the time series, the respective timing clearly differs. While we find an extremely steep increase only after 2010, the estimates by Brülhart et al. (2018) suggest that the ratio started rising in the mid-1990s, thus approaching our estimate in 2011.

This divergent trajectory of private wealth since the 1990s is the main cause for the different long-run patterns in β_{pt}: while Brülhart et al. (2018) β_{pt} find a pronounced U-shaped pattern, our private wealth-income ratio resembles a J-shaped pattern. What drives the difference in these patterns? As both estimates use very similar national income series, the principal source of divergence is attributable to differences in the estimation of private wealth.[12]

Brülhart et al. (2018) estimate net private wealth on the basis of tax data. They emphasize that net private wealth estimates based on wealth tax statistics will be downward biased, be-

[12]Brülhart et al. (2018) rely on somewhat different (historical) sources regarding national income than we do (see Appendix A.5 and their appendix (p. 9–10) for a detailed comparison). However, as documented and carefully discussed by Rais (2021), the use of different sources for national income is not the main driver of the differences in results.

cause i) compulsory private pension-fund wealth is exempt from taxes and hence not covered in tax data; ii) tax valuations of housing wealth are below market value. They address both sources of undervaluation separately. To address the first issue, they add tax-exempt private pension wealth by leveraging historical data from Leimgruber (2008) and corresponding data from the SNB. However, given their focus on inheritances, they only account for the *inheritable* fraction of pension wealth. To correct for the undervaluation of real estate wealth in tax data, Brülhart et al. (2018) proceed as follows. According to the authors, in tax data real estate is valued at about 70% of its market value. This is supported by federal court rulings (see, e.g., Federal Court Ruling 2C_418/2020, publication pending), that hold the cantons not to go below a tax value of 70% of the market value. Brülhart et al. (2018) therefore add a constant mark-up of 30% to their entire tax-based wealth series, multiplying total taxable wealth by a factor of 1.3 (but before adding the bequethable fraction of private pension wealth). As we show below, these adjustments explain the difference in levels and the diverging trends in the 1990s between the two series.

A first issue concerns the focus of the two papers and how, therefore, tax-free pension wealth is taken into account. Since Brülhart et al. (2018) are interested in inheritances, they only consider the fraction of pension assets that is drawn as a lump sum on retirement and is therefore bequeathable. They assume that an estimated 70–80% of total pension wealth will be drawn as ordinary annuities while the rest of the pension wealth is drawn as lump sum payouts. Hence, they only add 20–30% of total pension assets to their tax-based wealth series. This is certainly justified if one is interested in inheritable wealth, but the approach misses a large and growing part of total private net wealth—the measure we are interested in. As undisbursed private pension assets are an integral part of assets Swiss households build up through mandatory savings, they should be fully taken into account when measuring total private net wealth. Taking into account all private pension assets (i.e., also those that will eventually be drawn in the form of ordinary annuities) the two wealth series can indeed be reconciled for 2011, the last year for which both series are available. In 2011, we record a β_{pt} of 553% compared to $\beta_{pt} = 477\%$ in Brülhart et al. (2018). Total pension wealth measured in national income was 170% in 2011 (see Figure 9). If the 70% of pension assets that Brülhart

et al. (2018) did not include in their estimate were added to their β_{pt}, this would yield β_{pt} equal 596% (=477% + 0.7 ∗ 170%), even somewhat higher than our own estimate.

The stark difference in trends over the period 1987–2011—for which we present a steady development of the private wealth-income ratio, while Brülhart et al. (2018) conjecture a sharp rise—is most likely due to how housing wealth is recorded in tax statistics. Not only is housing wealth undervalued in tax statistics, but tax authorities also reassess real estate for tax purposes only very irregularly (approximately every 10 to 20 years, with variations across cantons). Consequently, the taxable value of residential property does not adequately reflect its actual market value. This measurement error increases in times of rapid price changes, particularly during the build up and burst of a housing bubble.

We consider that this mechanism is responsible for the observed increase in Brülhart et al.'s (2018) estimate of β_{pt} in the 1990s, as Switzerland experienced the burst of a housing bubble in the early 1990s. After the SNB increased the policy rate (called "rate for discount credits") from 3.5% to 6% in 1989, the Swiss real estate market entered a severe and long-lasting crisis in 1991 (see Lüscher, 2015, for a description of the Swiss real estate crisis of the 1990s). Capital gains in housing wealth were persistently negative from 1991 to 1998 (Jordà et al., 2019), and it took 15 years for Swiss real estate prices to recover in nominal terms. As a result of this real estate crisis, real per capita wealth fell in the early 1990s (Schmid, 2013), as did real income (see Appendix Figure B6). At the same time, financial assets enjoyed strong positive capital gains in the 1990s (see Jordà et al., 2019). These price changes in financial wealth are reflected in tax data, while valuation changes in housing wealth are not. By inflating the entire wealth tax base by 30% to correct for the undervaluation of real estate, Brülhart et al.'s (2018) estimates accidentally inflate the rising financial wealth, while the simultaneous decrease in real estate wealth is not reflected.

In sum, given the countervailing development of financial and housing wealth—which are roughly equally large components of private net wealth at the beginning of the 21st century—and the slow income growth in the 1990s, a rather stable wealth-income ratio trajectory in the 1990s seems more plausible than a steep increase.

For the period before 1981, finally, we have to rely on tax data to estimate total wealth, too.

However, we use a different approach to Brülhart et al. (2018): rather than using the level of total wealth observed in tax data, we use *changes* in combined historical tax wealth and total private pension wealth to extrapolate backwards the level of total private wealth from 1981, the first year for which private wealth at market value is available (see Appendix A.1 for details). For the period 2004–2018, for which we can assess our methodological approach, this works extraordinarily well, as the changes in the official market value observations and the changes in the combined tax and pension wealth series match very closely (see Figure B2).[13] In Sections 5.2 and 5.3, we provide additional evidence to plausibilize the illustrated historical evolution of the relationship between private wealth and income in the 20th century.

[13] Applying the growth rate of taxable wealth shown in Figure B2 and extrapolating back to 2003 from the SNB's 2018 W_{pt} observation yields an estimated β_{pt} of 496%, while the official estimate is 484%. In fact, the difference between the series of β_{pt} estimated in this way versus the official series never exceeds 16pp during the 2003-2018 period.

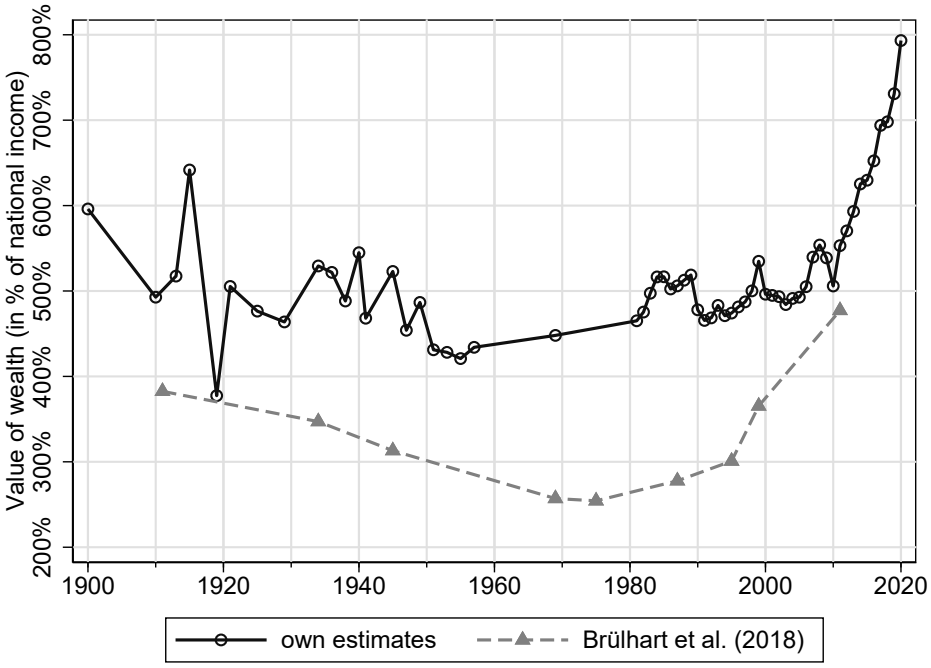


Figure 1: Private Wealth Estimates for Switzerland, 1900–2020

Note: This figure shows our estimate of the private wealth-income ratio, β_{pt}, for Switzerland in comparison with the estimates presented in Brülhart et al. (2018). The hollow dots and gray triangles, respectively, indicate years for which total private wealth estimates were available. The years in between are linear interpolations. Data sources are described in Appendix A.1.

5.2 Long-Run Evolution in International Comparison

Figure 2 compares the evolution of the wealth-income ratio in Switzerland to that of all other countries for which long-run estimates exist, namely Germany, France, the United Kingdom, the United States (Piketty and Zucman, 2014), Sweden (Waldenström, 2017), and Spain (Artola Blanco et al., 2021). While the level of β_{pt} is in line with other countries, it evolved very differently over the course of history. The following paragraphs discuss the evolution over the various historical episodes that marked the 20th Century and the beginning of the new millennium.

The turn of the century and the First World War. At the onset of the 20th century, Switzerland's wealth-income ratio was at a relatively high level of roughly six times national income. This level was similar to that observed in other countries at that time (e.g., Germany and

Spain[14]).

The observed decline in β_{pt} in Switzerland between 1900 and 1910 was due to increases in real income: between 1900 and 1910, real per capita net national income grew by 21%, while real wealth per capita stagnated (see Appendix Figure B6). The very large swings between 1913 and 1922 were caused by the shock of the First World War (1914–1918). Switzerland experienced a steep rise in price levels and real income fell sharply during the war. At the same time, total private wealth declined too: β_{pt} fell from 642% in 1915 to 376% in 1918. As a result of the subsequent recovery of private wealth after the war, combined with stagnating real national income between 1918 and 1922, β_{pt} recovered to a large degree. Other countries shown in Figure 2, in particular Sweden and the U.K., experienced similar dynamics during this period leading up to the Great Depression.

In stark contrast to all our comparison countries, however, the wealth-income ratio in Switzerland reached prewar levels in 1921. By that time, France, Germany, or Sweden had experienced a large drop in their private wealth-income ratio to historically low levels. The shocks of World War I (as well as later in World War II) led to a massive decline of private wealth in Old Europe. As Piketty and Zucman (2014) point out, his was mainly caused by real capital losses and only partly by war destruction.

The interwar period. After overcoming the post-World War I recession of the early 1920s, Switzerland recorded above-average growth in national income from 1922 until the onset of the Great Depression (Woitek et al., 2012), leading to a slight decline in β_{pt}. Between 1929 and 1939, Switzerland lived through a decade of declining per capita income (Woitek et al., 2012), and β_{pt} rose back to 545%. While in other countries such as the U.K. or Sweden, but also in France and Germany, we observe similar movements in β_{pt} over this time, the magnitude of the changes was much smaller in Switzerland. As a result, β_{pt} remained relatively stable and high in Switzerland.

World War II and the postwar period. In contrast to the First World War, World War II hardly seemed to leave a mark on the private wealth-income ratio in Switzerland. Despite an

[14] Artola Blanco et al. (2021) record $\beta_{pt} \approx 600\%$ in 1900 (see their Figure 1). However, β_{pt} is no longer available for Spain prior to 1929 on `https://wid.world`.

increased volatility, overall real income and wealth remained roughly constant over the period 1939–1945. In contrast, we observe sharp declines in the U.S., France, the U.K., and—to a lesser degree—Germany, but the decline in Switzerland was moderate and unsteady.

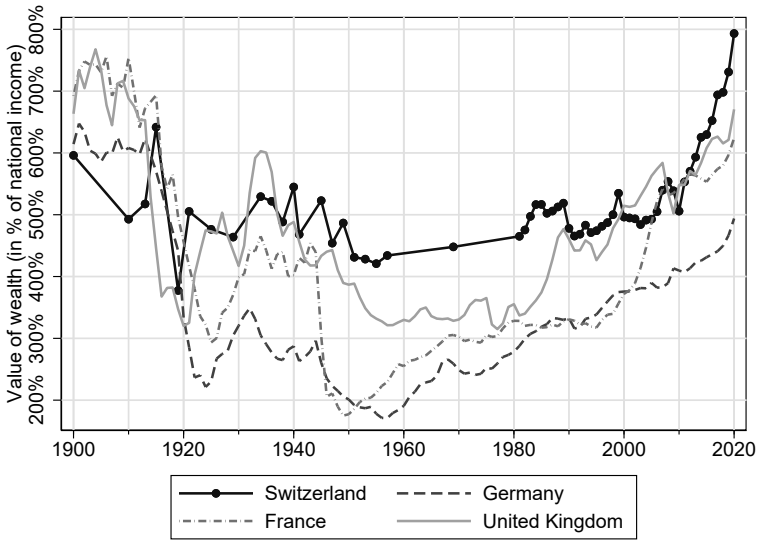
After the end of the Second World War, Switzerland recorded unprecedented, high growth rates. Real national income grew by an average of 5.3% per year until 1970 (see Appendix Figure B6), contributing to a decline in β_{pt}. From the 1970s onward, however, real income growth fell to 1.8% (geometric average of the 1970–1995 period) and was therefore particularly low—also relative to other countries. The low average income growth rate can be explained by the slump in economic growth in the 1970s and the deep recession and stagnation phase of the 1990s (Woitek et al., 2012). As a result, β_{pt} returned to its 20th century average of 500%.

Over the second half of the past century, wealth-income ratios rose steadily in Germany, the United Kingdom, France, and—although to a lesser extent—in the United States. Piketty and Zucman (2014) attribute this increase to a long-term recovery in asset prices. They argue that the long-run swing in relative asset prices was itself driven by changes in capital policies. In their view, anticapital policies had depressed asset prices in these countries in the postwar period. When these policies were gradually lifted from the 1980s onward, asset prices started recovering to eventually reach prewar levels. We argue that the exceptional Swiss case actually fits this narrative. In Section 5.3 we describe the trajectory of Switzerland's policy choices, which over the entire 20th century have favored the accumulation and preservation of capital.

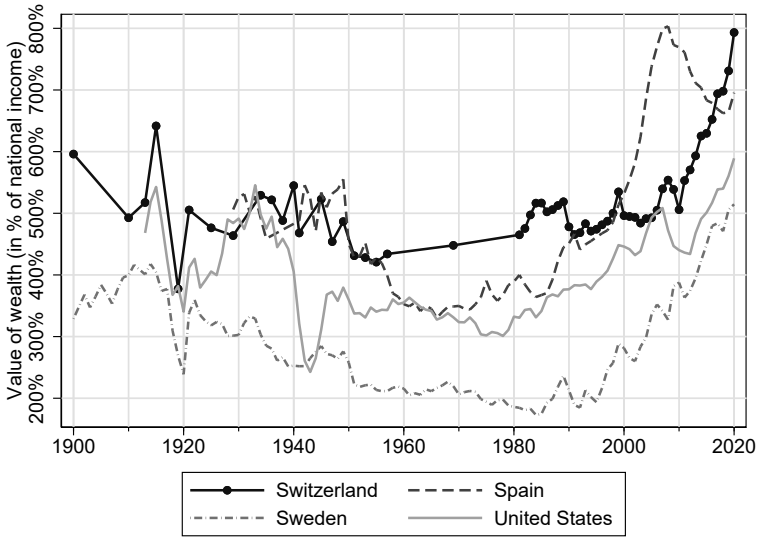
The new millennium. After the turn of the millennium, we observe a steep increase in β_{pt} in several countries, including Switzerland. Within less than 20 years, the Swiss wealth-income ratio rose from 500% to 800%. Also Sweden, France, and Spain have been experiencing rapid increases in their wealth-income ratios. Artola Blanco et al. (2021) find that, at least for Spain, the increase was mainly caused by a large housing bubble which burst in the Great Recession.[15] Our more detailed analysis by different wealth categories for the post-1990 period (Section 6, especially 6.4) provides suggestive evidence that in Switzerland, too, we have been witnessing

[15] Appendix C provides results from a cross-country panel regression exercise covering 12 countries and a 50-year period, assessing the relationship between capital gains in housing and/or financial assets to wealth-income ratios.

the build-up of a real estate bubble since early 2000s. The rally in real estate prices became even more accentuated after 2010 (see also Table 2).



(a) Switzerland, Germany, France and the United Kingdom



(b) Switzerland, Spain, Sweden and the United States

Figure 2: Private Wealth-Income Ratio in International Comparison, 1900-2020

Note: This figure shows the historical evolution of the private wealth-income ratio, β_{pt}, across countries. β_{pt} indicates how many years it would take to accumulate total private wealth if none of national income would be spent on consumption. For Switzerland, the black circles indicate observations for which we have wealth data. Years in between are linearly interpolated. The data sources for Switzerland are described in detail in Appendix A.1. The series for Germany, France, the United Kingdom and the United States are based on Piketty and Zucman (2014), on Artola Blanco et al. (2021) for Spain, and on Waldenström (2017) for Sweden. All these have been updated and are available for download from `https://wid.world`.

5.3 Policy-making in the favor of capital

Over the past century, a series of economic shocks and major historical events have inevitably contributed to considerable fluctuations in β_{pt}, also in Switzerland. However, Figure 2 clearly shows that throughout the 20th century in no other country private wealth-income ratios were as stable as they were in Switzerland. β_{pt} oscillated around 500% until after the Great Recession, averaging 480% over the period 1920–2010. The stable long-run evolution of the private wealth-income ratio also coincidences with results by Föllmi and Martínez (2017) on the stable level of top wealth shares in Switzerland over the course of the 20th century.

What factors explain Switzerland's exceptionally stable wealth-income ratio over an entire century that included two world wars? We argue that it was a combination of luck and a series of policy choices that were pro-capital—especially compared to other countries—-that led to a situation where capital could be preserved and accumulated. Two major policy areas can be broadly distinguished: on the one hand, economic and foreign policy that guaranteed stability, on the other fiscal policy that was (and is to this day) centered around low taxation. These policy areas are intertwined and evolved hand in hand, laying the ground for a steady development of private wealth.

Smallness and neutrality dividends. Several historians and political scientists have highlighted the importance of smallness to understand how Switzerland became an economically liberal and politically conservative corporate state (Katzenstein, 1980; Mach, 2006; Eichenberger, 2022). In particular, smallness favored neutrality, to this day a successful "business strategy that enabled Switzerland to occupy a remunerative niche in world economy and politics" (Eichenberger, 2022, p. 216).

Already in the eve of WWI, policymakers predicted that the Swiss economy would benefit greatly from maintaining a neutral position vis-à-vis the warring powers. In 1912, the secretary of the Swiss national bank, Adolf Jöhr, hoped for "handsome revenues" in the case of a great European war, anticipating that the country would see "the influx of a considerable amount of money from neighboring countries." Hermann Obrecht, a future federal councilor (the executive branch of the Swiss government), explained in 1917 that "if the war continues to spare us, Switzerland as a whole will have the opportunity to become a paradise residence for capitalists

after the war is over" (Eichenberger, 2022).

No war involvement. Switzerland indeed managed to stay out of both world wars. Located at the heart of Europe, the country maintained relationships with all warring parties. The mobilization of the economy remained very limited in international comparison, in particular during WWII. It relied on longstanding, consolidated partnerships between the state and the private sector: private firms became delegated experts in the administration of the wartime economy (Tanner, 1986). After both world wars, Switzerland was able to enter the world markets with intact production facilities (Straumann, 2010).

No significant episodes of inflation. While most European countries experienced a period of high inflation or even hyperinflation at least once, prices in Switzerland have remained relatively stable since 1920 (Straumann, 2010). Likewise, the currency remained stable and strong, such that financial assets kept their purchasing power.

A major global financial center. Switzerland had survived the First World War with a comparatively stable currency despite high inflation at the end of the war. As a result, the Swiss Franc started to serve as "safe haven" for international investments (a characteristic the currency has kept to this day). After the war, Switzerland gained importance both as a capital exporting country as well as an international financial center. These location advantages attracted foreign companies, assets, and capital market transactions (Körner and Schlup, 2013).

By the end of the 1920s Switzerland was already the leading financial center in Europe. After the Second World War, the amount of foreign assets continued to increase, as many European citizens feared another war, inflation, or confiscation (Straumann, 2010; Mazbouri et al., 2012). And of course, the flourishing financial sector itself created income and wealth that remained in the country, fostering W_{pt} and hence contributing positively to the wealth-income ratio.

Institutional involvement of interest groups. An important characteristic of Swiss economic policy-making has been the institutional involvement of interest groups in decision-making processes, uncommon in other countries. This Swiss peculiarity is promoted by the political system: direct democracy with binding referenda and popular initiatives, concordance government (a kind of institutionalized grand coalition), federalism and a federal administration that

was weakly developed for a long time. In particular, the militia system of administration and parliament contains a large number of advisory committees which represent the major interest groups and help in the implementation and supervision of policy (Katzenstein, 1980).

The actors were mainly the Swiss Trade and Industry Association ("*Vorort*", today *economiesuisse*) and the bankers' association (*Association Suisse des Banquiers*, ASB), but also the large international banks and the associations of individual industries, e.g., the watch and textile industries.

Historians agree on the large political influence of these interest groups over the 20th century to promote policies that would favor these big businesses and industries and ultimately, capital owners. The importance of non-governmental regulation is reflected, for example, in monetary policy in the fact that the SNB even concluded regular contracts or gentlemen agreements with these organizations (Bernholz, 2007). They were also heavily involved in the creation and preservation of the Swiss tax haven, both in the interwar period (Farquet, 2012, 2013), as well as in the postwar period (Fehr, 2017).

Less tight financial regulation. Switzerland never had any currency transfer restrictions in place, and the import and export of capital was always made possible—not least to benefit the growing and powerful financial sector.[16] The downside to this liberal stance was that the regular influx but also outflows of "hot money" fleeing currency shocks, inflation, or taxation regularly led to sudden changes in valuation of the Swiss Franc. These fluctuations were particularly pronounced in the 1930s (Bordo and James, 2007; Ackermann, 1935). Yet unlike other central banks, the SNB did not participate in attempts to close international capital markets and impose controls in order to close off the domestic economy (Bordo and James, 2007).

Invoking neutrality, Switzerland did not participate in the Bretton Woods Conference of 1944. The SNB again positioned itself fundamentally against capital controls—opposed to the firm conviction of the intellectual fathers of Bretton Woods. Moreover, the SNB also remained skeptical about a system of fixed exchange rates (Bordo and James, 2007).

[16]Even today, Switzerland has a very liberal stance on international transfers: there is no limit to the amount of cash which one can carry into or out of Switzerland, and there is no obligation to declare money brought to or taken out of Switzerland.

While unpopular at the time, these positions became the dominant monetary policy approach among leading international economists and central bankers from the 1970s onward. Switzerland did not join the Bretton Woods institutions until 1992, but was linked to them through free convertibility and the fixed exchange rate system (Bernholz, 2007). Although Switzerland took measures that affected international capital flows in the 1950s, these were less pronounced than in other European countries.

Conservative financial and fiscal policy. Spared from the wars and benefiting from political neutrality, Switzerland's financial position in the aftermath of WWII was better than that of many other countries. While other countries tried to stabilize the economy after 1945 by means of fiscal and financial policy, often incurring higher debt levels, Swiss economic policy remained rather cautious (Straumann, 2010). As a result, debt levels were relatively low by international comparison (although the federal government still had considerable debt, as illustrated in Appendix Figure B13), and tax rates were even lowered in the postwar period.

Small state and low-tax policy. Large foreign capital flows into Switzerland in themselves do not form part of the Swiss wealth-income ratio. Yet Switzerland offered political and economic stability and an overall high quality of life, making it attractive for wealthy families and entrepreneurs to not just deposit their money in Switzerland, but to move there, too. Especially in the eve of WWII, some wealthy foreigners took shelter in Switzerland.

They further benefited from a mild tax climate that Switzerland offered to the rich and in particular to foreigners. Conservative economic and social policy went hand-in-hand with attempts to keep the government small and with an encompassing low-tax policy, characteristic of the country to this day. This combination has ensured that not just capital, but also wealthy individuals have been seeking residence in Switzerland for more than a century. With the owners of large capital sums moving to Switzerland, their wealth enters the private wealth-income ratio. Over the course of time, low tax rates have further allowed fortunes to grow, such that despite periods of strong economic growth, Switzerland did not see its wealth-income ratio fall. Below we describe the cornerstones of this encompassing fiscal policy that is based on keeping tax burdens low, especially for capital owners.

Switzerland started from a comfortable position, as it had less need to collect tax revenue

compared to warring countries (see Guex, 2012, for details). This allowed for a lower tax burden.

Pre-World War II, this was achieved through exemptions, loopholes, and low enforcement. As Farquet (2013) writes, "it was through tax practices that the very rich were partly able to preserve their wealth and profit margins" (p. 335). The strong federal structure gave ample tax competencies to the cantons, while the competencies of the federal government remained very limited. Tax authorities were highly decentralized and weak (Fehr, 2017; Farquet, 2012). In particular, the federal tax administration was heavily understaffed: "at the end of the 1930s the Swiss Federal Tax Administration employed barely a hundred-odd officials, while, for example, in 1938–1939 in the UK, the Inland Revenue had 24,000 employees" (Farquet, 2012, p. 9). Tellingly, all direct federal taxes were strictly temporary measures during times of war and crisis.

In the postwar period, tax enforcement was improved, but in return tax rates started falling (Farquet, 2012). In fact, the postwar period was characterized by a series of tax reductions and successful efforts to keep the federal government small. Guex (2012) delivers a detailed account of this episode. The measures can be summarized as followed: Even though debt levels had risen during WWII, no new taxes were introduced at the federal level—in contrast to the aftermath of WWI. According to the logic of the leading conservative political forces, leaving the central government in debt would help keep the federal government small, and hence oppose demands for an expansion of the welfare state. Thanks to the high growth rates in the first decades after the war, debt was also seen as a minor problem.

While the political right did not succeed in their attempts to remove the federal income and wealth tax—named *military tax* until 1985—altogether, they institutionalized its temporary character. Only in 1985 did the federal income tax become permanent.The leading circles tried to gradually reduce the burden that the federal income tax and the stamp duty imposed on the wealthy, by shifting the tax burden partially to the taxation of consumption. In 1955, the rates of direct federal taxes were reduced by 10 percent, and in 1958 the federal wealth tax was abolished for good. Stamp duties were reduced from 5 to 3 percent. The maximal rate of the federal income tax for both, individuals and corporations, was set at 8 percent, and lowered

further to 7.2 percent in 1965. In 1968 a national tax amnesty won a majority at the ballots (see below for details). Only in the 1970s were the top rates of the federal income tax raised to 11.5 percent for individuals (where it remains to this day), and to 9.8 percent for corporations. The latter was lowered further to a uniform rate of 8.5 percent in 1997.

In order to compensate at least partially for the revenue losses incurred by these tax cuts, indirect taxes—which fell disproportionally on consumption—were raised: in 1959, tariffs were raised by 50 percent, and in the 1960s, duties on tobacco, petrol, and fuel oil were raised heavily. The initiative to tax the rich ("*Reichtumssteuerinitiative*") proposed by the social democratic party in 1977, in contrast, failed at the ballots with a no-majority of 55 percent (see Fehr, 2021, for a detailed account). The proposal had consisted of higher income and wealth taxes and would have limited the inter-cantonal tax competition.

Tax competition between cantons keeps taxes at bay (see e.g., Brülhart and Parchet, 2014). As a result, cantonal income taxes are also less progressive than the federal income tax. In fact, high-income taxpayers even exhibit a declining effective marginal tax rate due to income sorting into low-tax cantons and municipalities (Roller and Schmidheiny, 2016).

Overall, the tax burden (including cantonal and municipality taxes) remained very low in international comparison, as shown in Figure 3. Even more importantly: in the 1970s, the effective total tax rate on high income earners for married taxpayers without children was around 40 percent in Switzerland, but around 60 percent in France (Guex, 2012, p. 1117).

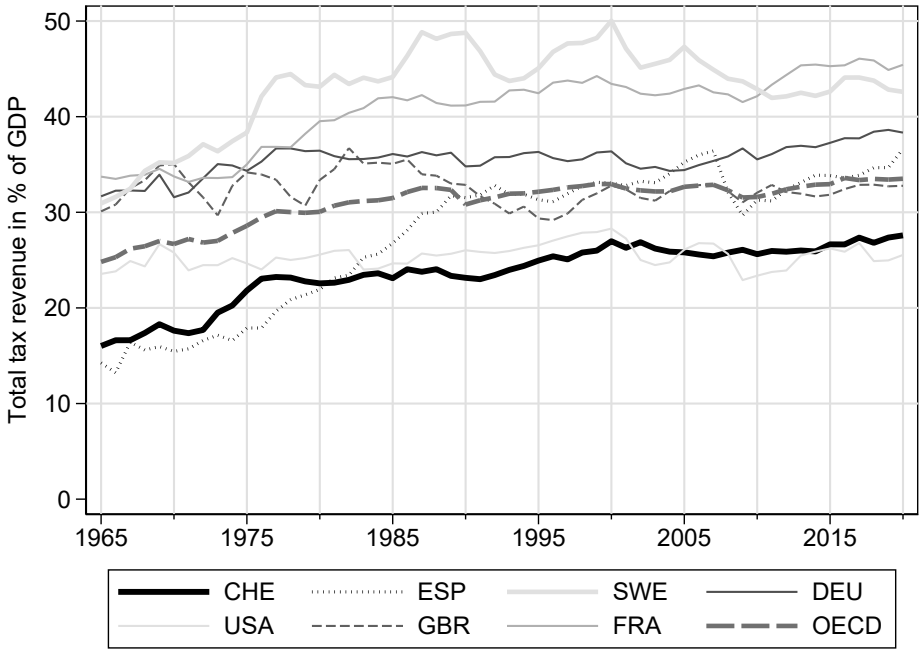


Figure 3: Total Tax Revenue in Percent of GDP, 1965–2020

Note: This figure shows the total revenues collected from taxes on income and profits, social security contributions, taxes levied on goods and services, payroll taxes, taxes on the ownership and transfer of property, and other taxes as a percentage of GDP. Appendix Figure B4 shows a break-down of each of these taxes in percent of GDP by country. Source: OECD tax revenue statistics `https://data.oecd.org/tax/tax-revenue.htm`, June 23, 2022.

Tax amnesties. The authorities were well aware of the extensive tax evasion that was prevalent especially in the first half of the century. Rather than tightening tax enforcement and closing loopholes, however, policymakers turned to recurring cantonal or federal tax amnesties (e.g., 1940 and 1944). Due to the strong opposition from the bankers' association and the "*Vorort*", these were not accompanied by tighter fiscal rules.

Fehr (2017) illustrates these political power plays presenting evidence around a federal tax amnesty proposed by the social democratic party in the early 1960s that would have been accompanied by tighter fiscal rules. A Federal Council report published in 1962 (Conseil Fédéral, 1962) estimated that 17–23 billion francs were evaded in assets (40–55% in terms of national income), and no less than 2 billion in income (4.7% of national income). These amounts resulted in an estimated loss of tax revenue for the municipalities, cantons and the Confederation

of 350 million francs, about 4% of the revenues of all these jurisdictions.

The bankers' association feared tighter fiscal rules and a loss of reputation abroad, as both endangered the lucrative business that the low-tax and low-enforcement environment had brought. The association intervened heavily at the highest political levels, with success: the report was eventually classified, and the proposal never gained support from the federal council. In 1964 it was rejected by 58 percent at the ballots. Only four years later, a tax amnesty without tightening of fiscal rules, and without the requirement to also disclose the source of disclosed wealth, passed the popular vote with a comfortable majority of 68 percent.

This episode is an example of the strong influence interest groups, especially the bankers' association, had even at the very highest levels of policy making. It also shows how wealth accumulation and the interests of capital were prioritized at the expense of tax enforcement.

Expenditure-based taxation for wealthy foreigners. Finally, an important Swiss tax instrument to attract not only foreign assets but also their owners to Switzerland is expenditure-based taxation. This scheme, only available to wealthy foreigners with no labor income earned in Switzerland, recurs to estimated expenditures instead of *actual* income and wealth as tax base.

In 1862, the canton of Vaud was the first canton to offer a special type of taxation to non-employed foreigners on the basis of tourist and economic interests. The canton of Geneva has known this kind of taxation since 1928, the Confederation since 1934. Since 1948, uniform rules across cantons are in place (Bernasconi, 1983). Only in the period 2010–2014 did some cantons abolish the practice. A national popular initiative to abolish the practice altogether was rejected by the people in 2014 (Baselgia and Martínez, 2022).

This scheme has made it very attractive for wealthy foreigners to take up residency in Switzerland (Jeitziner and Morger, 2011; Baselgia and Martínez, 2022). As a result, foreigners make up around 50 percent of the 300 richest individuals and families listed annually in the Bilanz magazine, while foreigners make up only 25 percent of the total population in Switzerland (Baselgia and Martínez, 2022). Furthermore, on average they are richer than their Swiss counterparts on the list. We take this as a further piece of evidence that the Swiss tax and location policy was indeed successful in attracting large fortunes as well as their owners.

6 Wealth-Income Ratios – Recent Evolution

For the time from 1990 onward, detailed data on the different components of national wealth allows us to study the evolution of private, public, and net foreign wealth in turn.

6.1 National Wealth

Figure 4 shows the national wealth-income ratios for Switzerland, Germany, France, Italy, Sweden, and the United States over the period 1990–2020. Switzerland stands out with the highest wealth-income ratio among these economies. We can further distinguish two periods in Switzerland: the years 1990–2006, where the total wealth-income ratio was remarkably stable, ranging around 500 to 550% of annual national income, and the period since 2006 where we observe an increase from 530 to 865%.

This period of rising importance of wealth in comparison to income started during the economic expansion prior to the Great Recession. In contrast to other European countries, the Great Recession and the following European debt crisis only led to a very brief contraction in Switzerland's wealth-income ratio between 2008 and 2010. This dip in 2010 was the combined result of i) a drop in wealth per capita (see Appendix Figure B5); and ii) an increase in national income per capita of 15% between 2008 and 2010 after the 12% fall between 2006 and 2008 as a result of the Great Recession (see Appendix Figure B6).

In other countries, there is hardly any change visible around the 2007–2011 period, with the exception of the U.S. In the U.S., the Great Recession led to a strong drop in the national wealth-income ratio and stabilized after 2009 at around 380–400% of national income—substantially below the 2007 level of almost 500%.

Switzerland's steady growth in the national wealth-income ratio since 2010 stands in strong contrast to other countries' experience. Only in Sweden do we observe a comparable, albeit less pronounced, upward trend throughout the period 1990–2020. At 865%, however, the wealth-income ratio in Switzerland is more than two years of national income higher than in Sweden. Most other countries saw their wealth income ratio stagnate or fall after the Great Recession.

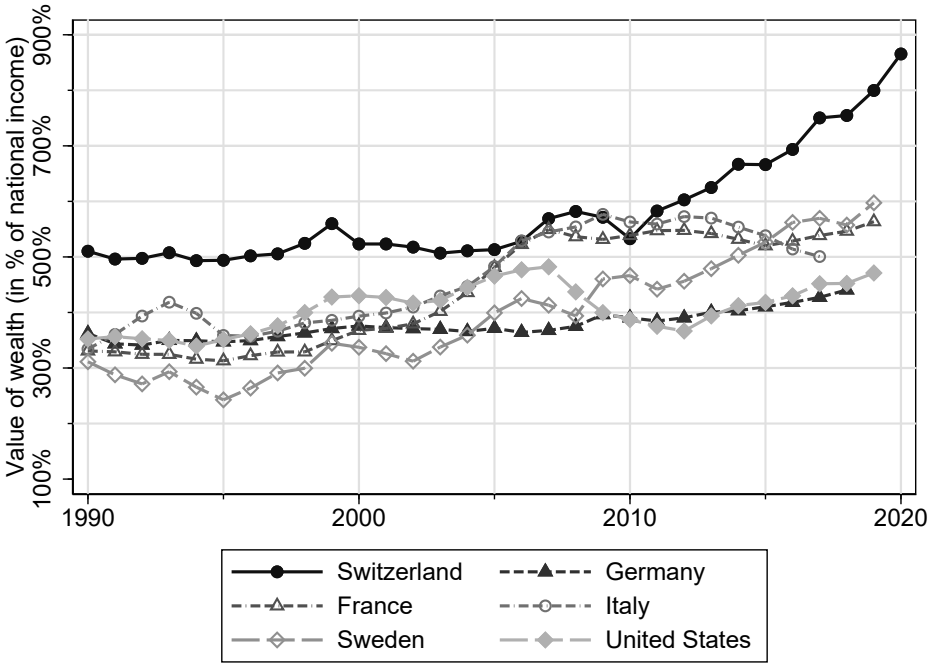


Figure 4: National Wealth-Income Ratios in International Comparison, 1990–2020

Note: This figure shows the evolution of the national wealth-income ratio, β_{nt}, for several countries from 1990 to 2020. β_{nt} is derived by dividing the sum of net private wealth, W_{pt}, and net public wealth, W_{gt}, by net national income, Y_t. Both, private and public wealth, are the sum of financial and non-financial assets minus financial liabilities. In order to present series which are harmonized across countries and over time, non-financial assets of private households, K_{pt}, only include of housing wealth (i.e., $K_{pt} = H_{pt}$). The data sources for Switzerland are described in detail in Appendix A.1 and A.3. The series for Germany, France, Italy and the United States are based on Piketty and Zucman (2014), and on Waldenström (2017) for Sweden. All these have been updated and are available for download from `https://wid.world`.

6.2 Public Wealth

The share of public wealth in total national wealth is relatively low, ranging between 3 to 9% in the period 1990–2020. As a consequence, the value of public wealth measured in national income is low. As Figure 5 shows, it would take a little more than half a year's national income to buy all the government owned assets—compared to the 8 annual national incomes needed to match private wealth. Even though estimates of public wealth at market value are likely less

precise than those for private wealth (since the market value of assets such as schools, hospitals or highways cannot be measured directly; see Piketty, 2014, for a discussion) and assuming a relatively large margin of error, it is apparent that national wealth consists largely of private wealth.

Interestingly, the increasing wealth-income ratio can be observed in both, public and private wealth-income ratios. Over the entire observable period Switzerland's public wealth-income ratio rose from 32% in 1990 to 72% in 2020. For both series, the increase has become very steep since 2010.

This upward trend in public wealth stands in sharp contrast to most other countries' experiences (shown in Appendix Figure B10), as they have seen a decline in public wealth measured in national income over this period—Italy (-57pp), Germany (-65pp), France (-65pp) and the U.S. (-80pp). These developments are the result of continuing public deficit spending. Over the period 1995–2010, 30–45% of private savings in these countries were absorbed by government budget deficits, as governments ran these deficits to pay current expenses, rather than for investments—with the result that they saw their public net wealth shrink (Piketty, 2014, p. 185–186).

Piketty (2014) further estimates that in Germany and France, public wealth accounted for up to one-third of national wealth between 1950 and 1970. In recent years, however, that figure has been approaching zero in both countries. In Figure B13, we present new historical evidence on the long-run evolution of public wealth in Switzerland. At the cantonal level, the historical estimates of the public wealth-income ratio range within $\pm 10\%$ from 1930 to 2020. Similarly, at the federal level, β_{gt} was close to zero between 1970 and 1990, while the figures for 1950 suggest moderate indebtedness. Note however, that these series are not directly comparable to the series based on the GFS-Model presented in this section. However, the main lesson we can draw from these estimates is: in contrast to other countries such as France and Germany, public wealth in Switzerland accounted for only a minor fraction of national wealth, at least since the mid-twentieth century. A simple back-of-the-envelope calculation suggests that net public wealth was virtually zero in 1950 and about 4.5% of national wealth in 1975 (see Note of Appendix Figure B13 for details).

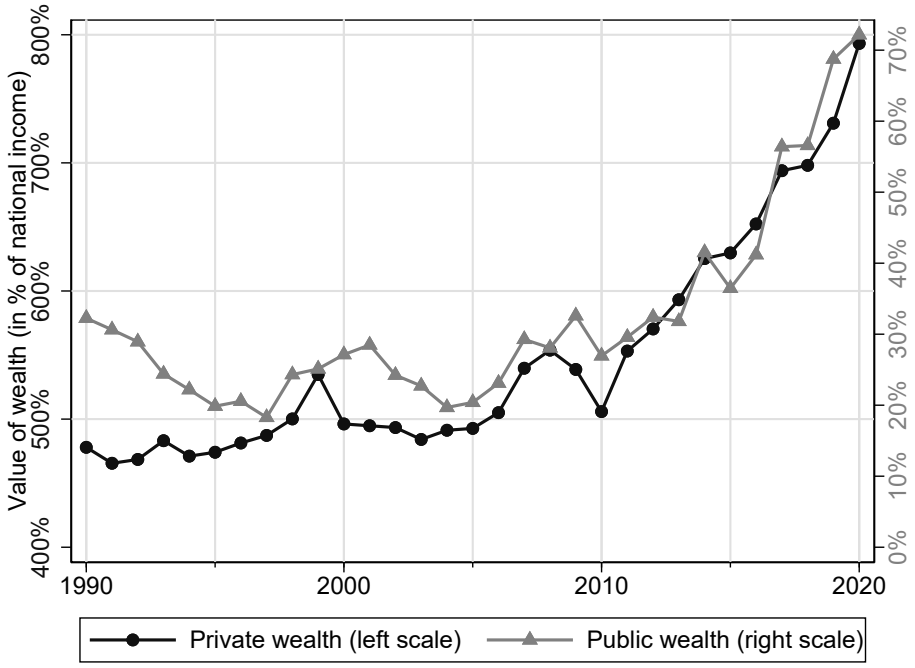


Figure 5: Private and Public Wealth in Percent of National Income in Switzerland, 1990–2020

Note: This figure displays the evolution of the private wealth-income ratio, β_{pt}, and the public wealth-income ratio, β_{gt}, of Switzerland between 1990 and 2020. The data sources are described in detail in Appendix A.1 for private wealth, and in A.3 for public wealth.

In our view, the following three key factors have most likely contributed to the observed increase in public wealth in Switzerland since 2004, the year public wealth was at its lowest level since the turn of the century. First, price effects led to significant capital gains. Second, the introduction of the "debt brake"—a fiscal budget rule to avoid structural deficits—at national level in 2003 (and subsequently in a series of cantons), led to a substantial reduction in public debt. Third, the exceptional monetary policy with negative interest rates and the strong Swiss currency lead to large seigniorage incomes from the Swiss National Bank over the past years. Below, we discuss these three factors in turn.

i) Capital Gains in Public Wealth. The increase in the public wealth-income ratio can be the result of saving as well as price effects leading to capital gains, as shown in the decomposition in equation (9). Re-arranging equation (9) allows to estimate the price effect, $(1+q_t)$, on the change in β_g from public saving rate $(1+g_{st}^w)$ and income growth rate $(1+g_t)$:

$$(1+q_t) = \frac{1+g_t}{1+g_{st}^w} \frac{\beta_{gt+1}}{\beta_{gt}}$$

Accordingly, around 33% of the increase in the public wealth-income ratio between 1995 and 2020 can be attributed to capital gains. These capital gains have been particularly strong since 2010, contributing on average to a 4.9% annual increase in public wealth (see Table B5).

ii) The "Debt Brake". The decomposition above implies that the other 67% of the increase has to be attributed to public savings.[17] This is in line with Figure 6, according to which debt reduction has contributed significantly towards the increase of total net public wealth. Liabilities fell substantially after 2002, from 72% to 50% in 2010. The timing coincides well with the introduction of the "debt brake" at the federal level in 2003, a fiscal rule which requires the government to save during economic expansions, thereby reducing and avoiding structural deficits.[18] Using a synthetic control approach, Schaltegger and Salvi (2016) show that the "debt brake" indeed contributed substantially towards the significant public debt reduction that took place since 2003. Similar developments are observed at the cantonal level, as cantons also adopted "debt brakes" and similar budget rules in the 2000s (see Yerly, 2013, for an overview).

iii) Expansionary Monetary Policy. The increase in public wealth during this period was further fueled by monetary policy. With the aim to counteract the appreciation of the Swiss Franc, the Swiss National Bank (SNB) has adopted a quantitative easing policy which includes negative interest rates. As a side effect, this significantly reduced the burden of public debt service. In addition, the SNB's policy generated large seigniorage incomes, of which two thirds are distributed to the cantons and one third to the central government. Between 2003 and 2011, the SNB distributed 2.5 billion and more each year to the cantons and the federation together. Taken together, all these developments led to an increase in financial public wealth.

[17]Note that net public savings (see Table B1) and capital gains in public wealth (see Table B5) exhibit significant fluctuations over time.

[18]For additional information see: `https://www.efv.admin.ch/efv/en/home/themen/finanzpolitik_grundlagen/schuldenbremse.html`

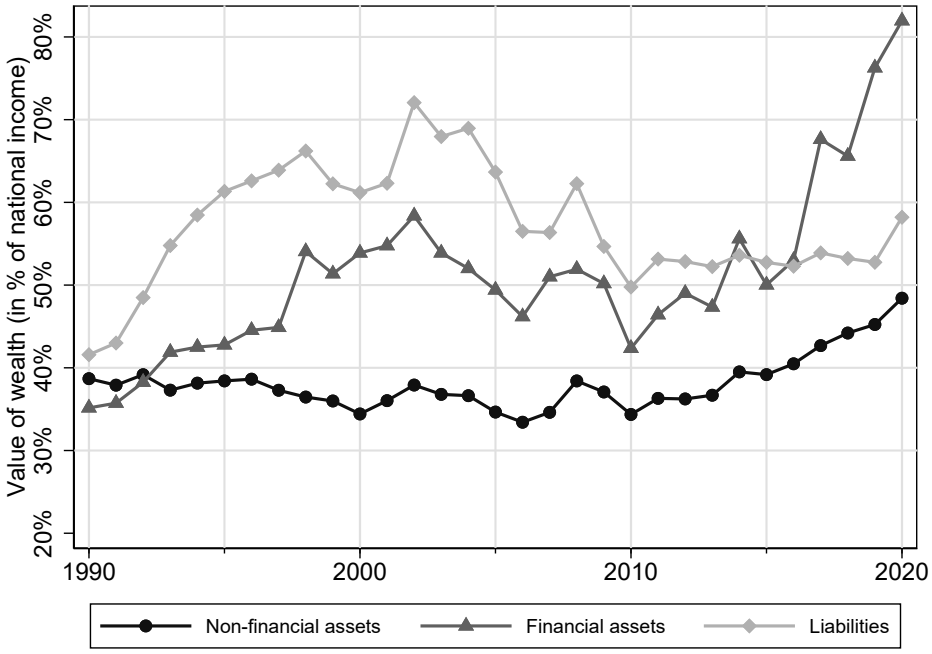


Figure 6: Decomposition of Total Net Public Wealth in Switzerland, 1990–2020

Note: This figure shows the evolution of three main components of net public wealth, W_{gt}: public non-financial assets, K_{gt}, public financial assets, F_{gt}, and public financial liabilities, L_{gt}, measured in percent of national income, Y_t. W_{gt} is the sum of all net wealth of public administrations and government agencies at all government levels. The corresponding data sources are described in Appendix A.3.

The increase in financial assets described in Figure 6 reflects the evolution over all government levels. While the overall value of government-owned non-financial assets in terms of national income remained relatively stable over the past three decades—experiencing a distinct surge only since 2015—this development masks considerable heterogeneity. Non-financial assets rose at the municipality and cantonal levels, but fell for the confederation (see Appendix Figure B11).

To uncover heterogeneity in net public wealth at different government levels, we further decompose total public wealth into wealth held by the Swiss Federation, the cantons (i.e., Switzerland's federal states), municipalities, and social security funds.

Figure 7 reveals the relative importance of public wealth as a share of total wealth since 1990 by government level. Undoubtedly, a major shift has taken place from the central govern-

ment (federal government including social security funds) to the lower levels of government, i.e., the cantons and municipalities.

At the federal level, the development is striking: net wealth measured in national income fell from 17% in 1990, when Switzerland entered a decade of economic crisis and stagnation, to as little as 3% in 2004. Since then, a gradual recovery can be observed, and at 17.3%, the wealth-income ratio at the federal level is now back at its 1990 level. The situation is very different for the cantons and municipalities. Virtually the entire increase in Switzerland's public net wealth—relative to national income—has taken place at these two levels of government. The rise in cantons' public wealth accounts for roughly 28pp of the total 40 percentage point increase in the public wealth-to-income ratio. Municipalities added another 11pp of the total 40pp increase in the public wealth-to-income ratio. This leaves the federal level and the social security funds with a negligible contribution (0.2pp and 0.8pp, respectively) to the change in the public wealth-income ratio between 1990 and 2020 (see Appendix Figure B12, which shows the different components in percent of national income).

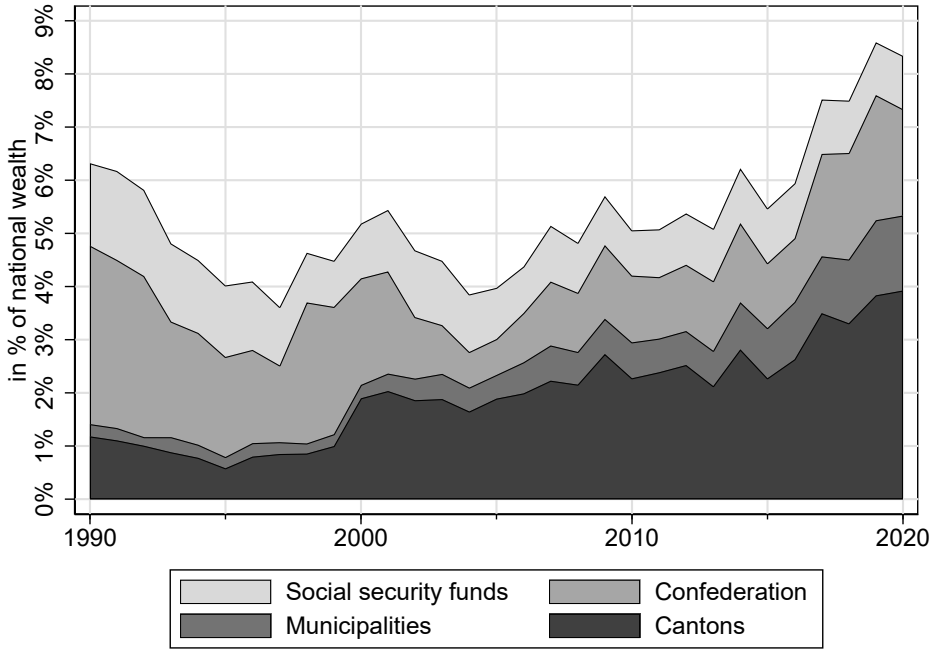


Figure 7: Public Wealth by Government-Level as Share of National Wealth, 1990–2020

Note: This figure displays the evolution of net public wealth, W_{gt}, of Switzerland as share of total national net wealth, W_{nt}, from 1990 to 2020 decomposed by the four government levels indicated in the legend. The data sources are described in detail in Appendix A.3.

6.3 Net Foreign Wealth

As described in equation (3), total national wealth can further be decomposed into net national and foreign wealth. Switzerland stands out with its high value of net foreign wealth, which for the period 1990–2020 lies between 80 and 160%. This is substantially more than in most other countries, where this ratio has rarely ever exceeded 25% in the postwar period and even turned negative in recent decades (see Appendix Figure B14). Despite Switzerland's high level of net foreign wealth, however, the recent increase in national wealth is solely due to an increase in domestic wealth as shown in Figure 8.

The high net foreign asset position of Switzerland itself is the result of a set of factors which have been changing over time. The stable evolution therefore masks substantial heterogeneity among the different net foreign wealth components. Until the Great Recession, direct investment and portfolio investment compromised 70–95% of total foreign net wealth. The reasons

for these high values lie in the high savings rate and the limited investment opportunities within Switzerland.[19] After 2009, however, net direct and, in particular, net portfolio investment have declined substantially and now account for a much smaller share of total net foreign wealth than they did back in 2009.

Furthermore, other investment had an increasingly dampening effect on the Swiss net foreign wealth position.[20] On the other hand, however, in an attempt to stabilize the Swiss currency, the Swiss National Bank bought unprecedented amounts of foreign currency, leading to an increase in reserve assets, which in turn more or less offset the fall in foreign investment (Swiss National Bank, 2018).

[19]Table B2 in the Appendix gives an overview of saving rates across countries.

[20]The category other investments includes in particular interest and other investment income from insurance companies, pension funds, the Swiss Confederation and the SNB (excluding currency reserves). For more detailed explanations see: `https://data.snb.ch/de/topics/aube#!/doc/explanations_aube_bopauverm`.

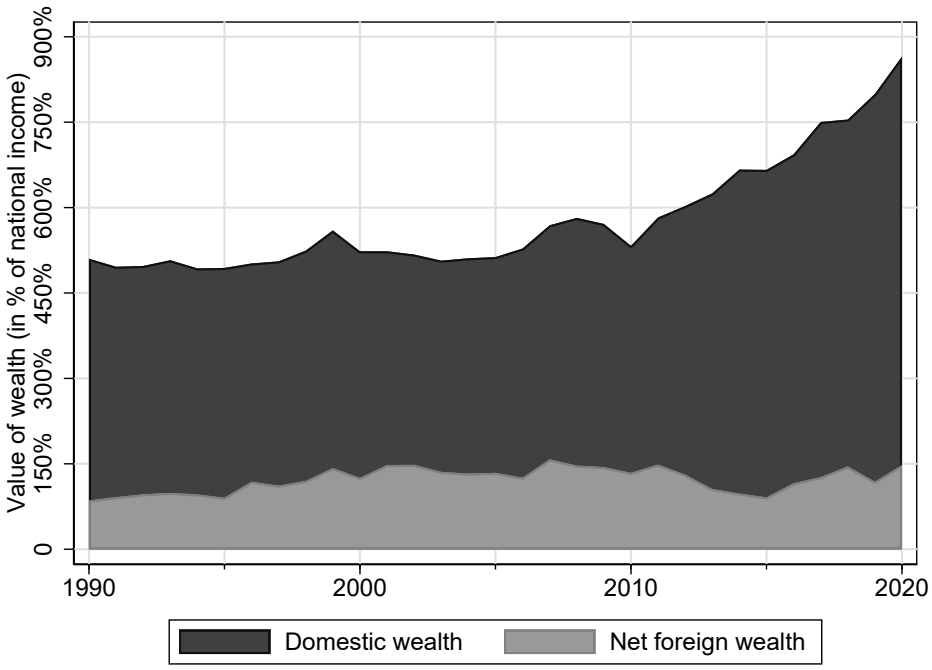


Figure 8: The Evolution of Domestic an Net Foreign Wealth of Switzerland, 1990–2020

Note: This figure displays the evolution of Switzerland's national wealth-income ratio, β_{nt}, distinguishing between domestic capital, K_{nt}, and net foreign wealth, NFA_{nt}. By construction it is the case that domestic capital plus net foreign wealth equals the sum of net private and public wealth. The data sources are described in Appendix A.4.

6.4 Private Wealth and the Rise in Housing Wealth

Since private wealth makes up around 95% of national wealth in Switzerland, private wealth parallels the evolution of national wealth. The composition of net private wealth in Switzerland shown in Figure 9 further reveals that the evolution of total wealth can be particularly attributed to housing wealth. Pension wealth has risen moderately but steadily to just above 200% of national income. This moderate but steady increase in pension wealth is the combined result of pension reforms and individual responses to demographic change and longer life expectancy. Net financial assets—gross financial assets minus liabilities—remained very stable at around 100% of national income throughout the observed period (with a slight rise in the two most recent years). As indicated in Appendix Figure B15, this stability reflects the interplay of an

increase in both gross financial assets (+92.6 pp) and liabilities (+61.8 pp).[21]

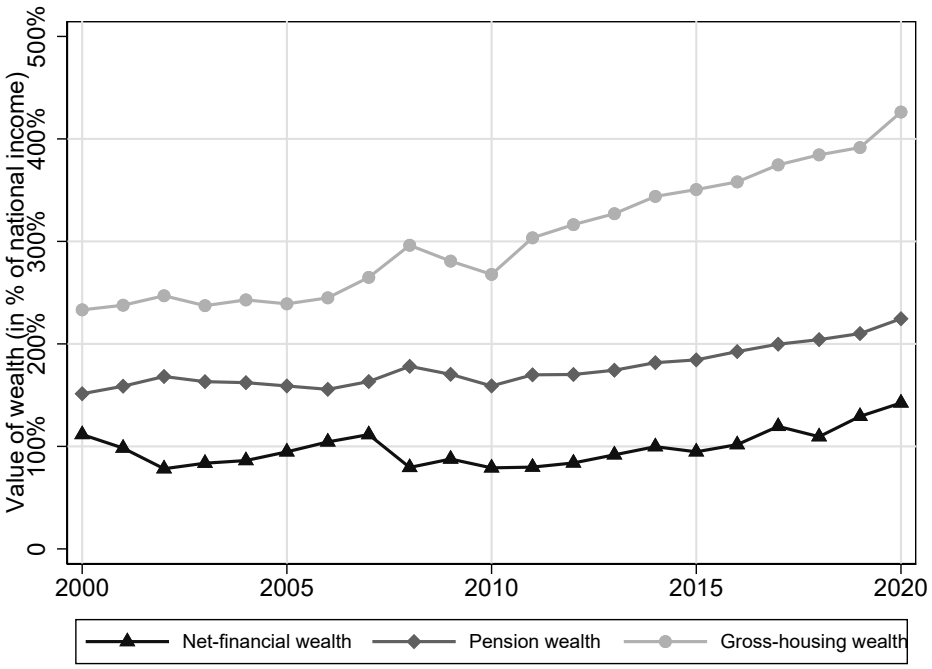


Figure 9: Main Components of Private Wealth in Switzerland, 2000–2020

Note: This figure shows the evolution of the three main components of private wealthW_{pt} (gross housing, net financial, and pension wealth), measured in national income, Y_t. The sum of these three sub components adds up to total net private wealth (see Appendix Figure B7). Figure B15 additionally decomposes net financial assets into gross financial assets and liabilities. Detailed information on these three subcomponents can be found in Appendix A.1.

The strong increase in housing wealth as share of total wealth is striking, especially because, like Germany, Switzerland is a land of tenants: the homeownership rate amounts to 39% of households and was at 32% in 1990.[22] Since 2010, when the steep rise in housing wealth began, the homeownership rate has been roughly stable.

[21]However, it may be noted that this increase is predominantly attributable to the two most recent years. In fact, half of the total increase in the gross financial wealth-income ratio between 1990 and 2020 can be attributed to the last two years. For liabilities, around a quarter is attributable to 2019–2020. Thus, net financial assets remained virtually unchanged (-2pp) in the period 1990–2018.

[22]Source: Federal Statistics Office

One likely explanation for the rise in housing wealth is the sharp increase in real housing prices that has been taking place since 2010. While real estate prices in Switzerland started to rise already after 2003, the trend clearly accelerated after 2010. In an environment of a strong currency and extremely low—since December 2014 even negative—interest rates, domestic investment opportunities in Swiss Francs have become more attractive (as cheap money has been readily available), but also harder to find due to increased demand. Real estate is an alternative asset class to government bonds and stocks, promising high returns. Private households as well as institutional investors (e.g., pension funds) and firms have been seeking out investment opportunities in real estate (Wijburg and Aalbers, 2017). Prevailing low interest rates therefore have likely increased the demand for real estate (Wildauer and Stockhammer, 2018; André, 2010). This is supported by the fact that during that time, also mortgage debt levels have increased sharply, going from 119% of national income in 2010 to 168% in 2020, as shown in Figure 10.

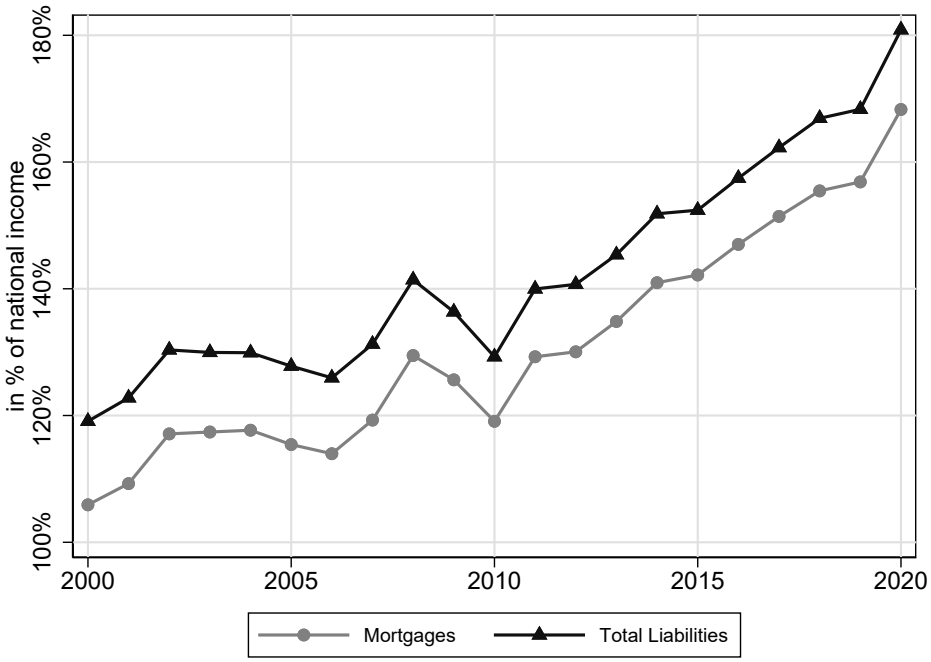


Figure 10: Private Debt-Income Ratios in Switzerland, 2000–2020

Note: This figure illustrates the evolution of total private financial liabilities, L_{pt}, and its main sub-component, mortgages, as a ratio of national income. The data sources for Switzerland are described in detail in Appendix A.1.

At the same time, annual population growth has spurred, increasing from 0.24% in 1997 to 1.27% in 2008. Ever since, it has remained above 0.7%, and is therefore larger than in most other developed economies. Population growth contributes to increased housing demand. Because it takes time to increase housing supply and moreover urban land is fixed and therefore scarce, prices typically rise. This idea dates back to Ricardo's (1817) famous principle of scarcity. Recent empirical contributions supporting this view include Rognlie (2015), Knoll et al. (2017), or Grossman and Steger (2017). It seems likely that increased demand for housing from continuous population growth combined with low interest rates ultimately fueled into the observed increase in real estate prices shown in Panel a) of Figure 11.

We come back to the role of capital gains—and hence: price increases—and savings in housing wealth in Section 7, where we argue that this recent increase in housing wealth is driven by a relative increase in housing prices (rather than savings in housing). Figure 11 further reveals the general trend in rising housing prices across Europe and in the U.S. Likewise, the increase in housing wealth relative to national income is by no means a unique Swiss feature. Appendix Figure B8 shows that the value of housing wealth in national income has been rising in most countries.[23]

[23]The extension in Appendix C contains a formal empirical analysis on this issue. Using cross-country panel regressions we show that such rapid house price appreciations are systematically correlated with wealth-income ratios in a number of rich economies, in particular in recent decades.

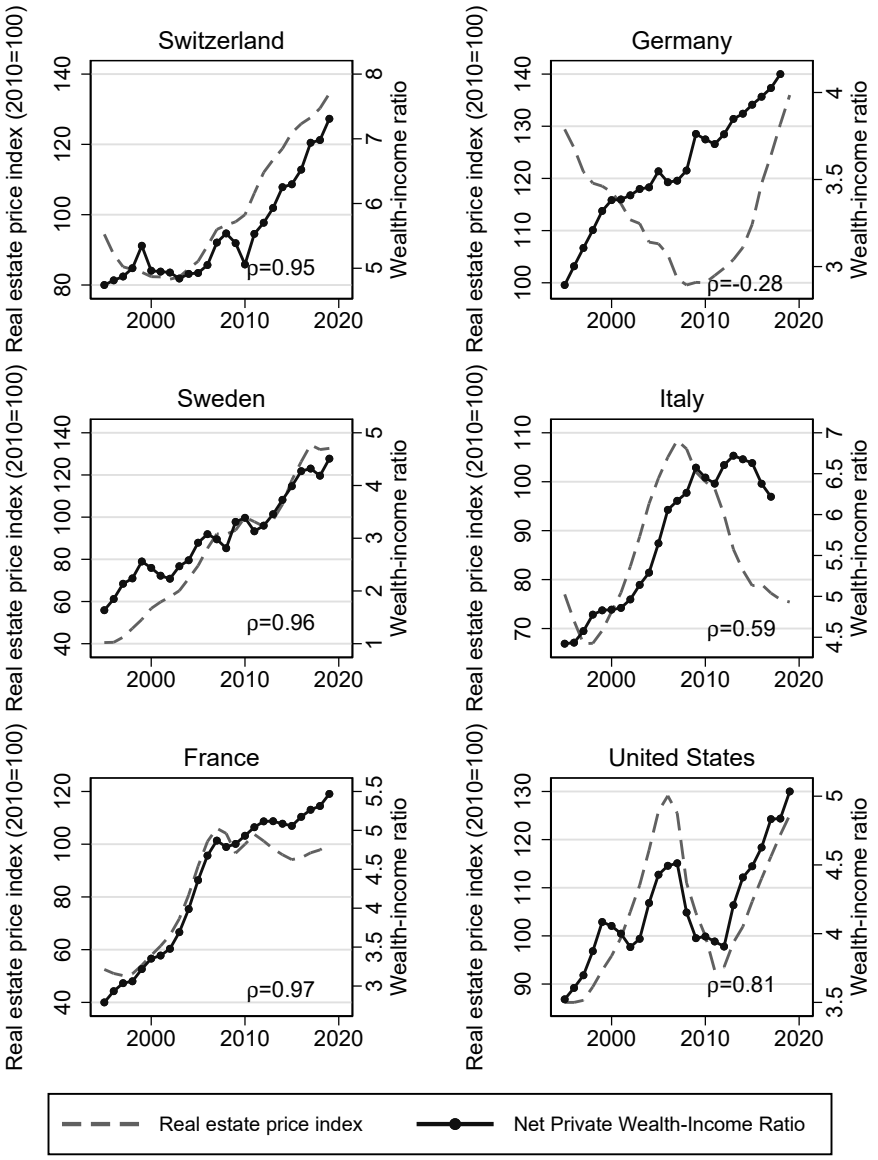


Figure 11: Wealth-Income Ratios and Real Estate Price Indices, 1995–2020

Note: This figure shows private wealth-income ratios in Switzerland, the U.S., Sweden, Germany, Italy and France along with real house price indices of each of those countries. The data for the real house price indices are described in Appendix A.11. Appendix Figure C2 illustrates private wealth-income ratios along with real house price indices for the U.K., Australia, Canada, Spain, Japan and Norway. All international private wealth-income ratios data is available for download at `https://wid.world`.

7 What Explains the Rising Wealth-Income Ratio?

Switzerland's national wealth-income ratio has risen sharply over the past decade. In principle, there are two possible drivers to account for the enormous rise: lower income growth and faster wealth accumulation. The latter can further be the result of an increased saving rate or large capital gains. Such capital gains arise when the valuation of an asset increases, which is why we also refer to capital gains as (relative) price effects. In this section, we discuss these factors in turn.

7.1 Income Growth and Savings

In a model with a constant relative price between capital and consumption goods (and hence no capital gains) as outlined by the Harrod-Domar-Solow formula adopted in Piketty and Zucman (2014), the national wealth-income ratio is in the long-run determined by the national savings and income growth rates: $\beta_n = s/g$. Table 1 presents the savings and income growth rates in Switzerland for the period 1995 to 2020 and three sub-periods.

We draw three findings from this table. First, income growth has declined over time. In the recent period 2010–2020, marked by the large increase in the national wealth-income ratio, national income growth was very low (and even negative in per capita terms). At the same time, real wealth grew at 5.0%. In the preceding 2002–2010 period, in contrast, national income grew extraordinarily fast at 2.9%. This led to only a slight increase in the national wealth-income ratio during that time, despite a relatively high growth rate of national wealth of 3.3%. Second, the net national savings rate has been largely stable over the period 1995–2020.[24] Third, despite the stable evolution of savings and declining income growth, the real growth rate of national wealth has been rising over time.

[24]This stability conceals some heterogeneity in the composition of national savings. For a breakdown of the structure of Swiss national savings, see Appendix Table B1. Appendix Table B2 shows the structure of national savings in an international comparison, whereby the high saving rate in Switzerland should be noted.

			Sub-Periods		
		1995–2020	1995–2002	2002–2010	2010–2020
Income growth					
Real income growth rate	g	1.2%	1.1%	2.9%	0.1%
Population growth rate	n	0.8%	0.5%	0.9%	1.0%
Real income p.c. growth rate	$\hat{g}$	0.4%	0.6%	2.0%	-0.9%
Capital accumulation					
Net saving rate	s	15.5%	15.5%	16.6%	15.0%
Real wealth growth rate	g^w	3.5%	1.7%	3.3%	5.0%
... savings-induced ($g^w_s = s/\beta_n$)	g^w_s	2.8%	3.1%	3.0%	2.4%
... capital gains induced	q	0.7%	-1.3%	0.3%	2.6%
Rel. contribution savings	g^w_s/g^w	78%	177%	91%	48%
Rel. contribution capital gains	q/g^w	22%	-77%	9%	52%
Wealth-income ratio					
At beginning of period	$\beta_{n,t}$	494	494	518	533
At end of period	$\beta_{n,t+d}$	865	518	533	865
Change	$\Delta\beta_{n,t}$	+371 pp	+24 pp	15 pp	+333 pp

Table 1: Income Growth, Saving Rates and Wealth Accumulation in Switzerland, 1995–2020

Note: This table displays annual growth rates of real national income, net national savings, and real wealth, respectively, along with the population growth rate. All growth rates are geometric averages over the indicated period. The average saving rates are obtained by weighting annual saving rates by real national income. The average real growth rate of national wealth, g^w, is decomposed into a savings-induced component, g^w_s, and capital gains or losses, q, using the formula in equation (9). Wealth-income ratios in the corresponding years, $\beta_{n,t}$ and $\beta_{n,t+d}$, are indicated at the bottom of the table. The last row shows the change in percentage points (pp) of the national wealth-income ratio, β_{nt}, over the corresponding period. Detailed information on the data can be found in the corresponding subsections in Appendix A.

Attributing the increase in the national wealth-income ratio merely to a decline in income growth does therefore not do justice to reality.[25] To accommodate the observed real growth in wealth accumulation, we next turn to capital gains.

7.2 Wealth Accumulation Through Capital Gains

While the Harrod-Domar-Solow formula abstracts from capital gains, in reality we do observe large capital gains due to relative price changes. Especially in the short to medium run, capital gains turn out to be crucial for the accumulation and evolution of wealth.

By taking into account capital gains, we can decompose the accumulation of national wealth into a savings and a capital gains component. Following equation (9), 2.8pp of the 3.5% annual real growth rate of national wealth is attributable to savings, leaving a capital gain effect of 0.7pp.[26] Accordingly, four-fifths of the increase in the national wealth-income ratio between 1995 and 2020 is attributable to savings, while capital gains accounted for about one-fifth.

Comparing different sub-periods between 1995 and 2020, Table 1 reveals some remarkable differences in how new savings and capital gains have contributed to the accumulation of national wealth.[27] First, real annual growth of national wealth was about twice as high after the Great Recession than it was in the 1990s and the first decade of the 21st century. Second, the savings-induced growth rate of wealth has been rather stable over the different periods. If anything, the savings-induced growth rate of wealth has been declining and has been lowest in

[25]This is also apparent from the international comparison of growth rates and changes in national wealth-income ratios, summarized in Appendix Table B3. Empirically, higher growth rates coincide with an increase in β_{nt}, which is unreasonable on the basis of a one-good capital accumulation model.

[26]Note that because we have to estimate capital gains as a residual, these figures may include not only actual valuation effects but also potential measurement errors.

[27]Table B4 in the Appendix provides the same decomposition for Switzerland, Germany, France, Italy, Sweden and the United States.

the 2010–2020 period, for which we observe by far the largest increase in the national wealth-income ratio. Third, we can distinguish three sub-periods which mark the changing importance of capital gains over time: i) Between 1995 and 2002, capital gains were negative, such that capital losses dampened the real growth of national wealth. ii) From 2002 to 2010, the growth rate of national wealth was almost exclusively determined by savings. Capital gains induced growth was virtually zero and in line with the Harrod-Domar-Solow formula. iii) In the most recent period from 2010 to 2020, national wealth grew exceptionally fast as a result of high capital gains. Substantial capital gains of around 2.6% per year have more than doubled the growth rate of real national wealth to 5.0% in the years between 2010 and 2020.

Hence we conclude that the marked increase in the national wealth-income ratio after the Great Recession was mainly driven by the emergence of large capital gains, which led to a substantial increase in the national wealth growth rate. At the same time, this period coincided with a considerable deceleration in income growth, allowing the wealth-income ratio to rise even more.

7.3 The Origin of Capital Gains: Housing vs. Financial Wealth

Next, we turn to the nature of these capital gains. From 2000 to 2020, real national net wealth rose by 2'209 billion Swiss francs, 88.4% of which is attributable to an increase in private wealth.[28] Therefore, in this section, we focus on private wealth, which can further be decomposed into financial and housing wealth.

Analogous to Table 1, Table 2 decomposes the real growth rate of total net private wealth, W_{pt}, as well as gross housing wealth, H_{pt}, and net financial wealth, $F_{pt} - L_{pt}$, into a savings-induced and an estimated capital gains component.[29] Again we study different periods, but due to limited data availability of different components of private wealth prior to the year 2000 (as

[28] As in Table 1, Table B5 in the Appendix provides a decomposition of the growth rates of national wealth into a savings and a capital gains component for the period 2000–2020, breaking down national wealth according to its components of private and public wealth.

[29] The approach and the data with which we decompose the real growth rates are described in detail Appendix A.10.

described in Section 4), this analysis is limited to the first two decades of the 21st century.

Over the entire 2000–2020 period, housing wealth grew much faster, at 4.0% per year, than net financial wealth, at 2.5%. However, at 2.3%, the savings-induced growth rate was about just as large for housing wealth as it was for financial wealth. What sets the two of asset classes apart are the large capital gains incurred in the housing sector over this period, which contributed 1.6pp (or 42%) to the annual growth rate. In contrast, financial assets hardly incurred capital gains (0.2pp) over this period, resulting in only a slight increase in the overall growth rate in net financial wealth.

In fact, financial wealth experienced very substantial capital losses in the first decade of the 21st century, as shown in Panel B of Table 2. During this period, financial markets were hit by both, the Dot-com Bubble and the Great Recession. Nevertheless national income grew, and as a result the financial wealth-income ratio fell between 2000 and 2010. On the other hand, housing wealth grew considerably faster than national income, so the overall ratio of total private wealth to income remained virtually unchanged during that period. The savings-induced growth rate in financial wealth remained high between 2000 and 2010. It was even significantly higher than in the subsequent period (shown in Panel C of Table 2), and considerably higher than the savings-induced growth rate in housing wealth. Yet while net financial wealth suffered from capital losses, housing prices picked up, which contributed to an annual increase of 1.0% in housing wealth.

Growth in housing wealth accelerated further after 2010, spurred once more by capital gains. And their role seems to be growing over time: they made up almost half of the 4.8% annual growth rate in housing wealth between 2010 and 2020. Performance of housing wealth since 2010 has been exceptional: in less than a decade, housing wealth grew by more than the size of one and a half years of national income. About half of this increase is the result of a relative increase in real estate prices.

Financial wealth recovered and grew at a high rate as well during the 2010–2020 period, but growth still remained below that of housing wealth. Overall, housing wealth has been gaining ground over financial wealth since the turn of the century. As a result, the housing wealth-to-

income ratio stood at 426% in 2020—193pp higher than almost two decades earlier.[30]

[30]For a formal analysis of the correlation between housing prices and the wealth-income ratio, see the extension in Appendix C.

	Private wealth-income ratio		Decomposition of the private wealth growth rate (%)		
			Real growth rate of private wealth	Savings-induced wealth growth rate	Capital gains induced wealth growth rate
	$\beta_{p,t}$	$\beta_{p,t+n}$	$g_w = g_{ws} + q$	$g_{ws} = s/\beta_p$	q
Panel A: 2000–2020					
Total Private Wealth	496%	793%	3.3% 100	2.4% 72	0.9% 28
Housing Wealth	233%	426%	4.0% 100	2.3% 58	1.6% 42
Net Financial Wealth	263%	367%	2.5% 100	2.3% 92	0.2% 8
Panel B: 2000–2010					
Total Private Wealth	496%	506%	1.9% 100	2.4% 127	-0.5% -27
Housing Wealth	233%	268%	3.1% 100	2.1% 67	1.0% 33
Net Financial Wealth	263%	238%	0.6% 100	2.8% 430	-2.1% -330
Panel C: 2010–2020					
Total Private Wealth	506%	793%	4.7% 100	2.3% 49	2.3% 51
Housing Wealth	268%	426%	4.8% 100	2.5% 53	2.2% 47
Net Financial Wealth	238%	367%	4.5% 100	1.9% 43	2.5% 57

Table 2: The Accumulation of Private Wealth in Switzerland, 2000–2020

Note: This table displays the changes in private net wealth $W_{p,t}$ and its to main subcomponents—private housing, (H_{pt}), and non-housing wealth, ($F_{pt} - L_{pt}$)—between 2000 and 2020. The first two columns indicate the level of the total private wealth-income ratio $\beta_{p,t}$, the housing wealth-income ratio and the net financial wealth-income ratio respectively in the corresponding years. The third column shows the average real growth rate g_w of the respective wealth components

over the different time periods. With the formula in Equation (9) it is possible to decompose the real wealth growth rate g_w into two multiplicative components. Where one part of the wealth growth rate is savings-induced g_s^w and the other part are capital gains or losses q. The methodology used to decompose the changes of the depicted private wealth categories into a savings and capital gains component is described in detail in Section A.10 in the Appendix. Note that the saving rate used in the above decomposition is the net saving rate of private households. The results of the same decomposition using the net private saving rate (including retained earnings of corporations) is shown in Table B6 in the Appendix (see in this context also Footnote 54). All growth rates are geometric averages. Detailed information on the data can be found in the corresponding subsections in Appendix A.

8 Conclusion

In this paper, we combine new data to estimate the private wealth-income ratio, β_{pt}, in Switzerland over the past 120 years. Our results show that the wealth-income ratio was extraordinarily stable over the 20th century. After World War I, β_{pt} oscillated around 500% until after the Great Recession. In contrast to other European countries, the evolution of β_{pt} in Switzerland did therefore not follow a U-shaped pattern during the 20th century, but is rather characterized by a steep, J-shaped increase after 2010. Our results further show that aggregate private wealth was likely higher than previous estimates by Brülhart et al. (2018) had suggested.

Switzerland benefited from being a neutral bystander in both world wars, during which the country maintained economic relationships with all conflict parties. In contrast to many other countries, Switzerland did not suffer from war destruction. The stable Swiss currency started to serve as a safe haven for international capital. Following the free market paradigm, international capital transactions were hardly regulated at all, allowing money to flow freely in and out of the country. This in turn spurred the development of the financial industry and already in the 1920s Switzerland was a global financial center. At the same time, economic and social policy remained conservative. After WW II, the expansion of the welfare state was much more limited in Switzerland than in other western economies. The goal of the leading political forces was to keep government small. This was also achieved through small government debt and an encompassing low-tax strategy. It is this environment of low taxes on income and wealth for both, individuals and corporations, that also attracted many wealthy foreigners. One tax instrument in particular, the expenditure-based taxation of wealthy foreigners with no labor income earned in Switzerland, helped domicile rich taxpayers from abroad. Taken together, all these factors made Switzerland a safe harbor for wealth and wealth accumulation by international standards, allowing fortunes to build up and persist during the postwar period.

Since the turn of the century and especially since 2010, however, we document a strong deviation from the long-term stable trend. From 2010 to 2020, the share of private wealth relative to national income rose from 506% to 793%. Even more, the national wealth-income ratio increased rapidly from 533% to 865%. These are level unprecedented in the 20th century. Mainly driven by large capital gains, real wealth was growing at a high rate. At the same

time, this period coincided with a considerable deceleration in income growth, leading to a fast increase in the wealth-income ratio.

The steep rise in the private wealth-income ratio is particularly attributable to capital gains in housing wealth: since 2010, capital gains in real estate alone have contributed to an increase in private wealth on the order of three-quarters of annual national income. This development was likely fueled by the expansionary monetary policy of the past decade—with low and, since December 2014, even negative interest rates. At the same time, the mortgage debt-income ratio rose by 40% between 2010 and 2020. Switzerland therefore bears important similarities with Spain, where the marked rise in β_{pt} had been driven by real-estate bubbles (Artola Blanco et al., 2021). Our results may be interpreted as a serious warning signal for an overheating of the Swiss real estate market.

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Appendix

Wealth-Income Ratios in Free Market Capitalism: Switzerland, 1900–2020

Enea Baselgia Isabel Z. Martínez

Contents

A Data

In this section, we provide the comprehensive description of all data sources used in our analysis. We explain the data by category from the most recent years to the past, as some series are constructed by backward interpolation.

A.1 Private Wealth (W_{pt})

For the years 2000–2020, official and reliable data of aggregate private wealth at market value are provided by the SNB in the context of the Swiss financial accounts.[31]

For the period 2000–2020, private wealth can be split up into three main components: financial assets F_{pt}, financial liabilities L_{pt} and non-financial assets K_{pt}. The position financial assets particularly consist of currency and transferable deposits, debt securities (short-term, long-term and structured products), shares and other equity, units in collective investment schemes as well as insurance and pension schemes. The stock of liabilities L_{pt} is composed of mortgages, loans and other accounts payable.

For private non-financial assets K_{pt}, the SNB only reports estimates on housing wealth H_{pt}. To the best of our knowledge, no estimates on the value of agricultural land and A_{pt} and other domestic capital D_{pt} exist for Switzerland. Therefore, in our analysis, private non-financial assets consist only of housing wealth ($K_{pt} = H_{pt}$), which implies that $A_{pt} = D_{pt} = 0$.[32]

For the years prior to 2000, no official statistics on the value of net private wealth for Switzerland exist. For the period 1981–1999, we use the aggregate net private wealth estimates submitted by Schmid (2013), who could rely on SNB internal data, which are partly gathered numbers from hardcopy prints of the relevant statistics and are not publicly available.[33] Since the estimates of Schmid (2013) follow the estimation techniques of the SNB, we consider this estimates to be relatively reliable.

[31] `https://data.snb.ch/en/publishingSet/FIN`

[32] For the countries with which we compare our results all three components (H_{pt}, A_{pt}, D_{pt}) of K_{pt} are available on WID.world. We have excluded A_{pt} and D_{pt} for the comparison countries in Section 6, but included A_{pt} and D_{pt} in Section 5. This decision is set out in the Appendix A.2 (see in particular Figure A1 and Figure A2).

[33] Data received on email request: frank.schmid@sif.admin.ch We are very grateful to Frank Schmid for sharing his data with us.

For the years prior to 1981, we follow an alternative approach, due to the lack of total wealth at market value. We combine historical wealth tax data with non-taxable pension wealth data, similar to Brülhart et al. (2018).

The primary sources we use to construct our net private wealth series are the wealth estimates based on tax data provided by (Dell et al., 2007, Table 11.3, Column 2). Their estimates cover 22 years between 1913 and 1997. We linearly interpolate the missing years of this period. To extend private wealth estimates back to 1900 we use additional tax data for the years 1900 and 1910 based on the assumption that taxable wealth represented 80% of taxable capital.[34] Again, we linearly interpolate the missing years, which leads to a tax wealth series covering the period 1900–1997.

The Swiss wealth tax base is extremely broad. With the exception of household effects, all types of assets are subject to the wealth tax: real estate, land, non-incorporated business assets, financial assets (including cash, shares, bonds, private loans, etc.), cars, as well as art, jewelry, and collectibles. Moreover, the Swiss wealth tax applies to global wealth, i.e., taxpayers are legally required to report assets held abroad. Some of these assets, in particular real estate held abroad, are not taxed in Switzerland, but must be reported to account for tax progressivity and obtain the correct tax rate. All Swiss residents above the legal age (18 years since 1996, 21 years before) are required to file a tax return and report their global income and wealth, even if their wealth may be below the exemption level. Wealth owned by children is reported in their parents tax return (e.g., bank accounts) or they file even before reaching the legal age (e.g., if they own real estate). In historical statistics, taxpayers with zero wealth or those with very low levels of wealth were sometimes omitted from the tables. Yet while this poses some challenges to the estimation of top wealth shares (e.g., in Dell et al., 2007), this is much less of a concern in our case—even more as our estimates of total wealth will be based on historical growth rates rather than the historical levels.[35] Given the design of the Swiss wealth tax and the careful

[34]The data is obtained from the statistical yearbook 'Statistisches Jahrbuch der Schweiz 1920' (p. 395). We derive the assumption that taxable wealth represents 80% of taxable capital by comparing the two observations of taxable capital from 1913 (81%) and 1919 (79%) with the observations reported by Dell et al. (2007).

[35]In 1913, 1919, 1969, 1981, 1991, and 1997, the tax statistics covered 100 percent of private taxable wealth (see Table 11.3 in Dell et al., 2007)). In these years, the statistics are based on aggregated cantonal statistics, where cantons had to report all taxpayers and their wealth holdings, including those below the exemption level and those with zero wealth. In addition, Dell et al. (2007) used cantonal tax statistics covering the entire cantonal distribution of taxpayers, and extrapolated the distribution

estimates by Dell et al. (2007), total wealth obtained from wealth tax statistics is not affected by changing shares of taxpayers subject to the wealth tax, nor by changes in the definition of the tax base. Due to the encompassing nature of the wealth tax, tax authorities do not distinguish between asset types, such that to this day, all wealth tax statistics report only total wealth. It is therefore unfortunately not possible to distinguish between different asset types.

Estimating net private wealth based on Swiss wealth tax data has two main drawbacks. First, pension wealth is not covered at all in tax data. Second, the tax value of real estate underestimates the true market value (Brülhart et al., 2018).

To account for the first issue, we use estimates of pension fund assets to correct the private wealth series based on tax data. For this purpose, we relied on historical estimates of total pension fund assets as reported by Leimgruber (2008). The estimates of Leimgruber (2008) cover 13 years between 1922 and 2004. We linearly interpolated these estimates for the missing years. In 1922, total pension wealth was only 200 million nominal Swiss francs. Since there exist no older observations, we assume that the pension assets before 1922 are equal to 0.

From the sources outlined we have two linearly interpolated series for tax wealth (1900–1997) and pension wealth (1900–2004). To estimate a long-run series of total net private wealth we proceed as follows. First, we add up these two linearly interpolated series. To address the second issue—the undervaluation of housing wealth in tax data—we do not use the absolute nominal value of the combined series of tax private wealth (including an optional mark-up) and pension wealth. Instead we calculate the growth rate of this combined series. By applying this growth rate to the last market value observation of private wealth recorded by Schmid (2013) in 1981, we estimate private wealth back to the year 1900. Prior to 1981, we only display estimates of net private wealth for years in which we have an actual observations from tax data (see, e.g., Figure 1).

Our estimation approach relies on the assumption that changes in taxable wealth (including private pension wealth) correspond well to changes in total private wealth at market value. To verify this assumption, we compare the growth rate of total private wealth at market value (as provided by the SNB) with the growth rate of taxable wealth (including pension wealth) for

to obtain the wealth distribution and total wealth at the national level.

the period 2003–2018, where annual data for both series exist.[36] Figure B2 shows the annual percentage change in private wealth at market value and taxable wealth (including pension wealth) for the period 2003–2018. Growth rates track each other extremely well including the years around the outbreak of the Great Recession in 2008, which are characterized by large changes from year to year. We are therefore confident that our method is valid to estimate total private wealth at market value over time.

A.2 Remarks on Agricultural Land A_{pt} and Other Domestic Capital D_{pt}

As described in Section 4, there exists no data on the value of agricultural land A_{pt} and other domestic capital D_{pt} for Switzerland. Therefore, in our post-1990 analysis (Sections 6 and 7), private non-financial wealth only consists of housing wealth, such that $K_{pt} = H_{pt}$, implying that $A_{pt} = D_{pt} = 0$. To compare like with like, we subtract the sum of A_{pt} and D_{pt} (shown in Figure A1), from total net private wealth W_{pt} for all reference countries in all analyses and figures in Sections 6 and 7. Note that if by subtracting $A_{pt} + D_{pt}$ from W_{pt}, net national wealth, W_{nt}, decreases, too.

[36] For taxable wealth, we use data from the Swiss wealth statistics for natural persons published annually between 2003 and 2018 by the Swiss Federal Tax Administration (`https://www.estv.admin.ch/estv/de/home/allgemein/steuerstatistiken/fachinformationen/steuerstatistiken/gesamtschweizerische-vermoegensstatistik-der-natuerlichen-person.html`). For pension wealth we use the data provided by the SNB. Note that the results shown in Figure B2 are not driven by the inclusion of the pension wealth data. The omission of the pension wealth would only marginally reduces the correlation from 0.89 to 0.88.

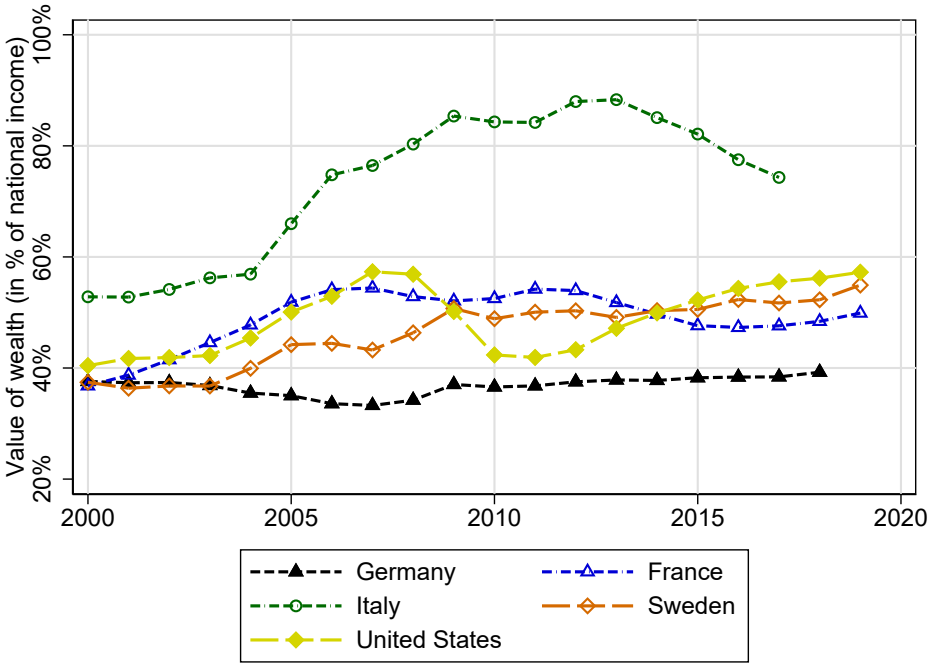
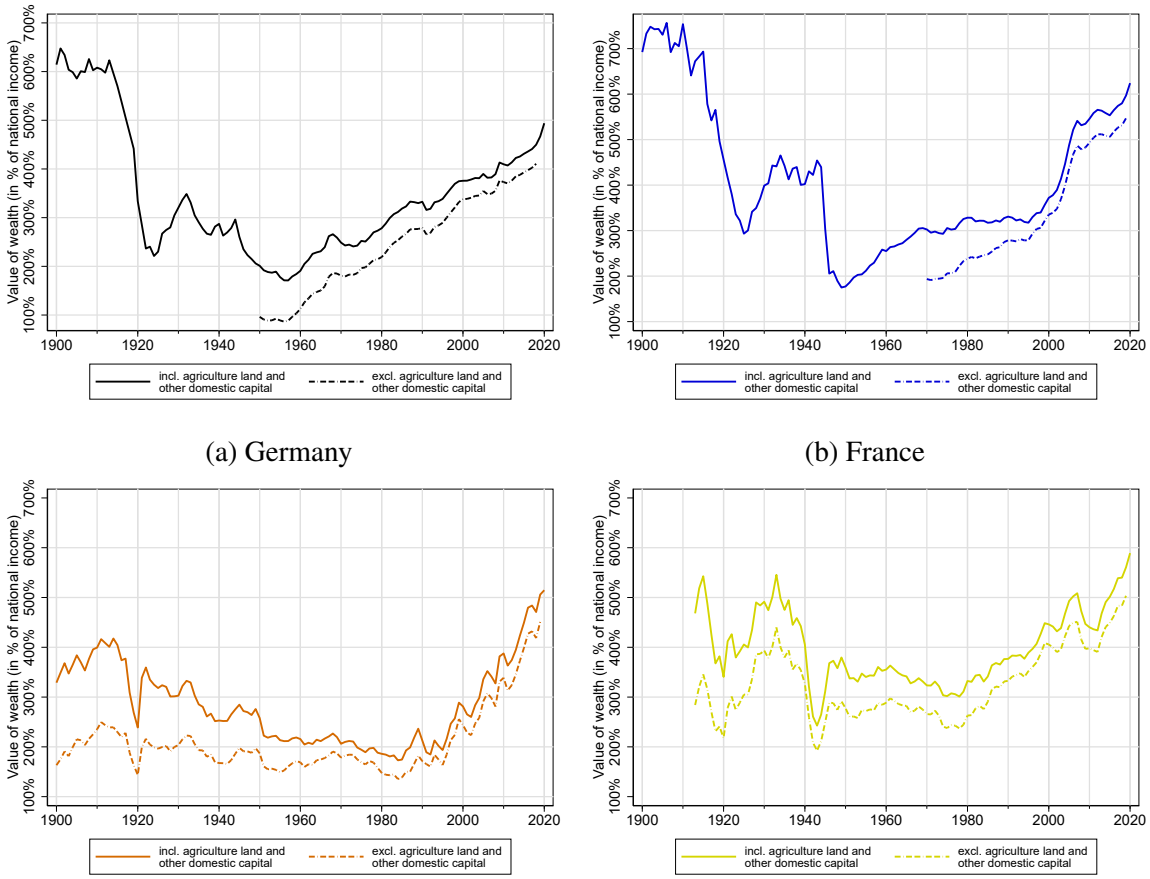


Figure A1: Agricultural Land and Other Domestic Capital ($A_{pt} + D_{pt}$), 2000–2020

Note: This figure displays the evolution of the sum of agricultural land A_{pt} and other domestic capital D_{pt} in terms of net national income Y_t for the countries indicated from 2000 to 2020. We subtract this ratio from β_{pt} and β_{nt} in Section 6 and 7 in order to compare the evolution of these countries with Switzerland, where no data for A_{pt} and D_{pt} exist. The series for Germany, France, Italy and the United States are based on Piketty and Zucman (2014), and on Waldenström (2017) for Sweden. All these have been updated and are available for download from `https://wid.world`.

As discussed in more detail in Section 4, our estimation method (backward extrapolation) leads to an estimate of private net wealth at the beginning of the 20th century that includes, at least in part, the value of agricultural land and other domestic capital. Our approach only fails to account for a share equal to $\phi_{1981} = (A_{p1981} + D_{p1981})/W_{p1981}$ of W_{pt} for all years prior to 1981 (under the assumption that the growth rates we use for backward extrapolation are correct). International evidence (see Figure A1 and A2), and in particular the estimation of A_{pt} capitalizing revenues per hectare into agricultural land values (see below), suggests that our long-run estimate likely captures most of W_{pt}. Therefore, to allow for a reasonable comparison, we do not exclude A_{pt} and D_{pt} from all long-run international series in Section 5.[37]

[37]Moreover, the values for A_{pt} and D_{pt} over a longer period of time are only available for Sweden and the United States anyway (see Figure A2).



(a) Germany

(b) France

(c) Sweden

(d) United States

Figure A2: Private Wealth-Income Ratios including and excluding A_{pt} and D_{pt}, 1900–2020

Note: This figure displays the evolution of the private wealth-income ratio β_{pt} for the countries indicated from 1900 to 2020. Where the solid line shows the evolution β_{pt} including the value of A_{pt} and D_{pt}. The dotted line, on the other hand, shows the development of β_{pt} without A_{pt} and D_{pt}. In particular, the graph for the United States and Sweden show that the importance of agriculture land was greater at the beginning of the century. The series for Germany, France and the United States are based on Piketty and Zucman (2014), and on Waldenström (2017) for Sweden. All these have been updated and are available for download from `https://wid.world`.

A.2.1 Estimating the value of agricultural land through capitalization of revenues

Quantifying the fraction ϕ that is missing from our historical estimates is challenging, as there are no data on A_{pt} and D_{pt}. Unfortunately, were unable to produce an estimate of D_{pt} due to the lack of corresponding data. For the total value of agricultural land A_{pt}, we produced a time series using the following capitalization approach. We used historical statistics on agricultural land surface (including productive forests),[38] and multiplied the surface with the average return

[38] Source: Historische Statistik der Schweiz HSSO, 2012. Tab. I.42. `https://hsso.ch/2012/i/42`. We linearly interpolated missing years.

per hectare[39] to obtain an estimate of total income generated with the underlying agricultural land. These estimates, however, suffer from considerable measurement error, as the returns per acre vary a lot by type of agricultural land (grass land, fruit and vegetable farming, forests, etc.) and farm size. The reported average revenues seem to be unweighted arithmetic averages from different farm categories (Schweizerisches Bauernsekretariat, 1935, p. 87). Unfortunately, we cannot estimate returns by type of agricultural land and farm size, as we lack information on these surfaces such that we recur to the overall average return per hectare, which is available on a yearly basis from 1901 to 1995.

We then capitalized the total revenue into the value of the underlying land using long-term nominal interest rates for Switzerland, reported in Jordà et al. (2019). These rates coincide well with average debt interest rates for farmers in the year of approval of an investment loan.[40] Because both, interest rates and revenues, fluctuate a lot from year to year, we smooth the series using a 20-year moving average before capitalizing the revenues into land values. Note that the capitalization method is very sensitive to the choice of the interest rate. Furthermore, it collapses completely in times of negative reported revenues (e.g., due to a bad harvest) or in times of negative interest rates (prevalent in Switzerland since 2014). How agricultural subsidies should be taken into account is another question that remains unanswered, as it is not clear whether they were included in the reported revenue statistics or not.

Figure A3 shows our estimate of the value of A_{pt} using this capitalization approach as a share of total private wealth for the period 1950-1996 (afterwards, the agricultural revenue statistics are not available anymore). This result suggests that the value of agricultural land as a share of private wealth has been extremely low over the past decades, eventually collapsing completely. In 1981, the year from which we extrapolate backwards, its value is estimated at 1.5 percent of total private wealth. This, in turn, would suggest that our approach of backward extrapolation would miss only a negligible fraction of the total W_{pt}.

Going back in time, the our estimate of A_{pt} (expressed in terms of W_{pt}) increases drastically

[39] Source: Historische Statistik der Schweiz HSSO, 2012. Tab. I.27a. `https://hsso.ch/2012/i/27a` and Historische Statistik der Schweiz HSSO, 2012. Tab. I.27b. `https://hsso.ch/2012/i/27b`, column "Reinertrag".

[40] Available only for the years 1967–1995. Source: Historische Statistik der Schweiz HSSO, 2012. Tab. I.32. `https://hsso.ch/2012/i/32`.

(while the share of agricultural land in total surface changed only gradually). At the beginning of the 20th century, A_{pt} would correspond to 60 percent of total private wealth. This strikes us an unreasonably high share by international standards of that time (Piketty, 2014; Piketty and Zucman, 2014). Previous research suggests that in the old world, the large fall in agricultural land value happened before 1900/1910, and that the value of agricultural land has been very small relative to national income since the 1920s.

A closer look at prior publications shows that estimates on land value seem to vary considerably. For example, (Piketty, 2014, Figure 4.1), suggests that in Germany the value of agricultural land in terms of national income seems to have been negligible since the 1970s. In contrast, data for Germany provided by the wid.world database more recently, suggest a value of agricultural land of approximately one year of national income in 1960, and about half a year's national income since the mid-1990s (see A2). In our view, this discrepancy reflects the difficulty of obtaining reliable historical market values for these types of assets.

Although this is the first attempt to estimate the value of agricultural land over a longer period of time for Switzerland, we do not consider the result of this estimation to be very robust. This estimate should be taken with great caution. We leave it for future research to find better ways to estimate a consistent series of agricultural land values and hope that our explanations will still provide some helpful inputs.

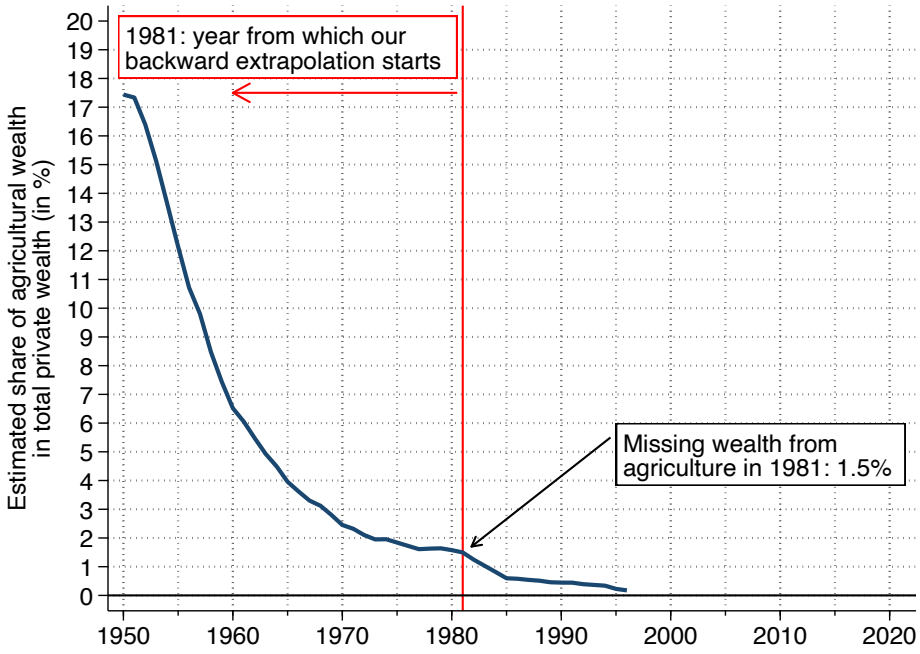


Figure A3: Agriculture Land as Share of Total Net Private Wealth, 1950-1996

Note: This figure displays net agricultural land values, A_{pt}, estimated via capitalization method, as a share of total private net wealth, W_{pt}. See text for details on data sources and computations.

A.3 Public Wealth (W_{gt})

Data on public gross financial wealth, public gross non-financial wealth, public gross debt and thus public net wealth W_{gt} can be obtained for the period 1990–2020 from the GFS-Model of the Federal Finance Administration.[41] With the GFS-Model, international comparability of the Swiss data is ensured, since the financial statistic standard of the International Monetary Fund (IMF) is applied, which is in turn compatible with the ESA-2010.

In the non-financial assets time series at the federal-level, a significant one-time shift occurs. From 2006 to 2008, non-financial assets increased from 41.8 to 84.6 billions Swiss francs (see Figure B9). This level shift is due to a break in the series in 2008, where accounting followed the new FS-Model. The Federal Finance Administration itself notes that the new standards introduced in 2008 restrict comparability with the figures in the national FS-Model from earlier years. Since the GFS-Model is based on the FS-Model, statistical inaccuracies cannot be ruled

[41] `https://www.bfs.admin.ch/bfs/en/home/statistics/general-government-finance/financial-situation/gfs-model-international-IMF.html`

out.[42]

We corrected for this brake in the series by applying the average growth rate of non-financial assets at the federal level (computed based on the years 1990–2006 and 2009–2020) for the two years 2007 and 2008. This adjustment is shown graphically in Figure B9. This leads to a more steady and plausible evolution of public non-financial assets. Note that this correction not only affects non-financial assets but also total net public wealth. Thus, since national wealth is the sum of private and public wealth this correction also slightly changes the value of national wealth.

As previously noted (e.g. in Section 4), there are no comprehensive and internationally comparable data on public wealth for Switzerland prior to 1990. Therefore, in order to examine the relevance of public wealth in the 20th century, we rely on other sources. The long-run public wealth series shown in Figure B13 are based on several historical sources, which are discussed below. Note, however, that the historical estimates in Figure B13 are not directly comparable to the estimates analyzed and discussed in the main part (see Section 6.2) due to differences in statistical collection methods and standards. In particular, considering Panel a) in Figure B13 suggests that estimates of W_{gt} obtained from the GFS Model, which follows current international statistical standards, yield a slightly higher valuation of public assets compared with historical estimates of W_{gt}.

Net public wealth at the cantonal level (historical estimate)—as shown in Panel a) of Figure B13—corresponds to total equity of all cantons (i.e. financial assets + administrative assets − liabilities). These values for public net wealth are obtained from the following sources. For the period *1930–1971*, the data are taken from the publication "Finanzhaushalt der Kantone 1930–1971 (Statistische Quellenwerke der Schweiz / Heft 520)" on p. 27. For *1973*, from the publication "Öffentliche Finanzen der Schweiz 1977 (Statistische Quellenwerke der Schweiz / Heft 630)" on p. 50–51. For the years *1974–1978*, from the publication "Öffentliche Finanzen der Schweiz 1978 (Statistische Quellenwerke der Schweiz / Heft 648)" on p. 50–51. For *1979*, from the publication "Öffentliche Finanzen der Schweiz 1982 (Statistische Quellenwerke der Schweiz / Heft 771)" on p. 50–51. For the period *1980–1989*, I have received the corresponding

[42] `https://www.efv.admin.ch/efv/en/home/themen/finanzstatistik/methoden.html` (published on 13.04.2016).

data from the Federal Finance Administration (FFA) by e-mail upon request.[43] For the years *1990–2020*, the historical estimates of W_{gt} are take from FS-Modell (Switzerland's own public finance statistics) as provided by the FFA.[44]

The historical estimate of public net wealth at the federal level—as shown in Panel b) of Figure B13—is compiled from the following sources. For *1950, 1955, 1960, 1965, 1970, and 1973–1977*, data are taken from the publication "Öffentliche Finanzen der Schweiz 1977 (Statistische Quellenwerke der Schweiz / Heft 630)" on p. 34–35. For *1978*, from the publication "Öffentliche Finanzen der Schweiz 1978 (Statistische Quellenwerke der Schweiz / Heft 648)" on p. 34–35. For the years *1979–1982*, from the publication "Öffentliche Finanzen der Schweiz 1982 (Statistische Quellenwerke der Schweiz / Heft 771)" on p. 34–35. For the years *1983–1985*, from the publication "Öffentliche Finanzen der Schweiz 1985 (Amtliche Statistik der Schweiz, Nr. 119)" on p. 34–35. For the years *1986–1987*, from the publication "Öffentliche Finanzen der Schweiz 1987 (Amtliche Statistik der Schweiz, Nr. 229)" on p. 34–35. For the years *1988–1989*, from the publication "Öffentliche Finanzen der Schweiz 1989 (Amtliche Statistik der Schweiz, Nr. 328)" on p. 34–35.

A.4 National Wealth (W_{nt}) and Net Foreign Wealth (NFA_{nt})

Because the market-value of national wealth W_{nt} is simply the sum of private and public wealth, no additional data is needed to construct a national wealth series. Equation (3) shows that national wealth can be decompose into domestic capital K_{nt} and net foreign wealth NFA_{nt}. For the period 1990–2020, net foreign wealth is published by the SNB as part of the Swiss balance of payments.[45]

[43] Email: finstat@efv.admin.ch.

[44] `https://www.efv.admin.ch/efv/en/home/themen/finanzstatistik/daten.html`

[45] `https://data.snb.ch/en/topics/aube#!/cube/auvekoma`

A.5 Net National Income (Y_t)

For the years 1995–2020, we use net national income as published by the FSO as part of the Swiss national accounts (B5n, S1).[46] These are the best data available, since they are fully compatible with the SNA-2008 and can therefore be compared internationally. We used growth rates of similar historical income data to calculate net national income back until 1900. In case of overlaps in the data, we always prefer to calculate the growth rates based on national income at market prices. For the period 1990–1994, we use the growth rates of national income at factor cost ("Volkseinkommen") that can be found in table Q.5. from the HSSO-database.[47] For the years 1948–1989, we use growth rates of net national income that are also available at the HSSO-database in table Q.6a. For the period 1929–1947, there exist again data of national income at factor cost at the HSSO-database in table Q.4a. For the years 1900–1929, we had to resort on historical nominal GDP data estimated by Stohr (2016).[48]

A.6 Population (N_t)

Data on Switzerland's total population are available from the FSO for the period 1861–2020.[49] The balance of the permanent resident population is composed of different statistical sources by the FSO. Although the individual data sources change over time, this long-run population series is the most reliable data available.

The population data in WID.world corresponds to the population of a country on July 1 of the year indicated (Blanchet and Chancel, 2016). For Switzerland, no such data exist. We therefore used the average of the total population between January 1 and December 31 of the year in question. This ensures comparability across countries.

[46] https://www.bfs.admin.ch/bfs/en/home/statistics/national-economy/national-accounts/sequence.html

[47] https://hsso.ch

[48] Data received on email request: christian.stohr@unige.ch. We are very grateful to Christian Stohr for sharing this data with us.

[49] https://www.bfs.admin.ch/bfs/en/home/statistics/catalogues-databases/tables.assetdetail.9486043.html

A.7 Price Index

Sometimes we show the absolute value of wealth at constant prices, rather than wealth-income ratios. To deflate the nominal wealth or national income series, we use a composed consumer price index (CPI). Switzerland's CPI can be obtained for the period 1914–2020 from the FSO.[50] To prolong this series back to 1900, we used CPI data available at the HSSO-database in table H.17.[51]

A.8 Savings and Savings Rates (s_t)

The various net savings flows can be directly obtained from the Swiss national accounts.[52] Net saving rates are then calculated by dividing the corresponding net savings flow by net national income (B.5*n, S1). We always include the savings of the NPISH sector (B.8n, S15) in the household sector (S14). The following net savings rates are computed:

- non-financial corporate savings = (B.8n, S11)/(B.5*n, S1)
- financial corporate savings = (B.8n, S12)/(B.5*n, S1)
- corporate savings = non-financial + financial corporate savings
- household savings = (B.8n, S14 + B.8n, S15)/(B.5*n, S1)
- private savings = corporate savings + household savings
- public savings = (B.8n, S13)/(B.5*n, S1)
- national savings = private savings + public savings = (B.8n, S1)/(B.5*n, S1)

[50] https://www.bfs.admin.ch/bfs/en/home/statistics/prices/consumer-price-index.html

[51] https://hsso.ch

[52] https://www.bfs.admin.ch/bfs/en/home/statistics/national-economy/national-accounts/sequence.html

A.9 World Inequality Database

Most international data we show in this paper can be obtained directly from the World Inequality Database (WID.world).[53] The series for Australia, Canada, France, Germany, Italy, Japan, the U.K. and the U.S. are based on Piketty and Zucman (2014), on Artola Blanco et al. (2021) for Spain and on Waldenström (2017) for Sweden. All these have been updated and are available for download from WID.world. The corresponding data for Norway are WID.world estimates.

Further note that for the countries other than Switzerland all three subcomponents of K_{pt} (H_{pt}, A_{pt}, D_{pt}) are available. We refer to the remarks in Appendix A.2 to comprehend which adjustments we made to ensure that the international data is as comparable as possible with Switzerland.

A.10 Savings and Capital Gains in Private Wealth

In Section 7, we split the newly accrued accumulation of net national respectively private wealth—and it's two main subcomponents non-housing wealth (i.e., net financial wealth including pension wealth) and gross housing wealth—into a savings and capital gains component. This section outlines the methodological procedure and the additional sources used.

For the decomposition of national wealth shown in Table 1 we use Equation (9). The only unknown variable in Equation (9) is the rate of capital gain or loss q_t, which is simply calculated as a residual. The data sources for the other variables β_{nt}, g^w_{st} and g^w_{st} variables are outlined in corresponding sections in Appendix A. For the national wealth-income $\beta_{nt} = \frac{W_{nt}}{Y_t}$, they can be found in A.4 for W_{nt} and for Y_t in A.5. To compute the savings-induced wealth growth rate $g^w_{st} = \frac{s_t}{\beta_{nt}}$ one needs additional data on national savings as set out in A.8. The data sources of the growth rate of national income g_t are described in A.5.

The decomposition of net private wealth and it's subcomponents housing wealth and net financial wealth as shown in Table 2 is conducted as follows. By using Equation 7 the level decomposition of the year to year change in net private wealth is straightforward. By deducting

[53] `https://wid.world`

the net savings flow of private households[54] (source outlined in A.8) from the year to year change in net private wealth (source of private wealth and it's subcomponents are outlined in A.1) one immediately obtains the capital gains or loss flow KG_t of net private wealth.

For the analysis conducted in Section 7 we split net private wealth into two subcomponents non-housing wealth (i.e., net financial wealth including pensions wealth, $F_{pt} - L_{pt}$) and gross housing wealth H_{pt}. Since we observe the stock at market value of both subcomponents every year since 2000, we can compute the year to year change in levels. To further split the changes of both subcomponents into savings and capital gains part, we use additional data provided by the SNB in the context of the Swiss financial accounts.[55] For the year to year change in the stock of total net financial wealth the SNB provides detailed information and decomposes the changes into financial transactions (i.e savings), capital gains and losses and statistical changes and reclassifications. Unfortunately, statistical changes and reclassifications are not insignificant and render a clear assignment to one of the two components of interest somewhat difficult. However, around half (in absolute value) of the statistical changes and reclassifications are due to changes in pension wealth caused by emigrants who leave Switzerland with their pension assets. Since we are interested in net private wealth held by Swiss residents, this outflow represents negative savings. We thus deduct this part of statistical reclassification from the households savings. For the remaining part of the statistical changes and reclassifications

[54] Following Piketty and Zucman (2014) we carried out the decomposition with two different savings concepts, namely the net saving rate of private households and the net private saving rate (i.e., the net saving rate of private households including retained earnings of corporations). Table 2 provides the results using the households savings rate and Table B6 shows the results using the net private savings rate. It is not a priori clear which savings rate should be used, as both concepts have their own drawbacks (for a detailed discussion see Piketty and Zucman (2013)). By excluding retained corporate earnings capital gains mechanically increase as the savings rate is lower (if retained corporate earning are positive). However, if companies retain their profits to finance new investments and new acquisitions (leading to rising share prices), this is not a real relative price effect, but rather a savings effect (Piketty and Zucman, 2013). On the other hand, if the net private savings rate is used, all retained earnings of Swiss corporations are attributed to the domestic household sector, which in turn might be problematic. Firstly, a part of the retained profits belonging to foreign shareholders will be attributed to domestic shareholders (the same applies vice versa). Furthermore, at least part of the retained earnings of domestic companies should be assigned to the government sector (Piketty and Zucman, 2013). Note that in Switzerland retained corporate profits account for less than 10% of total national net savings, which is a small share in international comparison (see Table B2). Nevertheless, the results differ depending on the savings concept used when decomposing the real private wealth growth rate. Due to the methodology used (which is determined by data availability), the differences occur in the capital gains of the housing wealth rather than in the net financial wealth component (as the housing wealth components are estimated as residuals). The reason why we prefer the decomposition based on the household saving rate is that otherwise there would be only very low capital gains in housing wealth over the period 2000-2010, which is rather inconsistent with the evolution of Swiss real estate price indices over this period (see Figure 11). Note in particular that in the 2010-2020 sub-period (in which the fast increase in the private wealth-income ratio takes place) both decompositions yield virtually identical results.

[55] `https://data.snb.ch/en/publishingSet/FIN`

no entirely clear allocation between savings and capital gains can be achieved. However, in order for the flows to correctly reflect the change in the stock of net financial wealth, we have included the remaining statistical changes in the capital gains component.[56]

The decomposition of housing wealth H_{pt} into savings and capital gains part is in turn straightforward. Since savings and capital gains of the two subcomponents must reflect the changes of total private net wealth at the macroeconomic level, the savings and capital gains part of housing wealth are estimated as residuals. The savings (capital gains) of non-housing wealth and housing wealth add up to the savings (capital gains) of net private wealth.

A.11 Real Estate Price Index Data

We use real estate price index data as published by the OECD in September 2020.[57] As we are interested in determining the influence of changes in real estate prices on changes in the wealth-income ratio (which is a real variable), we deflate the nominal house price index using CPI data from OCED.[58]

The data are graphically represented for all countries separately in Figure 11 and C2 in levels and in Figure C3 as annual changes.

A.12 Stock Market Index Data

As with real estate prices, we use the same method for share prices. For all countries in our analysis we use the stock price index data as published by the OECD in September 2020.[59] In addition to the share price data from the individual countries, we take into account the international price development on stock markets with the MSCI World Index.[60]

Again, we deflate all share price time series with CPI data because we are interested in real changes (see Footnote 58). As the MSCI World Index is measured in USD, we use the CPI of

[56]This is justified by the fact that the capital gains, which are estimated as a residual, include all sorts of measurement errors anyway. These estimates are subject to revision when better data sources become available.

[57]`https://data.oecd.org/price/housing-prices.htm`

[58]`https://data.oecd.org/price/inflation-cpi.htm`

[59]`https://data.oecd.org/price/share-prices.htm`

[60]`https://www.msci.com/end-of-day-data-search`

the United States for deflation. The data are graphically represented for all countries separately in Figure 11 and C2 in levels and in Figure C3 as annual changes.

B Supplementary Results

B.1 Supplementary Tables

	Net private saving (household & corporate) (%)	Net household saving (%)	Net corporate saving (retained earnings) (%)	Net public saving (%)	Net national saving (%)
1995–2020	14.0%	13.3%	0.7%	1.5%	15.5%
1995–2002	15.0%	11.4%	3.6%	0.5%	15.5%
2002–2010	14.9%	12.7%	2.2%	1.7%	16.6%
2010–2020	13.0%	14.7%	-1.7%	2.0%	15.0%

Table B1: Structure of National Savings in Switzerland, 1995–2020

Note: All average saving rates are obtained by weighting yearly saving rates by real national income. Savings of the NPISH sector are integrated into household savings. Net private savings are the sum of household and corporate savings. Net national savings are in turn the sum of private and public savings. Detailed information on savings data for Switzerland can be found in Appendix A.8.

	Net private saving (household & corporate) (%)	Net household saving (%)	Net corporate saving (retained earnings) (%)	Net public saving (%)	Net national saving (%)
Switzerland	14.4%	12.9%	1.5%	1.6%	15.9%
Germany	11.2%	6.0%	5.2%	-1.7%	9.5%
France	9.6%	5.9%	3.6%	-2.3%	7.3%
Italy	8.2%	5.9%	2.4%	-3.7%	4.6%
Sweden	14.1%	2.7%	11.4%	1.5%	15.7%
United States	10.9%	6.4%	4.5%	-6.5%	4.4%

Table B2: Structure of National Savings in International Comparison, 1995–2018

Note: The saving rates are calculated for the period 1995–2018. All average saving rates are obtained by weighting yearly saving rates by real national income. Savings of the NPISH sector are integrated into household savings. Net private savings are the sum of household and corporate savings. Net national savings are in turn the sum of private and public savings. Detailed information on savings data for Switzerland can be found in Appendix A.8. The results for the other countries are own calculations based on updated data which are available for download from `https://wid.world`. The original data for Germany, France, Italy and the United States are taken from Piketty and Zucman (2014) and for Sweden from Waldenström (2017).

	Real growth rate of national income (%)	Population growth rate (%)	Real growth rate of per capita national income (%)	Net national saving (%)*	$\Delta\,\beta_{nt}$
Switzerland	1.45%	0.83%	0.61%	15.9%	261pp.
Germany	1.40%	0.11%	1.29%	9.5%	93pp.
France	1.42%	0.50%	0.92%	7.3%	233pp.
Italy	0.49%	0.31%	0.19%	4.6%	142pp.
Sweden	3.05%	0.40%	2.64%	15.7%	315pp.
United States	2.56%	0.89%	1.65%	4.4%	101pp.

Table B3: Growth and Saving Rates in International Comparison, 1995–2018

Note: This table displays the growth rates of real national income, which can be decomposed into population and real per capita income growth. All growth rates are geometric averages over the period 1995–2018. The average saving rates are obtained by weighting yearly saving rates by real national income. The last column shows the change in percentage points (pp.) of the national wealth-income ratio β_{nt} over the period 1995–2018 (for Italy due to missing data for the period 1995–2017). Detailed information on the data for Switzerland can be found in the corresponding subsections in Appendix A. The results for the other countries are own calculations based on updated data which are available for download from `https://wid.world`. The original data for Germany, France, Italy and the United States are taken from Piketty and Zucman (2014) and for Sweden from Waldenström (2017).

	National wealth-income ratio		Decomposition of the national wealth growth rate (%)		
			Real growth rate of national wealth	Savings-induced wealth growth rate	Capital gains induced wealth growth rate
	$\beta_{n,t}$	$\beta_{n,t+n}$	$g_w = g_{ws} + q$	$g_{ws} = s/\beta_n$	q
Switzerland	494%	755%	3.3%	2.9%	0.4%
			100	86	14
Germany	347%	441%	2.5%	2.4%	0.1%
			100	97	3
France	313%	546%	3.9%	1.7%	2.1%
			100	45	55
Italy	359%	501%	1.9%	1.1%	0.8%
			100	58	42
Sweden	243%	557%	6.8%	4.1%	2.7%
			100	61	39
United States	351%	452%	3.7%	1.1%	2.6%
			100	30	70

Table B4: The Accumulation of National Wealth in International Comparison, 1995–2018

Note: This table displays changes in national wealth W_{nt} for the indicated countries between 1995 and 2018. The first two columns indicate the level of the national wealth-income ratio β_{nt} in 1995 respectively 2018 (for Italy due to missing data for 2017). The third column shows the average real growth rate of national wealth g_w. With the formula in equation (9) it is possible to decompose the real growth rate of national wealth g_w into two multiplicative components. Where one part of the national wealth growth rate is savings-induced g_s^w and the other part are capital gains or losses q. All growth rates are geometric averages. Detailed information on the data for Switzerland can be found in the corresponding subsections in Appendix A. The results for the other countries are own calculations based on updated data which are available for download from `https://wid.world`. The original data for Germany, France, Italy and the United States are taken from Piketty and Zucman (2014) and for Sweden from Waldenström (2017).

	National wealth-income ratio		Decomposition of the national wealth growth rate (%)		
			Real growth rate of national wealth	Savings-induced wealth growth rate	Capital gains induced wealth growth rate
	$\beta_{n,t}$	$\beta_{n,t+n}$	$g_w = g_{ws} + q$	$g_{ws} = s/\beta_n$	q
Panel A: 2000-2020					
National Wealth	523%	865%	3.5%	2.7%	0.7%
			100	79	21
Public Wealth	27%	72%	5.9%	6.1%	-0.2%
			100	103	-3
Private Wealth	496%	793%	3.3%	2.4%	0.9%
			100	72	28
Panel B: 2000–2010					
National Wealth	523%	533%	1.9%	3.1%	-1.1%
			100	160	-60
Public Wealth	27%	27%	1.7%	6.8%	-5.1%
			100	407	-307
Private Wealth	496%	506%	1.9%	2.4%	-0.5%
			100	127	-27
Panel C: 2010-2020					
National Wealth	533%	865%	5.0%	2.4%	2.6%
			100	48	52
Public Wealth	27%	72%	10.4%	5.5%	4.9%
			100	53	47
Private Wealth	506%	793%	4.7%	2.3%	2.3%
			100	49	51

Table B5: The Accumulation of National Wealth in Switzerland, 2000–2020

Note: This table displays the changes in national wealth $W_{n,t}$ and its two main subcomponents —net private wealth, $W_{p,t}$, and net public wealth $W_{g,t}$—between 2000 and 2020. The first two columns indicate the level of the different wealth-income ratios $\beta_{n,t}$, $\beta_{p,t}$ and $\beta_{g,t}$ respectively for the corresponding periods. The third column shows the average real growth rate g_w of the respective wealth components over the different time periods. With the formula in Equation (9) it is possible to decompose the real wealth growth rate g_w into two multiplicative components. Where one part of the wealth growth rate is savings-induced g_s^w and the other part are capital gains or losses q. Note that the saving rate used in the above decomposition for the private wealth component is the net saving rate of private households. The results of the same decomposition using the net private saving rate (including retained earnings of corporations) is shown in Table B6 (see in this context also Footnote 54). All growth rates are geometric averages. Detailed information on the data used can be found in the corresponding subsections in Appendix A.

	Private wealth-income ratio		Decomposition of the private wealth growth rate (%)		
			Real growth rate of private wealth	Savings-induced wealth growth rate	Capital gains induced wealth growth rate
	$\beta_{p,t}$	$\beta_{p,t+n}$	$g_w = g_{ws} + q$	$g_{ws} = s/\beta_p$	q
Panel A: 2000–2020					
Total Private Wealth	496%	793%	3.3%	2.5%	0.8%
			100	77	23
Housing Wealth	233%	426%	4.0%	2.7%	1.3%
			100	67	33
Net Financial Wealth	263%	367%	2.5%	2.3%	0.2%
			100	92	8
Panel B: 2000-2010					
Total Private Wealth	496%	506%	1.9%	2.8%	-0.9%
			100	147	-47
Housing Wealth	233%	268%	3.1%	3.0%	0.2%
			100	94	6
Net Financial Wealth	263%	238%	0.6%	2.8%	-2.1%
			100	430	-330
Panel C: 2010-2020					
Total Private Wealth	506%	793%	4.7%	2.2%	2.4%
			100	47	53
Housing Wealth	268%	426%	4.8%	2.4%	2.4%
			100	50	50
Net Financial Wealth	238%	367%	4.5%	1.9%	2.5%
			100	43	57

Table B6: The Accumulation of Private Wealth in Switzerland, 2000–2020

Note: This table displays the changes in private net wealth $W_{p,t}$ and its to main subcomponents—private housing (H_{pt}) and net financial wealth ($F_{pt} - L_{pt}$)–between 2000 and 2020. The first two columns indicate the level of the total private wealth-income ratio $\beta_{p,t}$, the housing wealth-income ratio and the net financial wealth-income ratio respectively for the corresponding years. The third column shows the average real growth rate g_w of the respective wealth components over the different time periods. With the formula in Equation (9) it is possible to decompose the real wealth growth rate g_w into two multiplicative components. Where one part of the wealth growth rate is savings-induced g_s^w and the other part are capital gains or losses q. The methodology used to decompose the changes of the depicted private wealth categories into a savings and capital gains component is described in detail in Section A.10 in the Appendix. Note that the saving rate used in the above decomposition is the net private saving rate (i.e., including retained earnings of corporations). The results of the same decomposition using the net saving rate of private households is shown in Table 2 (see in this context also Footnote 54). All growth rates are geometric averages. Detailed information on the data can be found in the corresponding subsections in Appendix A.

B.2 Supplementary Figures

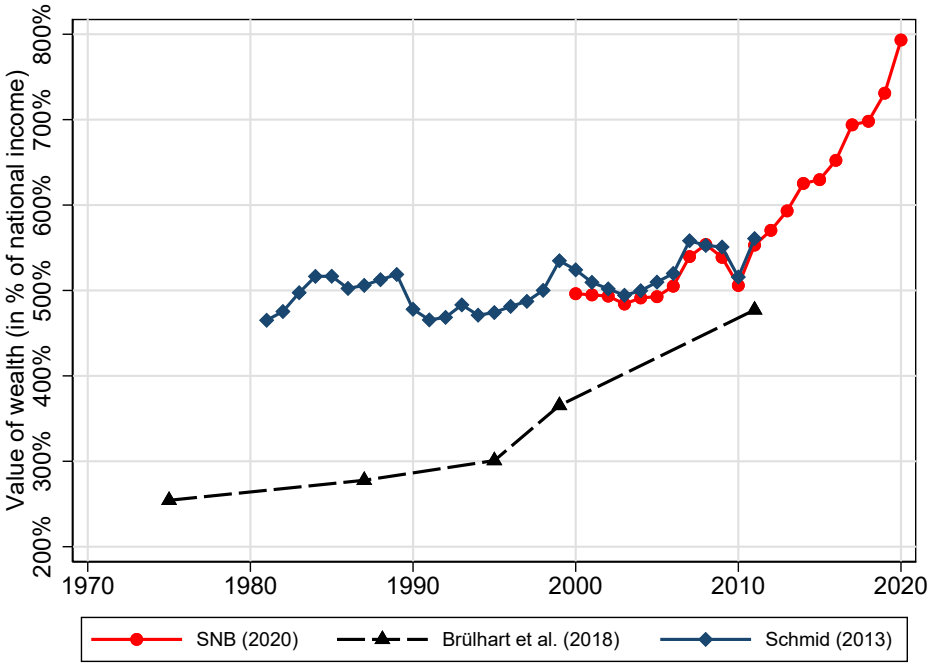
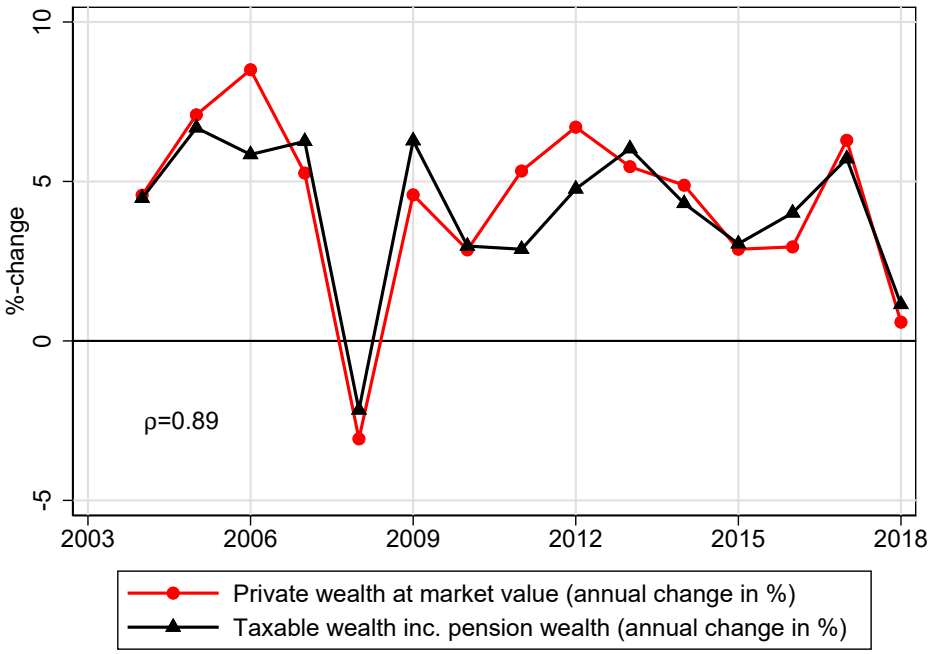


Figure B1: Different Private Wealth Estimates for Switzerland, 1975–2020

Note: This figure displays different estimates of private wealth measured in national income for Switzerland from 1975 to 2020. The red line shows the private wealth estimates at market value which are provided by the SNB in the context of the Swiss financial account. The dark blue line displays the aggregate net private wealth estimates submitted by Schmid (2013), who could rely on SNB internal data, which are partly gathered numbers from hardcopy prints of the relevant statistics and are not publicly available. Finally the black line shows net private wealth estimates of Brülhart et al. (2018), which are mainly based on wealth tax statistics.

(a) Share of Taxable Wealth in Total Private Wealth



(b) Change in Taxable Wealth and Total Private Wealth

Figure B2: Taxable Wealth and Total Private Wealth at Market Value, 2003–2018

Note: Panel a) displays the evolution of taxable wealth as share of total private wealth at market value. The red line (with circles) shows the share taxable wealth in percent of total private wealth, while the black line (with triangles) excludes pension wealth—which is non-taxable—from the denominator. Panel b) shows the annual change in total wealth at market values published by the SNB (red line with circles) and taxable wealth plus private pension wealth (black line with triangles) for the years where the two wealth series overlap. While these wealth series differ in levels, the figure shows that their annual growth rates—with a correlation of 0.89—are very similar. The data sources for Switzerland are described in detail in Appendix A.1.

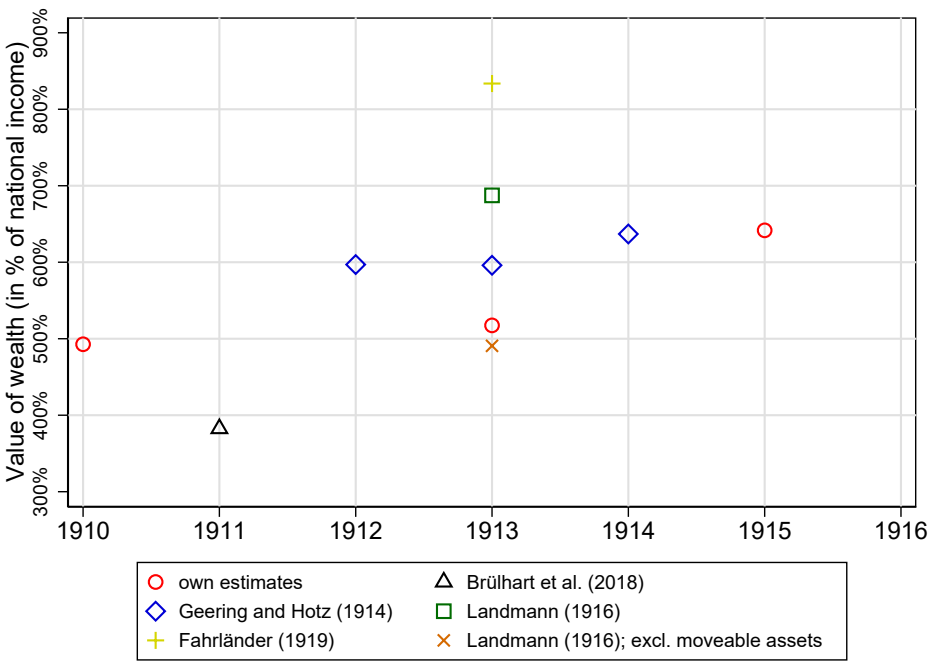


Figure B3: Historical Wealth Estimates in Comparison, 1900–1916

Note: This figure displays various estimates of aggregate Swiss wealth as a share of national income. Considering that Geering and Hotz (1914) do not give a specific date for their estimate, but rather state that national wealth might be estimated at 30 billion *today*, I present this figure for the year of publication as well as the two preceding years. The historical estimates displayed differ both in the wealth components covered and in the underlying statistical data sources, making comparability significantly challenging. However, the magnitude of these numbers suggests that our estimate, although significantly higher than previous ones by Brülhart et al. (2018), can still be considered a conservative estimate. Section 5.1 discusses the difference between our approach and estimates relative to those of Brülhart et al. (2018) in detail.

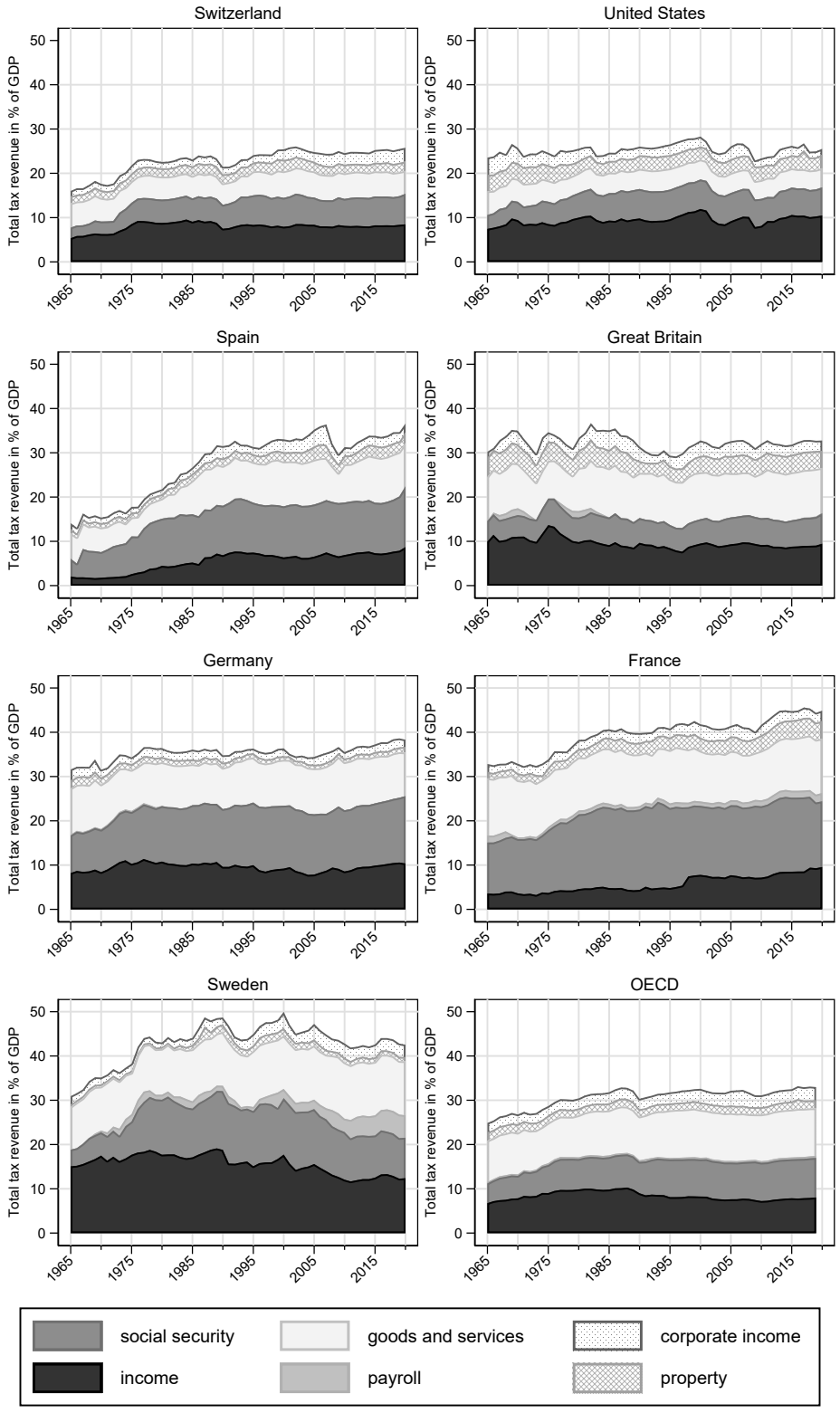


Figure B4: Tax Revenue in Percent of GDP, 1965–2020

Note: This figure shows the total revenues collected from taxes on income and profits, social security contributions, taxes levied on goods and services, payroll taxes (where applicable), taxes on the ownership and transfer of property, and other taxes as a percentage of GDP. Source: OECD tax revenue statistics `https://data.oecd.org/tax/tax-revenue.htm`, June 23, 2022.

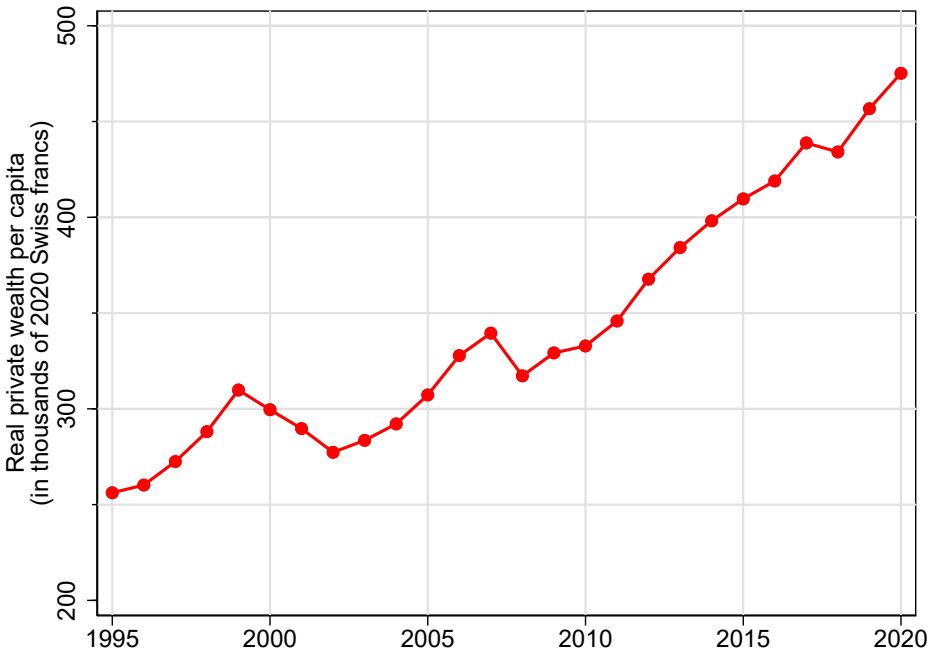
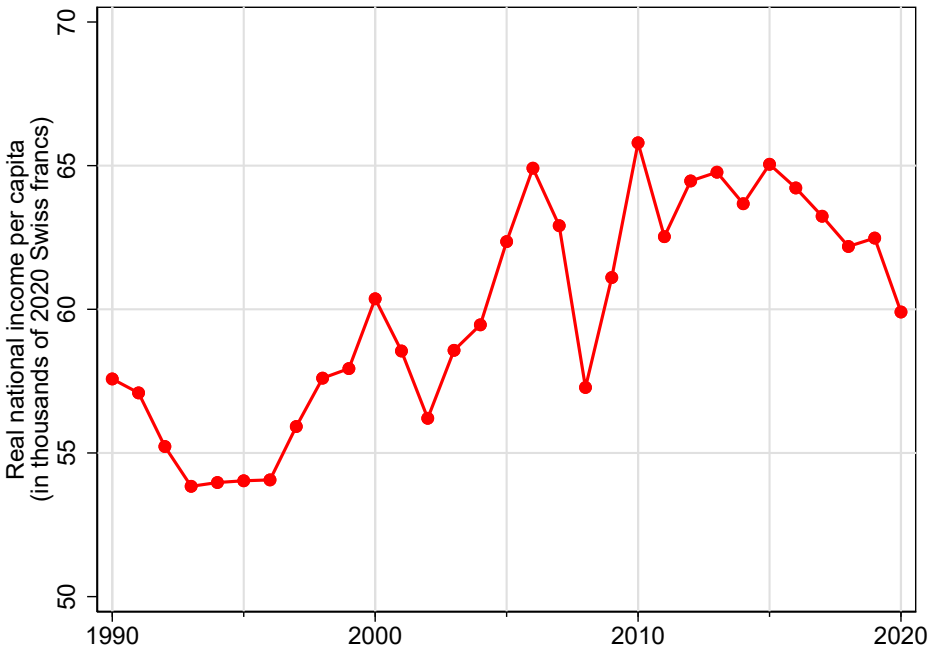


Figure B5: Real Private Wealth per Capita in Switzerland, 1995–2020

Note: This figure displays the evolution of real private wealth per capita in Switzerland between 1995 and 2020. The total nominal private wealth series is deflated by the Swiss CPI (A.7) and divided by the total population of Switzerland (A.6) in the corresponding year. Thus, the figure shows the average real net private of wealth of Switzerland, expressed in thousands of 2020 Swiss francs.

(a) 1900–2020



(b) 1995–2020

Figure B6: Real Net National Income per Capita in Switzerland

Note: This figure shows Switzerland's real per capita national income. Nominal net national income is deflated by the Swiss CPI (A.7) and divided by the total population of Switzerland (A.6) in the corresponding year. Thus, the figure displays the average real net national income of Switzerland, expressed in thousands of 2020 Swiss francs.

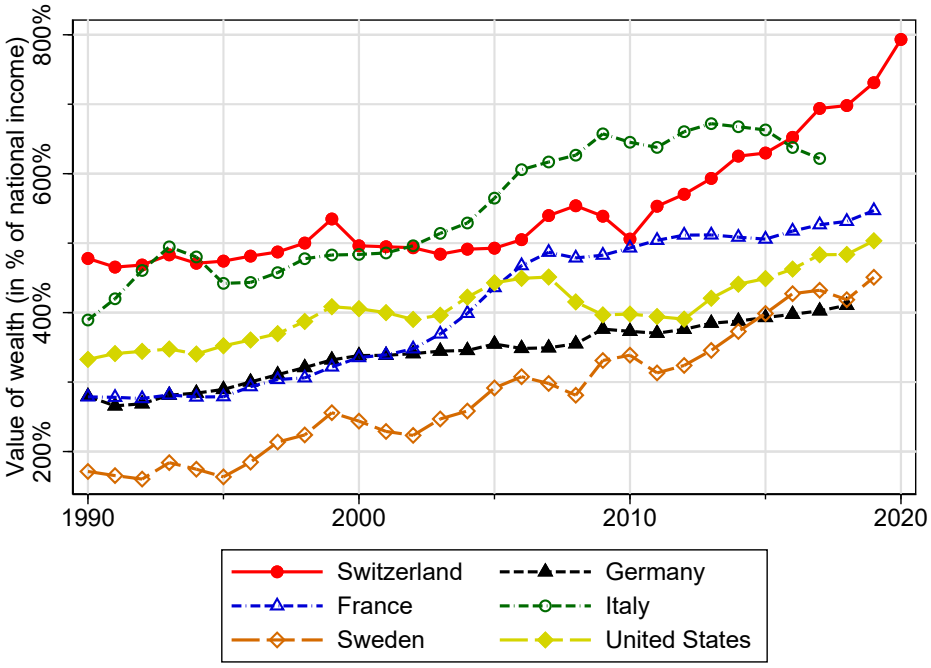
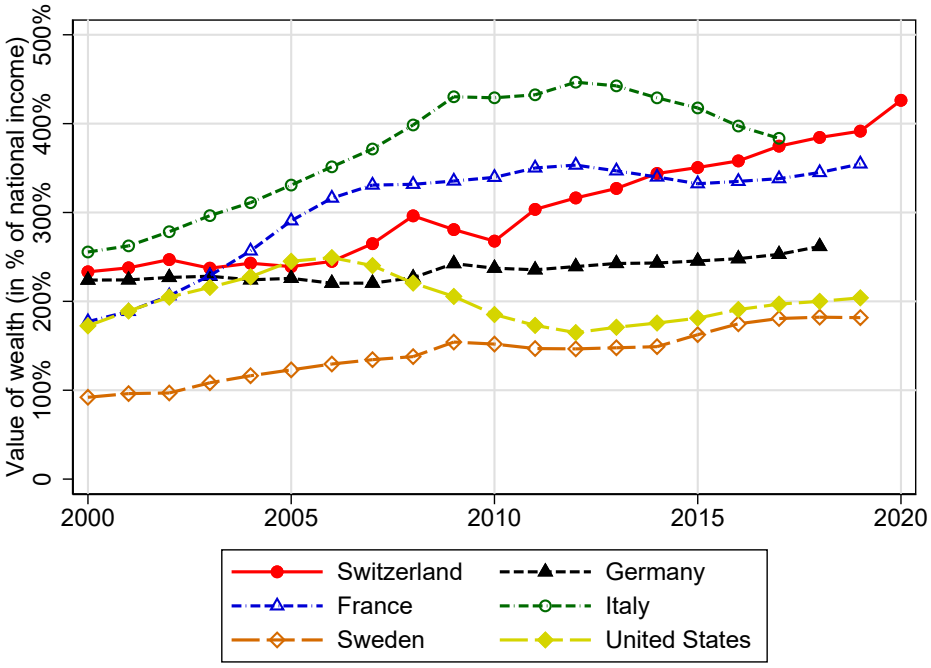
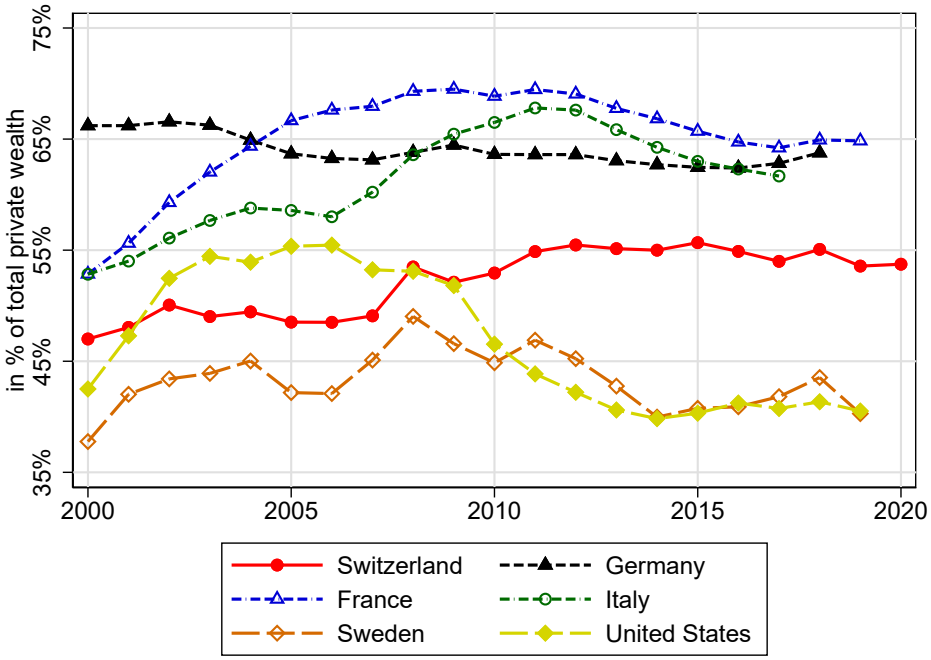


Figure B7: Private Wealth-Income Ratios in International Comparison, 1990–2020

Note: This figure shows the evolution of the private wealth-income ratio β_{pt} for several countries from 1990 to 2020. β_{pt} is derived by dividing total net household wealth—i.e., the sum of private non-financial assets (consisting only of housing wealth) and financial assets minus financial liabilities—by national income, Y_t. The data sources for Switzerland are described in detail in Appendix A.1. The series for Germany, France, Italy and the United States are based on Piketty and Zucman (2014), and on Waldenström (2017) for Sweden. All these have been updated and are available for download from `https://wid.world`.



(a) Housing Wealth-Income Ratio



(b) Housing Wealth as Share of Total Net Private Wealth

Figure B8: Housing Wealth H_{pt} in International Comparison, 2000-2020

Note: Panel a) displays the evolution of the housing wealth H_{pt} measured in national income Y_t for the countries indicated from 2000 to 2020. Where the private housing wealth-income ratio is derived by dividing total gross housing assets of private households by national income. Panel b) shows the development of housing wealth H_{pt} as a share of total private wealth W_{pt} for the same period and countries. The data sources for Switzerland are described in detail in A.1. The series for Germany, France, Italy and the United States are based on Piketty and Zucman (2014), and on Waldenström (2017) for Sweden. All these have been updated and are available for download from `https://wid.world`.

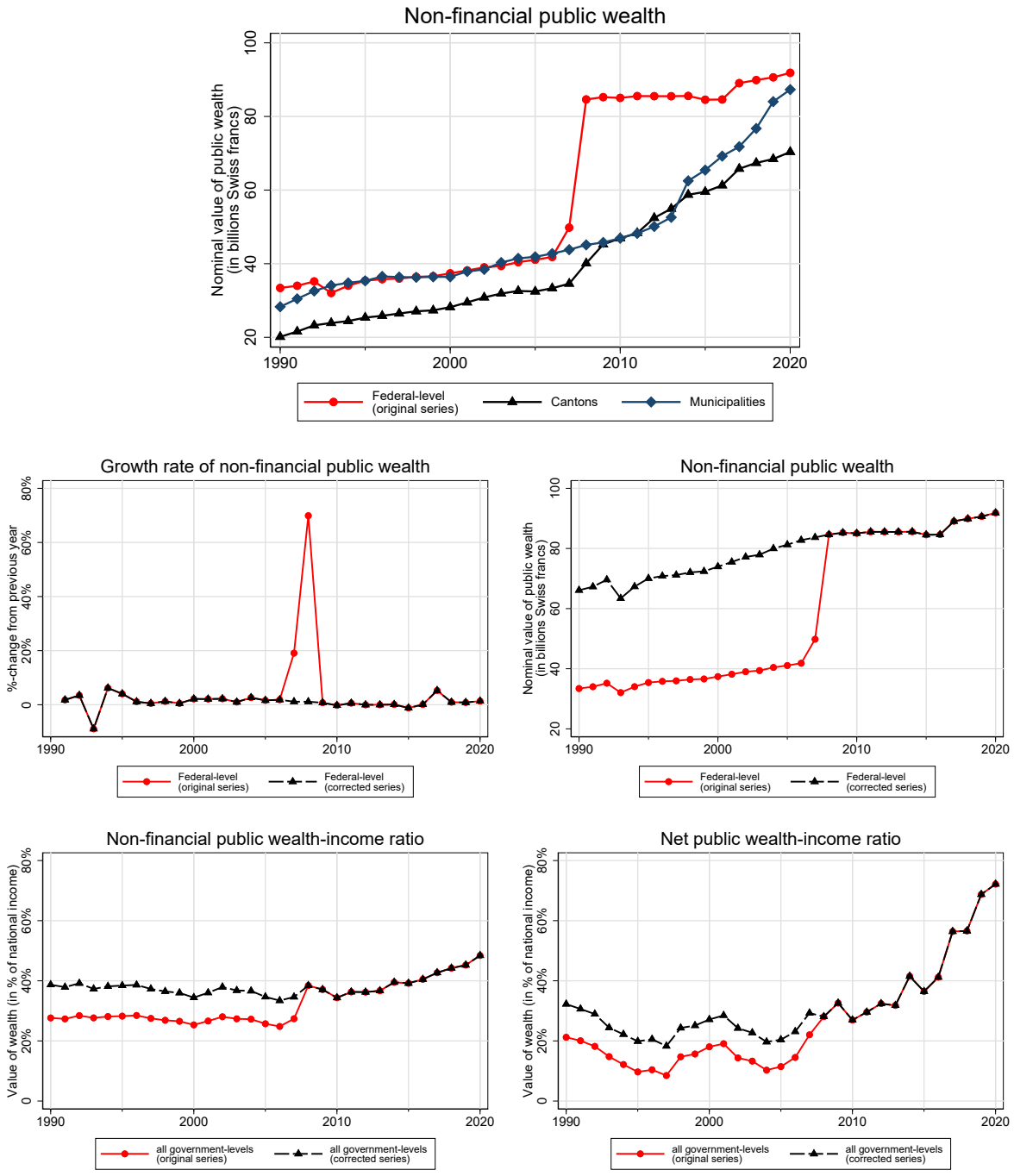


Figure B9: Correction of the non-financial public wealth series at the federal-level, 1990–2020

Note: Public non-financial assets K_{gt} usually grew at very modest rates except in 2007 (+19.3%) and 2008 (+72.6%). For these two years we corrected the series by applying the average growth rate of $+1.4\%$. This leads to a more stable and plausible evolution of the public wealth income ratio.

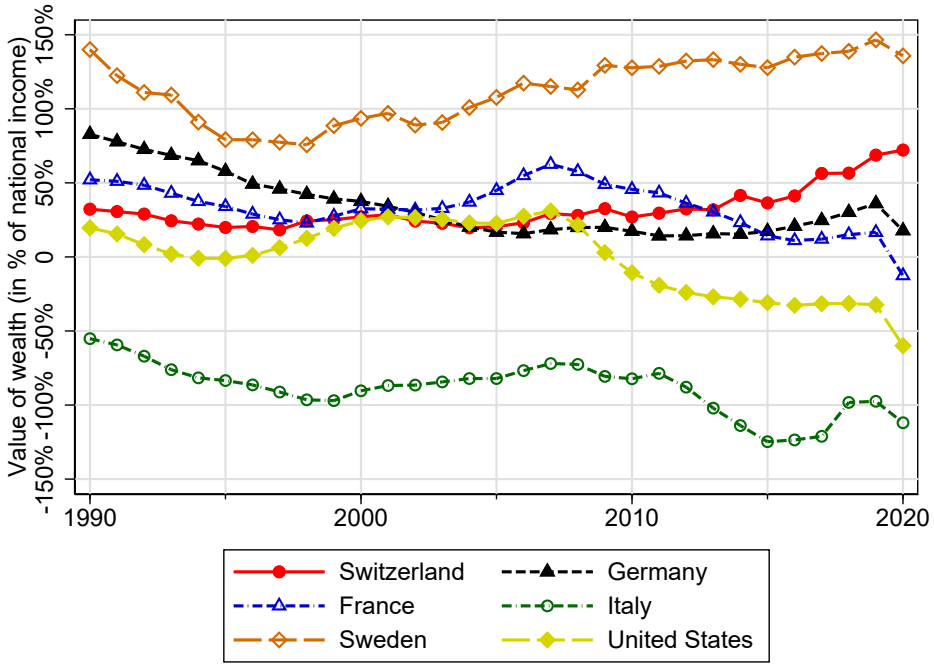
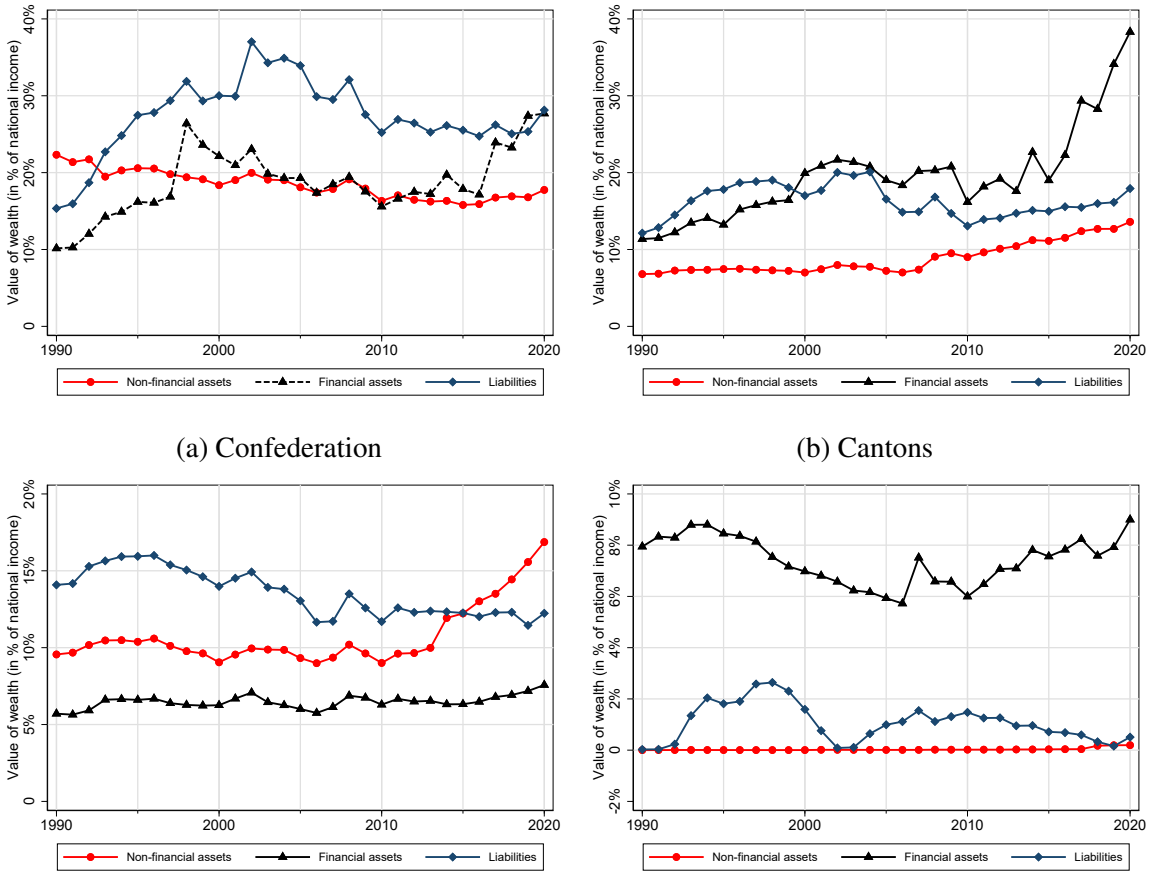


Figure B10: Public Wealth-Income Ratios, 1990–2020

Note: This figure displays the evolution of the public wealth-income ratio β_{gt} for the countries indicated from 1990 to 2020. Where β_{gt} is derived by dividing the sum of public non-financial assets K_{gt}, public financial assets F_{gt} minus public financial liabilities L_{gt} by national income Y_t. The data sources for Switzerland are described in detail in the A.3. The series for Germany, France, Italy and the United States are based on Piketty and Zucman (2014), and on Waldenström (2017) for Sweden. All these have been updated and are available for download from `https://wid.world`.



(a) Confederation

(b) Cantons

(c) Municipalities

(d) Social Security Funds

Figure B11: Public Wealth in Switzerland by Government-levels, 1990–2020

Note: This figure shows the development of three main components of public assets W_{gt}—Public non-financial assets K_{gt}, public financial assets F_{gt} and public financial liabilities L_{gt}—for the period 1990–2020 measured by national income Y_t separately for each government level. In addition to the three government levels of Switzerland—the federal level, the cantonal level (state level) and the municipality level—we display the evolution of the state-owned social security funds. Note that public financial liabilities L_{gt} are actually negative. To obtain net public wealth W_{gt} one has to subtract L_{gt} from the sum of K_{gt} and F_{gt}. The data sources are described in detail in Appendix A.3.

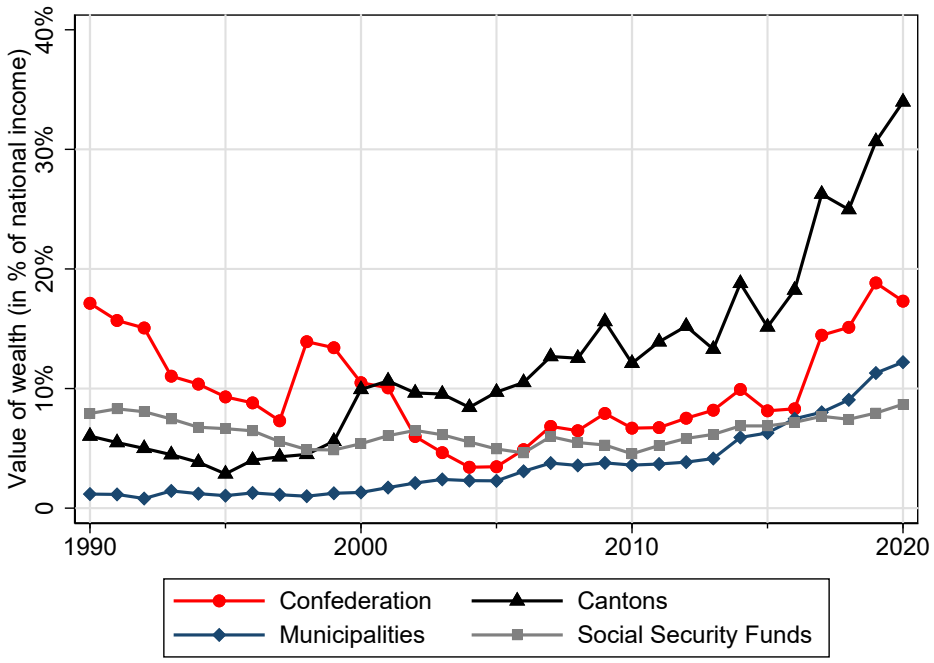
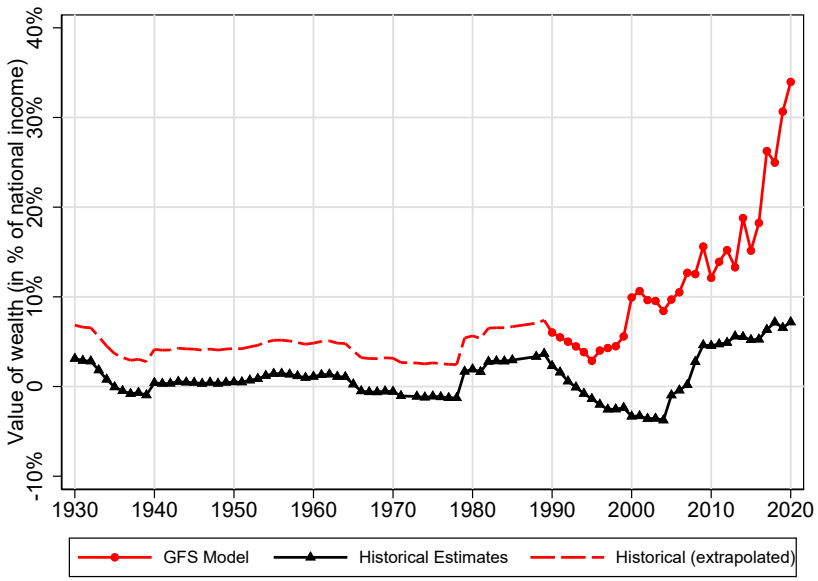
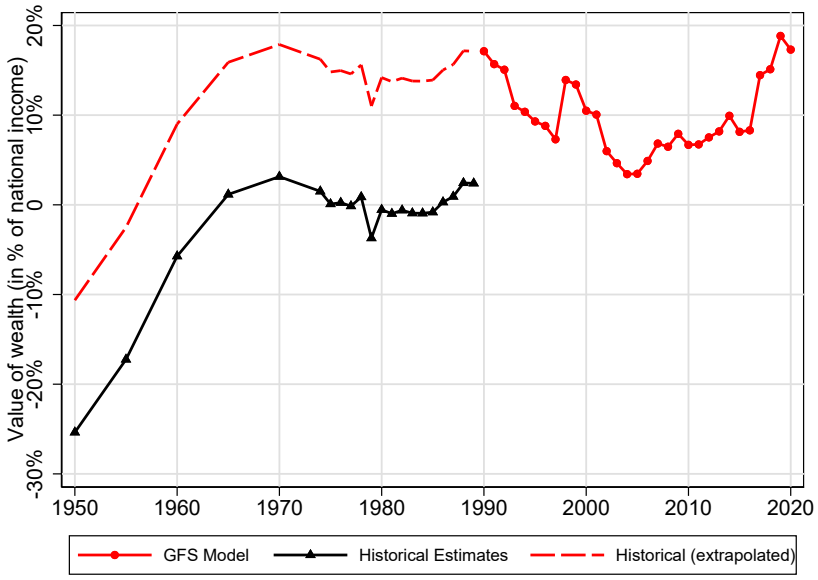


Figure B12: Public Wealth-Income Ratios in Switzerland by Government-level, 1990–2020

Note: This figure shows the evolution of net public wealth by the different government-levels of Switzerland expressed in terms of national income Y_t from 1990 to 2020. The data sources are described in detail in Appendix A.3.



(a) Cantons



(b) Confederation

Figure B13: Historical Evidence on Public Wealth in Switzerland, 1930–2020

Note: This figure displays the long-run evolution of public wealth in terms of national income at the cantonal (Panel a) and federal level (Panel b). The red dotted line depicts public wealth based on the financial statistics standard (GFS Model) of the IMF, thus ensuring international comparability. This data is analyzed and discussed thoroughly in Section 6.2. On the other hand, the black line with triangles shows historical estimates of public wealth over a much longer period of time. All data sources used here are described in Appendix A.3. Given that the historical series do not conform with the latest standards of international financial statistics, they are not directly comparable with the GFS estimates. Nonetheless, they are the best available evidence of public wealth in the long-run (Note: There are no comprehensive historical estimates of W_{gt} at the municipality level). Using these historical estimates, we show a simple extrapolation of the GFS series as the dashed red line. Based on this extrapolation, we conduct a simple back-of-the-envelope calculation of the share of net public wealth in national wealth ($S_n^g = W_{gt}/W_{nt} = \beta_{gt}/(\beta_{gt} + \beta_{pt})$). We assume that municipalities (for which we have no data) hold the same net wealth as the cantons. So for 1950 we have $\beta_{gt} = 2 \times 4.2\% + (-10.6\%) = -2.2\%$ and $\beta_{pt} = 468\%$ which yields $S_n^g = -2.2\%/((-2.2\%) + 468\%) = -0.5\%$. And analogously for 1975: $\beta_{gt} = 2 \times 2.6\% + 14.8\% = 20.1\%$ and $\beta_{pt} = 447\%$ yields $S_n^g = 4.3\%$.

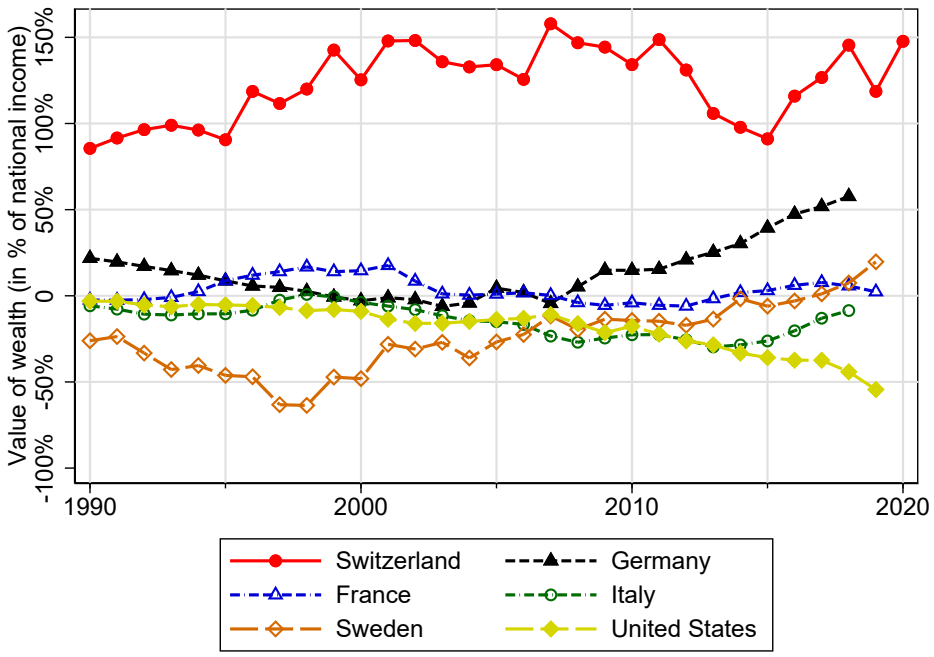


Figure B14: Evolution of Net Foreign Wealth, 1990–2020

Note: This figure displays the evolution of net foreign wealth NFA_{nt} expressed in terms of national income Y_t for the countries indicated from 1990 to 2020. The data sources for Switzerland are described in detail in the A.4. The series for Germany, France, Italy and the United States are based on Piketty and Zucman (2014), and on Waldenström (2017) for Sweden. All these have been updated and are available for download from `https://wid.world`.

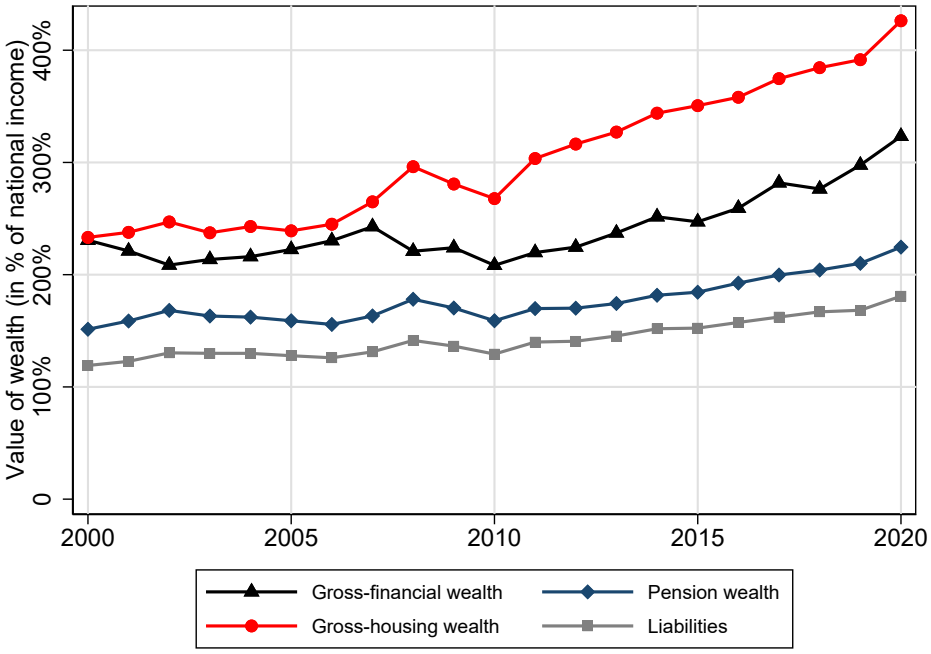


Figure B15: Main Components of Private Wealth and Liabilities in Switzerland, 2000–2020

Note: This figure shows the evolution of four main components of private wealth, W_{pt}: gross housing wealth, gross financial wealth, pension wealth and liabilities measured in national income, Y_t. Note that private (financial) liabilities are actually negative. The sum of these four sub components (liabilities with a negative sign) add up to total net private wealth, as depicted in Appendix Figure B7. Detailed information on these four subcomponents can be found in Appendix A.1.

C EXTENSION:

Cross-Country Evidence on Wealth-Income Ratios and Housing Prices

The different developments in financial and housing wealth highlighted in Section 7 raise the question whether changes in the wealth-income ratio can be explained by capital gains in either housing wealth or financial wealth. The role of housing prices and bubbles in the accumulation and distribution of wealth has recently been documented for a series of countries, including Spain, France, and the U.S. (Martínez-Toledano, 2020). Piketty and Zucman (2014) and Artola Blanco et al. (2021) find that the recent rise in household wealth to national income ratios has mainly been driven by capital gains on housing.

In this extension, we investigate the relationship between price changes and wealth-income ratios in a cross-country analysis. We use real house price index data (see Appendix A.11) and stock market index data (see Appendix A.12), both obtained from the OECD. A visual comparison of housing prices and private wealth-income ratios supports the hypothesis for a large number of countries (see both, Figure 11 and Figure C2).

To understand to which degree this is true, we run OLS country regressions of the annual change in the wealth-income ratio on the change in real stock prices and the change in real housing prices in Switzerland and 11 countries, for which data is available.[61] The country regressions generally cover 45–50 years, depending on data availability, from the 1970s to the present. As most wealth-income ratios and price indices exhibit a clear trend, we transform all the series to changes. These series, shown in Figure C3 in the Appendix, are stationary (as are the residuals from our regressions). Since all units are percentage changes, it is further possible to directly compare the regression coefficients.

Results for Switzerland and the full panel of countries are shown in Panels A and B, re-

[61] House and stock price data are available on a country by country base from the OECD and data on the private wealth-income ratio from WID.world, see Appendix A for details. We include in our analysis all developed economies for which long-run series on private wealth-income ratios exist. These are namely Australia, Canada, France, Germany, Italy, Japan, Norway, Spain, Sweden, Switzerland, the U.K. and the U.S. The observation period is limited due to the availability of data on β_{pt} for the three countries Canada (1980–2010), Germany (1989–2016) and Norway (1993–2015). All data used in the regression analysis are shown country by country in Figure C3.

spectively, of Table C1. We regress the change in wealth-income ratios either on the change in real house or real share prices in the respective country (Columns 1 and 2), or on both (Column 3). In Column 4, we further control for changes in the MSCI world share price index, which captures global stock price changes. While investors typically have a home bias, it might nevertheless be that in some countries investors seek out for greener grass abroad, in which case financial wealth fluctuates more strongly with international stock prices as measured by the MSCI world index. The multi-country panel regressions (shown in bottom Panel B of Table C1) further include country and year fixed effects. Because the year fixed effects would fully absorb the time variation in the MSCI World Index, we do not report results from this specification in Column 4 (they are identical to the results in Column 3). The country panel regressions, however, are not sensitive to the inclusion of these fixed effects (the detailed regression results for the different specifications can be found in Table C2). To account for correlation of observations within country and years, we report two-way clustered standard errors by country and year.

	(1)		(2)		(3)		(4)	
Panel A: Switzerland								
1970–2019								
House prices	-0.03	(0.10)			-0.03	(0.10)	-0.06	(0.11)
Share prices			0.04	(0.03)	0.04	(0.03)	0.01	(0.06)
MSCI world							0.03	(0.06)
Constant	1.14**	(0.55)	0.95*	(0.55)	0.99*	(0.57)	0.98*	(0.57)
Adj. R^2	-0.019		0.004		-0.015		-0.031	
Obs.	49		49		49		49	
1990–2019								
House prices	0.39**	(0.17)			0.40**	(0.17)	0.32*	(0.17)
Share prices			0.04	(0.05)	0.05	(0.04)	-0.05	(0.08)
MSCI world							0.16	(0.10)
Constant	1.21*	(0.70)	0.98	(0.80)	0.91	(0.74)	1.04	(0.73)
Adj. R^2	0.125		-0.009		0.132		0.181	
Obs.	30		30		30		30	
Panel B: Multi-Country Panel Analysis								
1970–2019								
House prices	0.24***	(0.04)			0.26***	(0.04)		
Share prices			0.03	(0.02)	0.03	(0.02)		
Adj. R^2	0.189		0.080		0.205			
Obs.	565		545		545			
1990–2019								
House prices	0.30***	(0.06)			0.30***	(0.06)		
Share prices			0.00	(0.03)	-0.01	(0.03)		
Adj. R^2	0.211		0.097		0.208			
Obs.	349		349		349			

Table C1: Regressions of Private Wealth-Income Ratios on Stock and House Prices

Note: The table shows results for OLS regressions of changes in private wealth-income ratios on changes in real house prices (Column 1), changes in real share prices (Column 2) and both (Column 3). Column (4) further includes the global MSCI world share price index as a control. Top Panel A shows the results for Switzerland. We show results for the whole period 1970–2019, for which data is available, as well as for the sub-period 1990–2019. Bottom Panel B shows the results of panel regressions including 12 countries. Private wealth-income ratio data are available for: Australia 1970–2019; Canada 1971–2019; France 1970–2019; Germany 1970–2018; Italy 1970–2017; Japan 1970–2017; Norway 1980–2016; Spain 1970–2017; Sweden 1970–2019; Switzerland 1970–2020; U.K 1970–2018; U.S. 1970–2019. See Figure C3 for details on data availability by country. All specifications in Panel B include year and country fixed effects. We do not report estimates in column (4) of Panel B because the year fixed effects fully absorb the variation in the MSCI World Index. Table C2 shows alternative specifications without fixed effects. We use house price (see Appendix A.11) and share price indices (see Appendix A.12) as published by the OECD in September 2020. Residuals in all models are stationary. Two-way clustered standard errors by country and year are shown in parentheses, next to coefficients. * p<.1, ** p<.05, *** p<.01.

Considering the whole period from 1970 to 2019, we do not find a systematic correlation between real house prices and share prices on the one hand and the wealth-income ratio on the other in Switzerland. Only when looking at the more recent period from 1990 onward, we find that growth in housing prices is systematically correlated with changes in the wealth-income ratio: a one percentage point increase in real housing prices is associated with a 0.39 percentage point increase in the wealth-income ratio. Considering the small number of observations resulting from limiting the period of analysis, the statistical significance is unexpectedly high. The finding is robust to simultaneously controlling for stock price changes, but additionally including changes in the MSCI world index leads to a slightly weaker correlation and reduces statistical significance (Column 4, Panel A of Table C1).

Turning to the panel analysis including all 12 countries for which data is available (Panel B of Table C1), alleviates the small *N* problem. Across all specifications we find that a one percentage point increase in real housing prices is associated with a 0.24–0.26 percentage point increase in wealth income ratios. These estimates are throughout statistically significant at the 1 percent level. Again this correlation increases to 0.30 percentage points in the more recent period since 1990. These findings suggest that rising housing prices are related to rising wealth-income ratios across many countries, and that this association has become stronger in more recent decades.

While the multi-country panel regressions are in line with findings for Switzerland, they mask some heterogeneity across countries. In Figure C1 we show the coefficients from regressions by country for the 1990–2019 period, corresponding to Column 3 in Table C1.

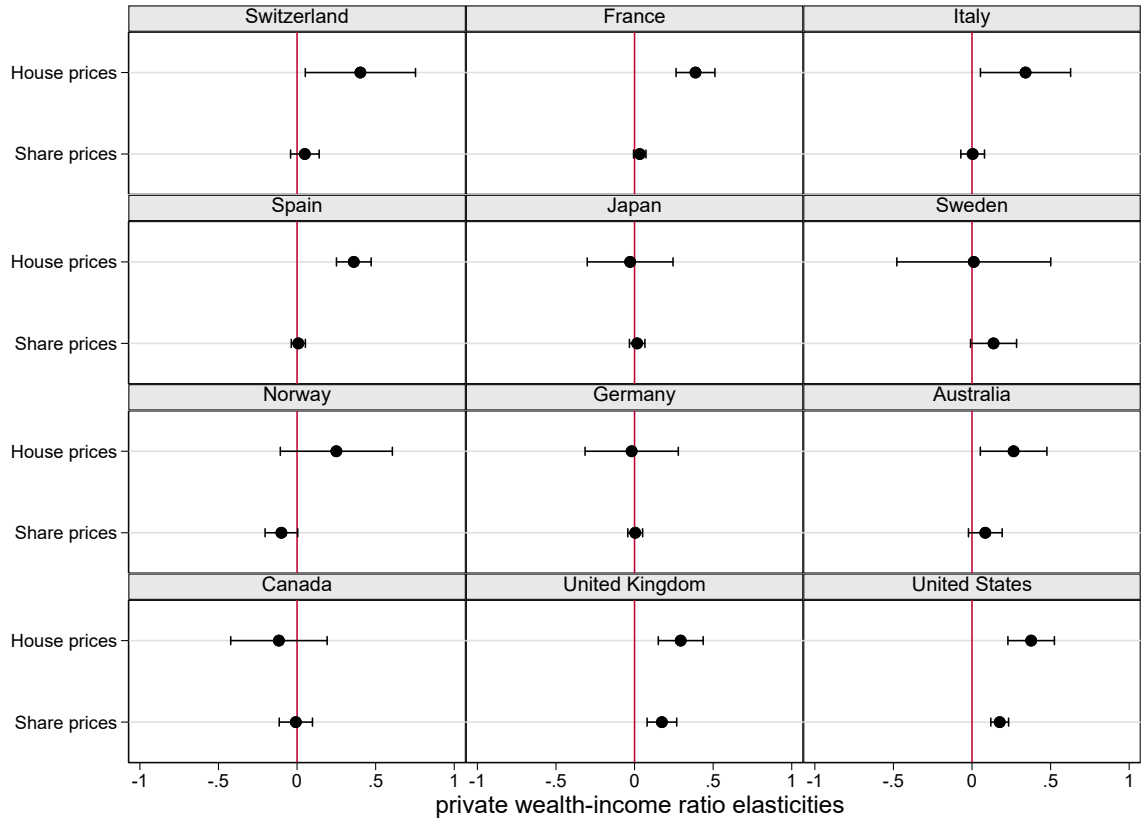


Figure C1: Regression Coefficients for Real Housing and Share Price Changes, 1990–2019

Note: The figure displays the coefficients along with the 95% confidence intervals from the regression of annual changes in the wealth-income ratio on annual changes of real housing prices and real share prices by country for the period 1990–2019. The model corresponds to Column (3) in Table C1. The full set of results by country is reported in Tables C3 and C4.

While the association seems to be particularly strong in Switzerland (0.40pp), France (0.39pp), the U.S. (0.38pp), Spain (0.36pp), and Italy (0.34pp) we find no effect in Germany, Sweden, Japan, and Canada. Results for Japan are significant only when we include the 1970-1990 period—which covers the country's large housing and stock market bubble of the late 1980s. We take this as evidence that asset price effects become main drivers for the aggregate wealth-income ratios in periods of rapid price changes. Although this is a simple empirical model, it explains over 60% of the variation in wealth-income ratios in the period after 1990 in Spain, France, and the U.S., suggesting that real estate prices play a crucial role in the evolution of wealth-income ratios.

Share prices seem to be important in U.S. and U.K. The U.S. stands out in particular as the country where both, share prices as well as real estate prices simultaneously are strongly

related to changes in the wealth-income ratio. Together these variables explain 75% of the observed variation in the wealth-income ratio. In Norway, interestingly, increases in share prices are marginally significantly related to *negative* changes in the wealth-income ratio.[62] Overall our results suggest that capital gains in housing have become an important driver of the increasing wealth-income ratio—both in Switzerland and other developed economies. This (direct) evidence of a positive relationship between real housing prices and wealth-income ratios is particularly consistent with the findings of Knoll et al. (2017), who document the crucial role of higher land prices.

After WWII, asset price and housing bubbles occurred both more frequently and in greater magnitude than in the first half of the 20th century (see Table 2 in Jordà et al., 2015). In fact, some of the largest bubbles in economic history built up post-1980, including Japan's real estate and stock market bubble of the 1980s, which burst in 1991; the "Dot-com Bubble", which peaked in 2000; and the U.S. housing bubble bursting in 2009. For Switzerland, we know that in the 1980s a real estate bubble was building up to burst in 1990 (see Appendix Figure C3.a), that shows real annual changes in housing prices). This explains the distinct drop in β_{pt} between 1989 and 1991. Our results suggest that rising house prices due to augmented bubbles had a stronger impact on aggregate wealth-income ratios in the post-1990 period than they did in the more distant past—particularly in France, Italy, Spain, the U.S., and Switzerland (see Tables C2 and C3).

[62] This could be due to the oil industry: if during booms share prices of petrol companies as well as incomes earned in these companies located in Norway go up, the wealth-income ratio might fall.

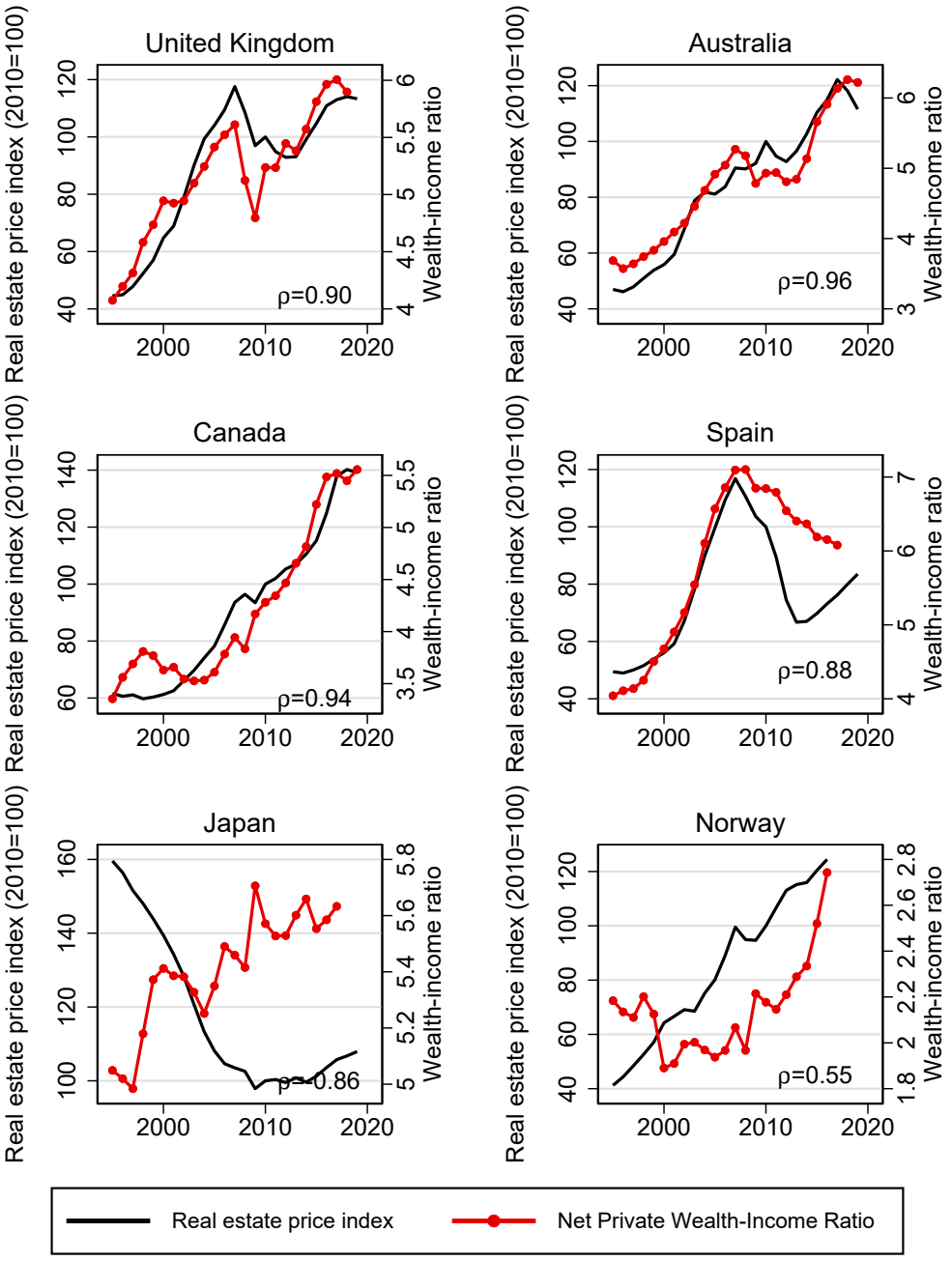
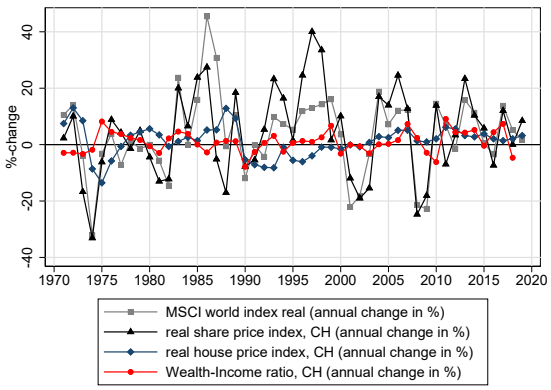
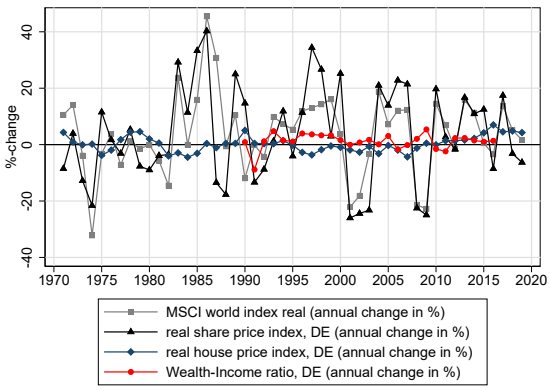


Figure C2: Wealth-Income Ratios and Real Estate Price Indices, 1995–2020

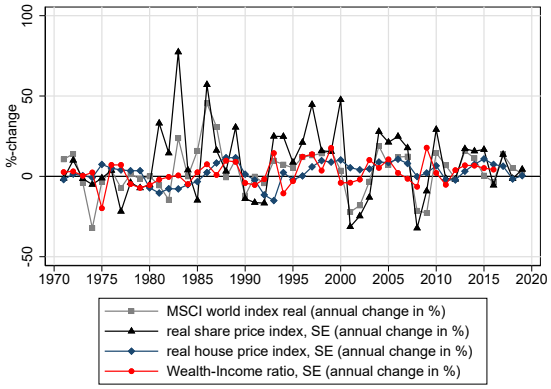
Note: This figure shows private wealth-income ratios in the U.K., Australia, Canada, Spain, Japan and Norway along with real house price indices of each of those countries. The price indices were obtained online from the OECD in September 2020. The data for the real house price indices are described in Appendix A.11. All international private wealth-income ratios data is available for download at `https://wid.world`.



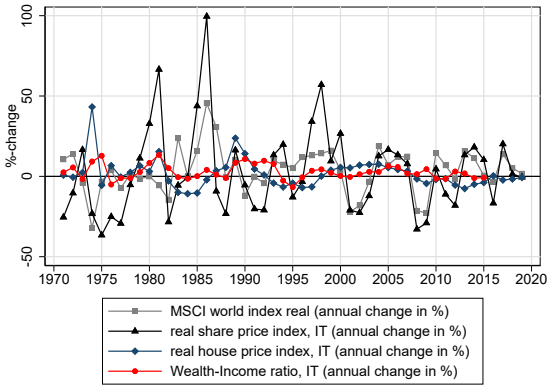
(a) Switzerland



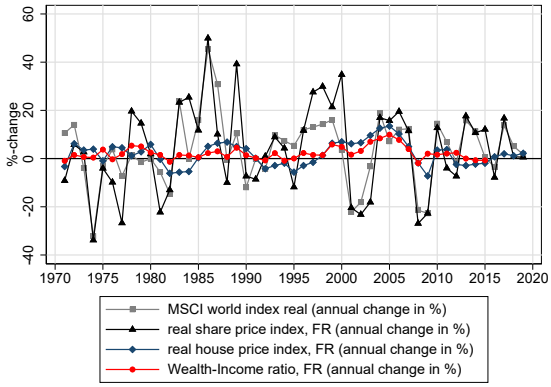
(b) Germany



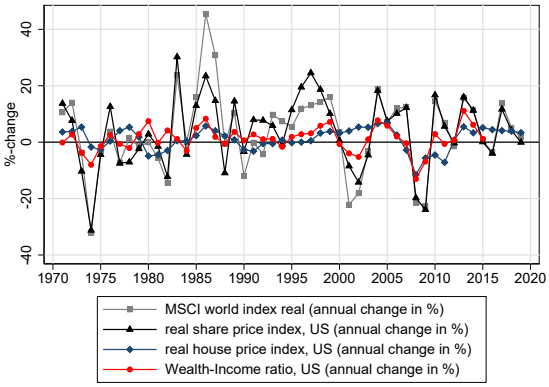
(c) Sweden



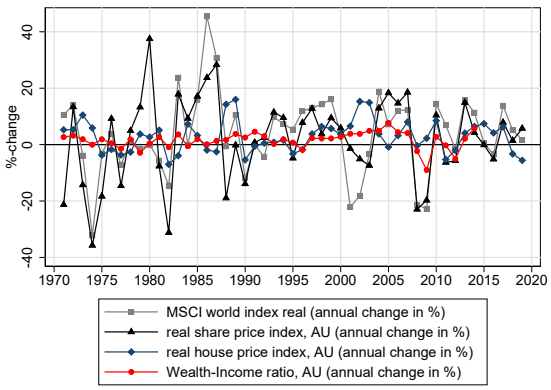
(d) Italy



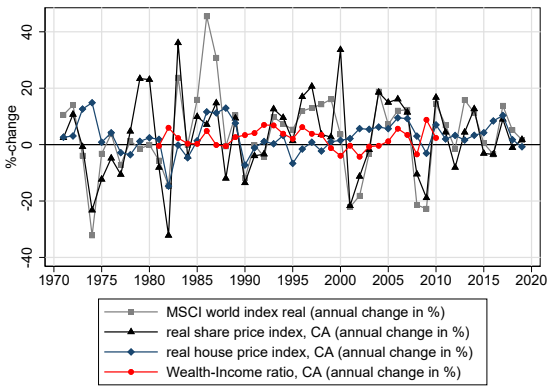
(e) France



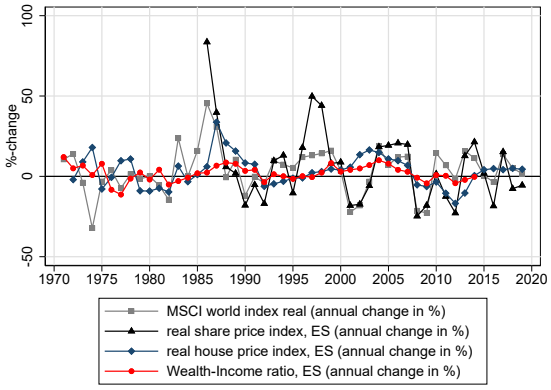
(f) United States



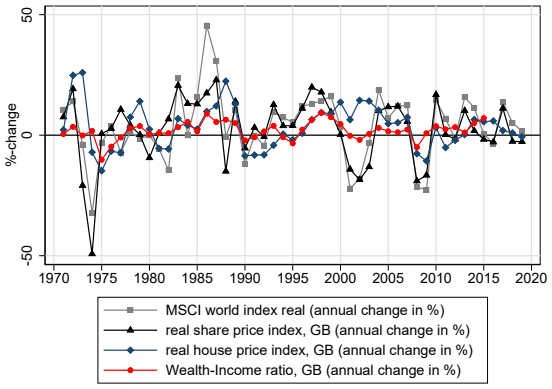
(g) Australia



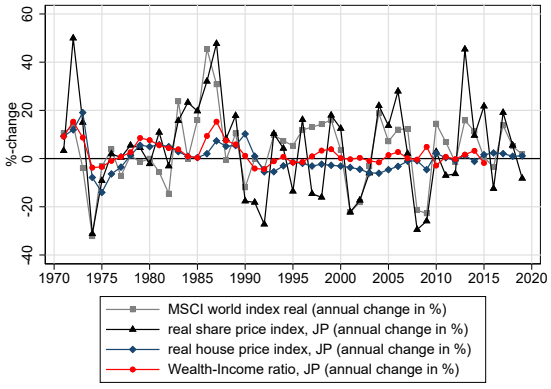
(h) Canada



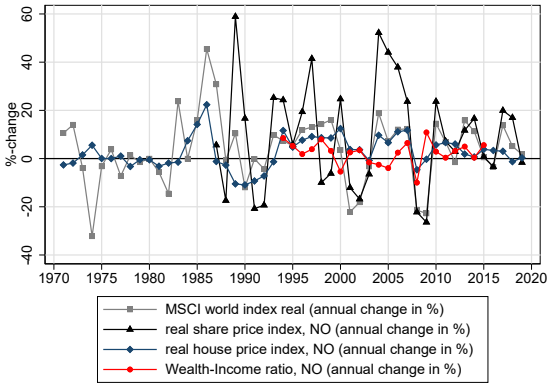
(i) Spain



(j) United Kingdom



(k) Japan



(l) Norway

Figure C3: Annual Changes in β_{pt}, Real House Prices and Real Share Prices

Note: This figure shows the data used for the regressions of wealth-income ratios on real share prices and real housing prices in Section 7.3. The price indices were obtained online from the OECD in September 2020. For the real house price indices, the data are described in Appendix A.11 and for the real share price indices in Appendix A.12. All international private wealth-income ratios data is available for download at `https://wid.world`.

	(1)		(2)		(3)		(4)	
1970-2019								
Pooled OLS								
House prices	0.20***	(0.04)			0.21***	(0.04)	0.20***	(0.04)
Share prices			0.04**	(0.02)	0.04*	(0.02)	0.02	(0.02)
MSCI world							0.02	(0.02)
Adj. R^2	0.109		0.041		0.149		0.150	
Obs.	565		545		545		545	
Year FE								
House prices	0.22***	(0.04)			0.25***	(0.03)	0.25***	(0.03)
Share prices			0.03	(0.02)	0.02	(0.02)	0.02	(0.02)
MSCI world							0.00	(.)
Adj. R^2	0.185		0.087		0.203		0.203	
Obs.	565		545		545		545	
Country FE								
House prices	0.21***	(0.05)			0.21***	(0.05)	0.21***	(0.05)
Share prices			0.05**	(0.02)	0.04*	(0.02)	0.03	(0.02)
MSCI world							0.02	(0.02)
Adj. R^2	0.110		0.036		0.149		0.150	
Obs.	565		545		545		545	

Table C2: Panel Regressions of Private Wealth-Income Ratios on Stock and House Prices

	(1)		(2)		(3)		(4)	
1990-2019								
Pooled OLS								
House prices	0.26***	(0.06)			0.25***	(0.05)	0.25***	(0.05)
Share prices			0.04	(0.03)	0.03	(0.03)	0.00	(0.03)
MSCI world							0.05	(0.03)
Adj. R^2	0.125		0.028		0.135		0.141	
Obs.	349		349		349		349	
Year FE								
House prices	0.29***	(0.06)			0.30***	(0.06)	0.30***	(0.06)
Share prices			0.01	(0.03)	-0.01	(0.03)	-0.01	(0.03)
MSCI world							0.00	(.)
Adj. R^2	0.207		0.087		0.205		0.205	
Obs.	349		349		349		349	
Country FE								
House prices	0.26***	(0.06)			0.25***	(0.06)	0.25***	(0.06)
Share prices			0.04	(0.03)	0.03	(0.03)	0.00	(0.03)
MSCI world							0.05	(0.03)
Adj. R^2	0.129		0.036		0.139		0.144	
Obs.	349		349		349		349	

Table C2: Panel Regressions of Private Wealth-Income Ratios on Stock and House Prices

Note: This two-page table shows alternative specifications for the panel regressions in the bottom Panel B of Table C1. The table in turn reports the results for OLS regressions of changes in private wealth-income ratios on changes in real house prices (Column 1), changes in real share prices (Column 2) and both (Column 3). Column (4) further includes the global MSCI world share price index as a control. In the "Year FE" specification, the coefficient for the MSCI World is zero, as the effect is fully absorbed by the fixed effects. See Figure C3 for details on data availability by country. We use house price (see Appendix A.11) and share price indices (see Appendix A.12) as published by the OECD in September 2020. Residuals in all models are stationary. Two-way clustered standard errors by country and year are shown in parentheses, next to coefficients. * p<.1, ** p<.05, *** p<.01.

	(1)		(2)		(3)		(4)	
Switzerland								
House prices	-0.03	(0.10)			-0.03	(0.10)	-0.06	(0.11)
Share prices			0.04	(0.03)	0.04	(0.03)	0.01	(0.06)
MSCI world							0.03	(0.06)
Constant	1.14**	(0.55)	0.95*	(0.55)	0.99*	(0.57)	0.98*	(0.57)
Adj. R^2	-0.019		0.004		-0.015		-0.031	
Obs.	49		49		49		49	
France								
House prices	0.32***	(0.06)			0.31***	(0.05)	0.31***	(0.05)
Share prices			0.05***	(0.02)	0.04***	(0.01)	0.06**	(0.02)
MSCI world							-0.03	(0.03)
Constant	1.56***	(0.30)	1.98***	(0.34)	1.44***	(0.28)	1.47***	(0.29)
Adj. R^2	0.389		0.118		0.468		0.466	
Obs.	49		49		49		49	
Italy								
House prices	0.21***	(0.07)			0.22***	(0.07)	0.18**	(0.08)
Share prices			0.02	(0.02)	0.02	(0.02)	0.04	(0.03)
MSCI world							-0.07	(0.06)
Constant	2.16***	(0.63)	2.48***	(0.69)	2.11***	(0.64)	2.37***	(0.68)
Adj. R^2	0.159		-0.013		0.155		0.161	
Obs.	47		47		47		47	
Spain								
House prices	0.22***	(0.06)			0.32***	(0.04)	0.32***	(0.04)
Share prices			0.04	(0.03)	-0.00	(0.02)	-0.02	(0.03)
MSCI world							0.03	(0.05)
Constant	1.71***	(0.57)	2.22***	(0.71)	1.23***	(0.44)	1.17**	(0.46)
Adj. R^2	0.246		0.020		0.658		0.649	
Obs.	46		32		32		32	
Japan								
House prices	0.53***	(0.09)			0.44***	(0.09)	0.45***	(0.09)
Share prices			0.12***	(0.03)	0.07***	(0.02)	0.06*	(0.04)
MSCI world							0.02	(0.05)
Constant	2.15***	(0.49)	1.76***	(0.58)	1.86***	(0.46)	1.84***	(0.47)
Adj. R^2	0.454		0.255		0.529		0.519	
Obs.	47		47		47		47	
Sweden								
House prices	0.29*	(0.15)			0.26*	(0.15)	0.25	(0.15)
Share prices			0.10**	(0.04)	0.09**	(0.04)	0.07	(0.06)
MSCI world							0.05	(0.09)
Constant	1.47	(1.03)	1.29	(1.02)	0.76	(1.05)	0.78	(1.06)
Adj. R^2	0.053		0.083		0.123		0.109	
Obs.	49		49		49		49	

Table C3: OLS Regressions of Wealth-Income Ratios on Stock and House Prices, 1970–2019

	(1)		(2)		(3)		(4)	
Australia								
House prices	0.20***	(0.07)			0.21***	(0.07)	0.21***	(0.07)
Share prices			0.02	(0.03)	0.02	(0.03)	-0.01	(0.04)
MSCI world							0.06	(0.04)
Constant	1.18***	(0.42)	1.71***	(0.41)	1.13**	(0.43)	0.97**	(0.44)
Adj. R^2	0.146		-0.009		0.143		0.162	
Obs.	49		49		49		49	
Canada								
House prices	-0.16**	(0.07)			-0.17**	(0.08)	-0.18**	(0.08)
Share prices			0.00	(0.03)	0.02	(0.03)	-0.02	(0.04)
MSCI world							0.05	(0.04)
Constant	2.55***	(0.47)	2.09***	(0.45)	2.52***	(0.48)	2.48***	(0.48)
Adj. R^2	0.073		-0.021		0.058		0.066	
Obs.	48		48		48		48	
United Kingdom								
House prices	0.30***	(0.05)			0.28***	(0.05)	0.26***	(0.05)
Share prices			0.11**	(0.04)	0.09**	(0.03)	0.05	(0.06)
MSCI world							0.05	(0.06)
Constant	0.41	(0.51)	1.18*	(0.59)	0.24	(0.48)	0.23	(0.48)
Adj. R^2	0.403		0.107		0.471		0.467	
Obs.	48		48		48		48	
United States								
House prices	0.35***	(0.12)			0.21**	(0.09)	0.20*	(0.10)
Share prices			0.19***	(0.03)	0.18***	(0.03)	0.16**	(0.06)
MSCI world							0.02	(0.06)
Constant	0.97*	(0.50)	0.65	(0.39)	0.47	(0.38)	0.48	(0.39)
Adj. R^2	0.129		0.468		0.508		0.498	
Obs.	49		49		49		49	

Table C3: OLS Regressions of Wealth-Income Ratios on Stock and House Prices, 1970–2019

Note: This two-page table shows results for OLS regressions of percentage changes in wealth-income ratios on percentage changes in real house prices, real share prices, and real the MSCI world stock index, respectively, by country. We use house price (see Appendix A.11) and share price indices (see Appendix A.12) as published by the OECD in September 2020. Period of analysis are the years 1970–2019 or the latest year with available data (see Figure C3 for details on data availability by country). We regress the change in wealth-income ratios either on real house or share prices in the respective country (columns 1 and 2), on both (column 3), and on changes in the MSCI world share price index (column 4). Residuals in all models are stationary. Standard errors shown in parentheses, next to coefficients. * p<.1, ** p<.05, *** p<.01.

	(1)		(2)		(3)		(4)	
Switzerland								
House prices	0.39**	(0.17)			0.40**	(0.17)	0.32*	(0.17)
Share prices			0.04	(0.05)	0.05	(0.04)	-0.05	(0.08)
MSCI world							0.16	(0.10)
Constant	1.21*	(0.70)	0.98	(0.80)	0.91	(0.74)	1.04	(0.73)
Adj. R^2	0.125		-0.009		0.132		0.181	
Obs.	30		30		30		30	
France								
House prices	0.41***	(0.06)			0.39***	(0.06)	0.39***	(0.06)
Share prices			0.06*	(0.03)	0.03*	(0.02)	0.00	(0.03)
MSCI world							0.05	(0.05)
Constant	1.56***	(0.34)	2.13***	(0.50)	1.48***	(0.33)	1.43***	(0.33)
Adj. R^2	0.603		0.093		0.629		0.633	
Obs.	30		30		30		30	
Italy								
House prices	0.34**	(0.14)			0.34**	(0.14)	0.32**	(0.15)
Share prices			-0.01	(0.04)	0.00	(0.04)	0.03	(0.06)
MSCI world							-0.06	(0.10)
Constant	2.06**	(0.74)	2.16**	(0.83)	2.05**	(0.76)	2.20**	(0.80)
Adj. R^2	0.163		-0.037		0.130		0.109	
Obs.	28		28		28		28	
Spain								
House prices	0.37***	(0.05)			0.36***	(0.05)	0.38***	(0.06)
Share prices			0.04	(0.03)	0.01	(0.02)	-0.03	(0.04)
MSCI world							0.07	(0.05)
Constant	1.17***	(0.42)	1.71**	(0.69)	1.15**	(0.43)	1.03**	(0.44)
Adj. R^2	0.648		0.013		0.636		0.642	
Obs.	28		28		28		28	
Japan								
House prices	-0.03	(0.13)			-0.03	(0.13)	-0.03	(0.13)
Share prices			0.02	(0.02)	0.02	(0.02)	0.03	(0.03)
MSCI world							-0.02	(0.05)
Constant	0.28	(0.49)	0.33	(0.44)	0.28	(0.50)	0.35	(0.53)
Adj. R^2	-0.037		-0.019		-0.057		-0.094	
Obs.	28		28		28		28	
Sweden								
House prices	0.17	(0.23)			0.01	(0.24)	0.00	(0.24)
Share prices			0.14**	(0.07)	0.14*	(0.07)	0.16	(0.12)
MSCI world							-0.06	(0.20)
Constant	2.79*	(1.62)	2.31	(1.43)	2.28	(1.57)	2.28	(1.59)
Adj. R^2	-0.016		0.106		0.072		0.040	
Obs.	30		30		30		30	

Table C4: OLS Regressions of Wealth-Income Ratios on Stock and House Prices, 1990–2019

	(1)		(2)		(3)		(4)	
Norway								
House prices	0.07	(0.15)			0.25	(0.17)	0.27	(0.18)
Share prices			-0.06	(0.04)	-0.10*	(0.05)	-0.09	(0.06)
MSCI world							-0.03	(0.11)
Constant	0.58	(1.13)	1.36	(1.01)	0.74	(1.07)	0.68	(1.11)
Adj. R^2	-0.032		0.036		0.076		0.040	
Obs.	27		27		27		27	
Germany								
House prices	-0.02	(0.14)			-0.02	(0.14)	-0.02	(0.15)
Share prices			0.00	(0.02)	0.00	(0.02)	0.02	(0.04)
MSCI world							-0.02	(0.05)
Constant	1.40***	(0.39)	1.37***	(0.40)	1.38***	(0.41)	1.39***	(0.42)
Adj. R^2	-0.036		-0.035		-0.075		-0.110	
Obs.	29		29		29		29	
Australia								
House prices	0.29**	(0.11)			0.26**	(0.10)	0.27**	(0.11)
Share prices			0.10*	(0.06)	0.08	(0.05)	0.06	(0.09)
MSCI world							0.03	(0.08)
Constant	1.36**	(0.62)	1.90***	(0.60)	1.21*	(0.61)	1.17*	(0.63)
Adj. R^2	0.184		0.076		0.229		0.204	
Obs.	30		30		30		30	
Canada								
House prices	-0.12	(0.14)			-0.12	(0.15)	-0.12	(0.15)
Share prices			-0.02	(0.05)	-0.01	(0.05)	-0.09	(0.08)
MSCI world							0.10	(0.08)
Constant	3.01***	(0.69)	2.78***	(0.63)	3.02***	(0.71)	2.99***	(0.70)
Adj. R^2	-0.009		-0.030		-0.045		-0.023	
Obs.	30		30		30		30	
United Kingdom								
House prices	0.33***	(0.08)			0.29***	(0.07)	0.31***	(0.08)
Share prices			0.20***	(0.06)	0.17***	(0.05)	0.24**	(0.11)
MSCI world							-0.06	(0.10)
Constant	0.21	(0.63)	0.55	(0.63)	-0.09	(0.52)	-0.08	(0.53)
Adj. R^2	0.341		0.284		0.560		0.548	
Obs.	29		29		29		29	
United States								
House prices	0.49***	(0.11)			0.38***	(0.07)	0.37***	(0.07)
Share prices			0.21***	(0.04)	0.18***	(0.03)	0.15**	(0.06)
MSCI world							0.03	(0.06)
Constant	0.90*	(0.48)	0.46	(0.45)	0.21	(0.33)	0.26	(0.35)
Adj. R^2	0.405		0.525		0.755		0.748	
Obs.	30		30		30		30	

Table C4: OLS Regressions of Wealth-Income Ratios on Stock and House Prices, 1990–2019

Note: The two-page table shows results for OLS regressions of percentage changes in wealth-income ratios on percentage changes in real house prices, real share prices, and real the MSCI world stock index, respectively, by country. We use house price (see Appendix A.11) and share price indices (see Appendix A.12) as published by the OECD in September 2020. Period of analysis are the years 1990–2019 or the latest year with available data (see Figure C3 for details on data availability by country). We regress the change in wealth-income ratios either on real house or share prices in the respective country (columns 1 and 2), on both (column 3), and on changes in the MSCI world share price index (column 4). Residuals in all models are stationary. Standard errors shown in parentheses, next to coefficients. * p<.1, ** p<.05, *** p<.01.