Wealth-income ratios in a small, developing economy: Sweden, 1810–2014[*]

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Abstract

This study uses new data on Swedish national wealth over the last two hundred years to examine whether the patterns in wealth-income ratios in rich and large Western countries shown by Piketty and Zucman (2014) extend to smaller and less developed economies. The findings reveal both similarities and differences. During the industrialization era, Sweden's domestic wealth was relatively low because of low saving rates and instead foreign capital imports became important. Twentieth century trends and levels are more similar, but in Sweden government wealth grew more important, not least through its relatively large public pension system. Overall, the findings suggest that initial conditions and economic and political institutions matter for the structure and evolution of national wealth.

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Keywords: National wealth, Household portfolios, Pension wealth, Welfare state, Institutions, Economic history

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1. Introduction

The historical evolution of aggregate national wealth addresses central aspects of long-run economic development and how the welfare of countries reflects changes in the level of technological development or institutional structures. A recent study by Piketty and Zucman (2014) presents data on long-run historical series of national and private wealth-income ratios in some very large and rich Western European and North American societies: France, Germany, the United Kingdom and the United States.[1] Their key finding is that the relative importance of aggregate wealth has fluctuated grossly over time, being historically large up until World War I and then falling until the 1970s when it started to increase, and that most of these patterns can be attributed to accumulated savings while relative asset price gains matter mostly over shorter time spans.

Although these findings provide a number of important insights, some important issues remain unresolved. Most importantly, the findings only apply to a few very large and early-developed economies and a priori there may be a large difference between their experiences and those of smaller or middle-sized economies. For example, in standard trade models, a technological shock such as industrialization shifts relative factor prices in large economies, and thus the relative value of wealth, whereas small, price-taking economies should instead experience capital accumulation through either new saving or cross-border capital flows. Furthermore, economic and political institutions may differ between the large European and American powers and other less significant countries. In fact, our understanding of how wealth accumulation responds to institutional variation is quite limited in relation to what has been shown in terms of more mechanical changes in saving, relative prices or geopolitical shocks.

This paper presents the first comparative analysis that contrasts the recent evidence of Piketty and Zucman for large countries with a new dataset on national wealth-income ratios for a small country, Sweden. Sweden offers a particularly promising case for a comparative analysis with France, Germany, the U.K. and the U.S. It is the archetypical small, open economy, lacking an important domestic market and also influence on global goods and capital prices. It industrialized later than the four large countries, and was predominantly agrarian several dec-

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[1] See also Piketty and Zucman (2015) and Piketty (2014). Their studies continue the line of research on the structure and development of aggregate household wealth, where a particularly pioneering contribution to the cross-country analysis was made by Goldsmith (1985). Other important contributions to this line of research include Goldsmith 1962; Goldsmith, Lipsey and Mendelsen, 1963; Wolff, 1989; Davies, Lluberas and Shorrocks, 2011).

ades into the twentieth century. Sweden developed during the twentieth century a social-democratic welfare state, which had one of the world's most extensive universal and egalitarian tax and social insurance systems.[2] Needless to say, without a larger historical country sample making a fuller account of the determinants of wealth-income ratios would have required a much larger sample of countries, but since such data do not yet exist a comparative analysis between Sweden and the four large economies can provide useful insights into the main historical and institutional factors of importance.

The foundation of the analysis is a new historical database on Swedish aggregate national and private wealth and savings. This database covers the private sector, households and corporations over the period 1810–2010 and the public sector, with both central and local government balance sheets, during 1870–2010, and thus the entire Swedish national wealth over the period 1870–2010. The private sector wealth database, which essentially consists of household balance sheets, includes subseries for non-financial and financial assets, and liabilities are subcomponents within each of these categories and are also provided annually over the whole period. The database also consists of estimated pension assets in both funded and unfunded private and public pension systems, informal financial claims and debts within the (unconsolidated) private sector that were dominating household portfolios during most of the nineteenth century, as well as the stock of consumer durables.

The findings reveal several new patterns in the evolution of aggregate wealth-income ratios. Most importantly, the level of these ratios in Sweden were during the nineteenth century only about half the levels found in Britain, France and Germany, even after the fast Swedish catch-up up to the First World War. However, they were almost exactly at the same level as those in the U.S. Looking for explanations, the analysis point to the role of very low Swedish saving rates which effectively put a strain on wealth accumulation. The low U.S. wealth-income ratio, by contrast, was due to high savings being dominated by even higher levels of income growth. When financing the Swedish industrialization, Swedes instead appear to have turned abroad; the study documents substantial capital imports from the middle of the nineteenth century.

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[2] In addition to these major differences, Sweden contrasts in several other dimensions: Sweden was not a belligerent country in any of the World Wars of the twentieth century (or, as a matter of fact, in any wars after the Napoleonic campaigns); Sweden is geographically the most northern country for which long-run wealth-income ratios have been studied so far; Swedes speak a different language and share a specific national and cultural heritage. Although these differences surely matter, they are hardly as important to the level, trends and composition of wealth-income ratios as the factors described in the main text.

A second main finding concerns the role of institutions for differential wealth-income ratios. In Sweden, social-democratic institutions reflecting high egalitarian ambitions were developed during the twentieth century and they created a completely different set of incentives seen in elsewhere. The study finds that government wealth grew relatively faster in Sweden than in the four large economies during the postwar era and, as a specific part of this system, the build-up of the public pension system boosted the stock of defined benefit pension wealth to internationally unmatched proportions. In other words, Sweden differed from the large European economies in the nineteenth century, unable to save because of low incomes and therefore unable to accumulate domestic wealth, and in the twentieth century, mainly because of the expansion of political institutions linked to the universalistic welfare-state system.

The remainder of this paper is organized as follows. Section 2 presents central measurement and theoretical concepts and a description of the new Swedish wealth database. Section 3 reports the main empirical results concerning trends in Swedish private and national wealth-income ratios in comparison with the same evidence for other European and North American countries. Section 4 analyzes the importance of saving and capital gains for wealth accumulation and section 5 further investigates the determinants with focus on foreign capital and welfare-state institutions. Section 6 concludes and identifies areas for future research.

2.   Concepts and measurement

2.1 Measuring national wealth in Sweden, 1810–2014

The study builds on a new database, the Swedish National Wealth Database (SNWD), which contains annual national and private wealth and savings for Sweden over the period 1810–2014.[3] Definitions of all variables in SNWD follow the international standards of the System of National Accounts, SNA 2008 (United Nations, 2009), and the European System of Accounts, ESA 2010 (Eurostat, 2013).[4] The analytical and definitional framework is adopted

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[3] A complete description of the SWND and details of its construction, including extensive treatments of source materials, previous studies, alternative definitions and the numerous problematic aspects of the data are presented in the companion paper Waldenström (2016) and in an online appendix.

[4] There are some discrepancies between the SNA 2008 and ESA 2010 as well as differences in how countries implement these systems in their own practices. An important new feature of the ESA 2010 is that costs for research and development (R&D) are redefined from running expenses (i.e., consumption) to investments, which implies that R&D is to be included in the capital stock. In this paper, however, I follow the practice of Piketty

from the recent study by Piketty and Zucman (2014), and the Swedish database is structured in a similar fashion as their cross-country dataset. Although several of these series are newly collected for this study, many emanate from previous efforts by scholars and statistical agencies.[5]

Private sector wealth, W_{Pt}, is estimated yearly since 1810 as the sum of the end-of-year market value of the wealth of households (including non-profit institutions serving households) and the corporate sector wealth. Since household wealth, W_{Ht}, includes the total value of household-owned equity of non-financial and financial corporations, the rest of privately owned corporate wealth is reflected in the "residual" between firms' market value and the replacement value of the firm net assets, W_{Ct}.[6] Public sector wealth, W_{Gt}, is the sum of the net assets of the central government (the state) and the local governments (counties and municipalities). Finally, Swedish national wealth, W_{Nt}, is the sum of private and government wealth. Note that national wealth in an open economy encompasses not only domestic capital, K_t, but also the net of assets and liabilities vis-à-vis foreigners, i.e., net foreign assets, NFA_t, which means that we can also write national wealth as $W_{Nt} = K_t + NFA_t$.

The main variable of interest in this study is the aggregate *wealth-income ratio*, $\beta_t = W_t/Y_t$, which shows how many annual national incomes Y_t that are needed to earn the current stock of wealth. National income is defined in a standard manner as the gross domestic product less capital depreciation, δK, plus net foreign income, NFI. There are different βs for the different sectors in society, with β_{Pt}, β_{Gt} and β_{Nt} denoting the wealth-income ratios using private, government and national wealth, respectively.

Data on the historical wealth aggregates come from a variety of sources. In the interest of space, this section only makes a brief description but an online appendix presents details of all sources and calculations as well as several robustness checks.

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and Zucman (2014) for comparative purposes and do not treat R&D as investment but instead as expenses, thus following the older routine in the ENS 1995 (the Swedish version of ESA 1995). .

[5] Fahlbeck (1890) and Flodström (1912) made important contributions to Swedish national accounting, including the construction of national wealth estimates for single years. Berg (1983, 2000) compiled household balance sheets since 1950. In the 1990s, Statistics Sweden constructed national balance sheets for the period 1980–1994 (Tengblad 1992; Statistics Sweden 1995). In addition, the database relies on the work by Swedish economic historians in generating long-run national accounts series (Edvinsson, 2005, 2014; Krantz and Schön, 2007, 2012; Schön, 2012).

[6] That is, if Tobin's Q is equal to one, this difference is zero and private wealth equals household wealth.

Non-financial assets consist of produced assets, mainly dwellings and other construction, and non-produced assets, such as urban and agricultural land and timber tracts. The main sources for these series are tax assessments of agricultural and non-agricultural property (both buildings and land), available annually over the full period. One important adjustment of these series is to convert tax-assessed values to market values, and this done using a range of published ratios of tax and market values in historical statistical publications and modern economic history research.

Financial assets deposits and currency, shares, bonds, informal claims as well as life insurance savings and funded pension assets. Financial liabilities include standard financial sector loans, state loans to housing or higher studies and central government debt. Data on series come from annual reports of the banking and financial sector (saving banks, commercial banks, mortgage associations, insurance companies) and from government publications of balance sheets. Valuation is difficult for especially two of these items: non-listed corporate equity and government assets. For non-listed corporate equity, the main approach is to simply reported used book values in relation to the incorporation of these firms, but for some of the earlier categories (e.g., manufactures) I have used earnings information and computed capital stocks from assumed capital-income ratios. Similarly, government assets for which there are no clear market prices (e.g., utilities, infrastructure) I have followed the valuation principles of contemporary accounting standards as reflected in published balance sheets.

Data on saving rates gross and net of depreciation, s_t^g and s_t^n respectively, are also presented for each since 1810.[7] Private saving rate is the sum of the personal and corporate saving rates. $s_{Pt} = s_{Ht} + s_{Ct}$ and the national saving rate is simply the sum of private and public saving, $s_{Nt} = s_{Pt} + s_{Gt}$. Data on savings are scarce before 1950, when Sweden introduced its official national accounts.[8] Between 1810 and 1950, therefore, savings are computed from the historical national accounts of Edvinsson (2005, 2014) as the sum of investments, gross or net of depreciation, and the sum of the current account (defined as the difference between exports and import of goods and services) and capital accounts (defined as the net foreign income). The sectoral decomposition of saving before 1950 is based on applying approximate and un-

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[7] The gross saving rate is defined as $s_t^g = S_t^g/Y_t$ and net saving is $s_t^n = (S_t^g - \delta_t K_t)/Y_t$.
[8] Even though there are previous attempts to calculate historical saving rates (e.g., Schön, 2012) these are not published and also not available at the sectoral level.

certain shares of national saving reported in Lindberger (1956) and Lundberg (1970).[9] After 1950, I use the numbers for household, corporate, government and national saving reported in the official national accounts.

2.2 Analytical framework

What are the forces determining the level and trends of wealth-income ratios over time? For reasons of comparability, I adapt the framework of Piketty and Zucman (2014), also elaborated in Piketty (2011, 2014), which aimed at pinpointing some of the components underlying the evolution of wealth-income ratios. They used a simple model of wealth accumulation which expresses how new wealth is generated either through new savings or through capital gains: $W_{t+1} = W_t + s_t^n Y_t + KG_t$. Then they used the Harrod-Domar-Solow model to derive steady-state levels of β. In a model with only one capital good, this level is the ratio of the private net savings s_P^n to income growth rate g, $\beta = s_P^n/g$.[10] Finally, they extended this framework to consider more goods and therefore relative price effects, decomposing wealth accumulation into a saving-induced component (a volume effect) and a capital gains-induced component (a relative price effect).[11]

It is possible to extend the analysis, for example by being more flexible with respect to the role of capital depreciation when expressing saving and output. Using rates net of depreciation corresponds to the accumulation of new wealth which is made over and above the imputations needed to restore a deteriorated capital stock. At the same time, using gross rates can also be relevant, not least when considering the fact that the rate of depreciation may actually vary over time, not least in response to technological development. Piketty and Zucman discuss these alternatives, and Krusell and Smith (2015) have even solved for the steady-state level of β when using different combinations of gross and net saving and output rates; these are shown in Figure 1. Using the new Swedish historical evidence of gross and net saving rates and output, Section 4 examines empirically how the different steady states of long-run capital-output ratios match the observed Swedish historical β.

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[9] Shares of national saving adhering to households, corporations and the government are reported by Lundberg (1970, pp. 92f) for the period 1923–1962 and Lindberger (1956, ch. 4) for 1945–1951. The shares before 1923 are assumed to be at the same level as in the 1920s. See further online appendix section F3.

[10] This steady-state result derives from the dynamic equation $\beta_{t+1} = \beta_t[(1 + g_{Wst})/(1 + g_t)]$, where $1 + g_{Wst} = 1 + s_t^n/\beta_t$ is the savings-induced rate of wealth growth and $1 + g_t = Y_{t+1}/Y_t$ is the rate of income growth (Piketty and Zucman, 2014).

[11] Denoting the volume of capital, V, and the market value of capital, $K = qV$, Piketty and Zucman (2014) show that the wealth-income ratio evolves according to the process $\beta_{t+1} = \beta_t[(1 + g_{Wst})(1 + q_t)/(1 + g_t)]$, where $1 + q_t$ is the capital gain or capital loss.

3. Main trends: Sweden vs. Europe and North America

Are the differences in terms of country size, economic development or geopolitical events immediately visible in the trends and levels of β? This section aims to answer this question by comparing the evolution of Swedish wealth-income ratios and with the same series for other industrialized economies.

Figure 2 displays private and national wealth-income ratios during the most recent period, 1970–2010, in Sweden and seven other industrialized countries in Europe and North America. Both panels are relatively similar in level, which reflects a general pattern found across countries and time, namely that private wealth typically accounts for most of national wealth whereas government net assets are relatively small or at times even negative (Sweden deviates from this pattern in some periods, as will be shown below). When making a full comparative account from the figure there are, of course, numerous country-specific factors at play, but if one restricts attention to how Sweden compares with the rest, then two immediate results stand out. First, Sweden's wealth-income ratios are relatively low. When considering private sector wealth (left panel), in the 1980s and 1990s, β_P hovers at approximately 200 percent (or two years of national income) in Sweden and 200–400 percent in the other countries. During the 2000s, Sweden has a ratio of approximately 300 percent and the other countries are at 400–600 percent. When considering national wealth (right panel), Sweden is more similar but always on the low end. The two countries that appear to most resemble Sweden in both cases are Canada and Germany. A second result is that Sweden appears to follow a similar trend of an increasing β, even if a close inspection reveals that the rise is not very smooth. In fact, the rise in Sweden begins only in the late 1990s, which naturally has bearing on the acclaimed role of macroeconomic and policy events in the 1970s and 1980s.

Turning to the long-run historical perspective, Figure 3 displays β_P between 1810 and 2010 in the countries for which such long-run data exist: Sweden, France, Germany, the U.K. and the U.S. In this group of countries, Sweden truly stands out at all times: during the nineteenth

century as being much smaller and more backward, and during the twentieth century as being much smaller, outside the World Wars and having a more egalitarian welfare state. The wealth-income ratio in the nineteenth century is much lower in Sweden than in the other European nations, at roughly one-third to one-half of their levels. However, Sweden is almost exactly on par with the level of the U.S., beginning low at approximately 300 percent of national income and then slowly increasing to between 400 and 500 percent a century later.[12] In the twentieth century, all five countries appear to converge, dropping during the First World War and then decreasing further until the 1980s, when the decrease turns into an increase.

[Figure 3 about here]

Figure 4 presents the long-run development in the same five countries but for national wealth-income ratios, β_N. Although the time span is somewhat shorter, the patterns look quite similar to the case of private wealth. Before the First World War, Sweden has the same relatively low level as the U.S. but having a wealth-income ratio that is approximately half of those found in the rest of Europe. In the twentieth century, the countries are all in the same region and Sweden does not deviate notably. It is interesting to note, however, that the modern relatively low Swedish national wealth-income ratio is not present until the 1970s.

[Figure 4 about here]

4.   Decomposing wealth accumulation: Savings vs. capital gains

The model of wealth accumulation presented in section 2 postulated that wealth accumulation can be decomposed into relative contributions from savings and capital gains. The analysis of Piketty and Zucman (2014) found for France, Germany, the U.K. and the U.S. that over the very long run, almost all of the new wealth came from savings whereas capital gains mattered primarily over shorter time periods during which capital stocks did not adjust. Does Sweden fit into this pattern as well? A priori, it is not clear what to expect. Although the same basic forces are also at play in the accumulation of Swedish wealth, the country's much smaller size (with a limited domestic market and little influence on international factor prices) and a set of institutional characteristics ranging from initial conditions to complex outcomes such as fi-

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[12] If one instead considers per capita wealth in constant PPP levels, Swedes were poorer not only than Continental Europeans but also than Americans up until the postwar era (Waldenström, 2016).

nancial development could imply quite differential outcomes. For example, the demand shock for capital coming with industrialization should raise interest rates and therefore savings, but if such savings are unavailable for some reason the outcome depends on the economy's degree of openness: a small, open economy should experience increased capital imports (as factor prices are set) whereas a closed economy should experience increased capital prices.

Table 1 begins this analysis by decomposing private wealth accumulation for subperiods since 1810 for Sweden and then compares it with the same decompositions made for France and the U.S. by Piketty and Zucman. The table distinguishes between results using personal saving and private saving. Making this distinction refers to the fact that private gross assets come from the household sector balance sheet (housing, bank deposits, shares, insurance savings, etc.) and therefore directly map against personal savings. Corporate savings are, in principle, also incorporated through the value of corporate equity but in case there are deviations between book and market values of corporate equity (and Tobin's Q differs from one), then large corporate savings may not be reflected in the market values of firms and instead spill over on the estimation of capital gains or losses in other asset markets, predominantly the housing market.[13]

The main result in Table 1 is that Sweden stands out quite remarkably from the larger countries. In the nineteenth century, capital gains represent the most important source of Swedish real wealth growth regardless of whether one uses private or personal savings; in the latter case capital gains account for almost 90 percent of the wealth growth! During the twentieth century, Sweden is more similar but only when private saving is used. Disregarding corporate savings results in substantially lower net saving rates and then capital gains once again account for the major part of private wealth accumulation. Doing the same separation across private and personal saving rates in France and the U.S. makes little difference, underlining the finding that Sweden differs.

[Table 1 about here]

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[13] The Swedish Q ratio, computed here as the ratio of the market value of all household business equity (listed and non-listed) to net corporate book assets, hovers around 0.3–0.5 in the 1980s and 1990s, rises steeply to almost one around the year 2000, only to fall to lower levels thereafter (see further the online appendix, section C). Piketty and Zucman (2014) found that similar low Q ratios in Germany (approximately 0.5) can account for much of the country's low β_P.

One possible explanation for this stark difference between Sweden and the larger economies could be that the indirect Swedish capital gains (or actually the estimated saving rates) are measured with some error and therefore simply are too large. One way to address such a concern is to compare the indirectly estimated capital gains contributions with actual historical capital gains observed in Swedish asset markets at the time. Thanks to recent research efforts it is now possible to make such comparison using historical data from Swedish housing and stock markets.[14] Table 2 shows four different variants of inflation-adjusted capital gains: (a) Housing price increases in the two largest cities (Stockholm and Gothenburg), (b) Stock returns on the Stockholm Stock Exchange composite index, (c) Indirectly estimated capital gains from Table 1 using private saving rates, and (d) Indirectly estimated capital gains from Table 1 using personal saving rates. Restricting attention to their main message, a clear pattern emerges: There is a strong correlation between capital gains estimated from personal saving rates and real house price gains, a less strong correlation between these capital gains and stock returns, and finally no seeming relation at all between these market returns and the capital gains estimated using private saving rates. In other words, the simple structural model of section 2 decomposing wealth growth into net savings and capital gains performs remarkably well when evaluated against real-world price gains in housing markets and using personal saving rates but not when using private saving rates, a result that most likely reflects discrepancies between the measurement of corporate values in either book or market terms.

[Table 2 about here]

A final assessment of the role of savings for wealth accumulation is to address empirically how well the models reviewed in section 2 using gross and net of depreciation rates for saving and output are able to match actual long-run averages of β. Table 3 presents one variant of such assessment, namely a simple parametrization of the different model versions using actual historical Swedish parameters during different historical episodes over the past two hundred years.[15] When considering the entire 200-period, an admittedly extremely long "long run", all four models perform relatively well, generating steady-state β_P's that deviate only marginally (5–15 percent) from the actual average β_P. Looking at different subperiods, however, all par-

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[14] Bohlin (2014) and Söderberg, Blöndal and Edvinsson (2014) computed homogenous time series of housing prices in Gothenburg and Stockholm since 1875, with all-Swedish series available since 1857. Similarly, Waldenström (2014) presents new Swedish evidence of stock returns since 1871 and bond yields since 1856.

[15] Focus is here put on private wealth and private savings, but the results are quite similar when using national aggregates since 1870.

ametrically computed ratios perform considerably worse. In the nineteenth century, all models substantially undercut the observed level. This could reflect the absence of capital imports in these closed-economy models and possibly an incomplete account of real capital gains, both of which are found elsewhere in this paper to matter particularly for Swedish wealth accumulation. The picture is similar for twentieth century with notable discrepancies between the model predictions and the actual wealth-income ratio, probably for similar reasons. In all, the new historical evidence of Sweden presented here delivers mixed support for simplistic wealth accumulation models at least when it comes to predicting the steady-state wealth-income ratio.

[Table 3 here]

5.   Further explanations for the evolution of Swedish wealth-income ratios

5.1 Is Sweden "the U.S. of Europe"?

A main result in the previous section is that Sweden did not follow the Continental European of high pre-war wealth-income ratios, but was instead closer to the lower levels seen in the U.S., at least up to the First World War. While this resemblance may seem unexpected, nineteenth century Sweden and USA had actually some specific common features that could influence the relative capital intensity: both had a very low population density and both were predominantly agrarian.[16] However, before labeling Sweden "the U.S. of Europe" a closer inspection of the data is required. Figure 5 begins by decomposing β into three broad asset classes: agricultural land, housing and other domestic assets.[17] Only in one of these, the value of agricultural land relative to national income, do Sweden and the U.S. depart from the large European countries. In the nineteenth century, agricultural land represented approximately 1–2 years of national income in the U.S. and Sweden, compared to 3–4 years of national income in France, Germany and the U.K, which accounts for basically all of the difference in the aggregate wealth-income ratio.

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[16] Population density during the nineteenth century (using Maddison data on inhabitants per square km of current country surface) was relatively high in France (from 50 to 60 between 1820 and 1910), Germany (from 70 to 170) and the U.K. (from 90 to 180), whereas it was relatively low in Sweden (from 6 to 12) and the U.S. (from 1 to 9).

[17] Even though the asset categories are admittedly very broad, Piketty and Zucman still urge caution when making cross-country comparisons based on their historical series.

[Figure 5 about here]

But what explains the relatively low values of agricultural land in Sweden and U.S.? Looking only at the simple accounting, it must be due to low land prices (a relative price effect) or to small areas of cultivated land (a volume effect), or a little of both. Piketty and Zucman (2014) discuss the low U.S. agricultural land values, arguing that given the high saving rates and vast geographical areas the natural explanation is low prices per acre.[18] Table 4 sheds offers some evidence on the issue in terms of constant land prices per acre in Sweden and the U.S. between 1800 and 1920.[19] In 1800, an acre was worth, on average, 103 USD in Sweden but only 10 USD in the U.S., or approximately one-tenth. In 1850, U.S. land prices had increased to one-fourth of the Swedish ones, by 1880 it was one-half, and in the 1910s, the U.S. land value per acre had surpassed that in Sweden. In other words, U.S. land prices per acre were, in fact, very low in the nineteenth century, which supports Piketty and Zucman's assertion about one important reason for the low U.S. wealth-income ratio.

[Table 4 about here]

However, while explaining the relatively low wealth-income ratio in the U.S., this evidence still leaves us with a puzzle for Sweden: if Sweden's land prices were so high (in relative terms), how come the aggregate value of agricultural land not higher in terms of national income? According to the standard wealth accumulation model the answer should be a volume effect, i.e., insufficient new savings to generate a stock of assets. A final piece of evidence to examine this issue is presented in Table 5, which reports net saving rates and national income growth rates for the five countries analyzed here over different periods since 1810. The table shows how Swedish saving rates were very low throughout the nineteenth century, at only 2–3 percent of national income, which was about one quarter of the saving rates found in the U.S. and also France and the U.K. Over time, the Swedish saving rates increased, and by the latter part of the twentieth century, all four countries seem to have converged.

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[18] This, in fact, squares only with having and elasticity of substitution between capital and labor σ being less than 1 in a standard CES production function. The relative price effect (land price per unit of labor) then will dominate the volume effect (having much land per citizen), and Piketty and Zucman (2014) argue that this was indeed the case in the U.S. during the nineteenth century.

[19] The Swedish land value per acre (4,047 square meters transformed from the Swedish unit "hektar", 10,000 square meters) is computed by simply dividing the farmland value by the size of farmland. Lindert (1993, table 1) reports data from agricultural censuses and the official U.S. Department of Agriculture averages for the 48 states. Prices are in 1960 USD.

Summing up the discussion, the answer to the question "Is Sweden 'the U.S. of Europe'?" must be "no". The two countries are remarkably similar in their wealth-income ratios, especially during the nineteenth century, but for quite different reasons. Whereas the U.S. had a low ratio largely due to very low land prices, Sweden had a low ratio due to domestic savings: the Swedes were simply too poor to afford accumulating any of their income. However, even though Sweden was not the U.S. of Europe, it was even more dissimilar to the other European countries included in the comparison. This calls for further research into the role of differing historical and institutional experiences for wealth accumulation among the countries across the European continent.

5.2 The role of foreign capital

The significance of cross-border capital flows in Sweden is often emphasized in relation to two historical episodes: the industrialization era in the late nineteenth century and the high capital taxation era of during the late twentieth century.

Above it was shown that nineteenth century Sweden was a relatively capital-scarce economy, but that wealth accumulation picked up towards the end of the century, with private wealth-income ratios increasing from around 300 percent of national income in 1850 to around 500 percent in 1900. The question of how important capital imports were in Sweden's industrialization process has been studied before, and scholars have documented both the size of capital flows and the identity of main borrowers. Still, there is still no consensus about how important these foreign funds were. Some scholars point to balance sheets of industrial firms which indicate that most of the borrowed capital came from domestic banks, not foreign financiers (Gårdlund, 1942). Others, however, have emphasize the role of foreign capital imports (Schön, 1989), in particular arguing that even though Swedish banks indeed did lend money to Swedish industrial corporations, Swedish banks were, in turn, largely capitalized by foreign loans. Furthermore, the Swedish government borrowed abroad to finance the railway

expansion, which benefited domestic industrialization, and that also left some funds for the private industry to borrow, which otherwise may not have been available (Schön, 2012).[20]

Figure 6 sheds light on this issue by relating net foreign assets (defined as all claims on foreigners' net of foreign claims on citizens at current market prices) to national income since 1810. The picture shows clearly that Sweden was a net importer of capital during the entire industrial take-off, with foreign wealth representing approximately one-half of a year's incomes. Most of these foreign funds came from German and French creditors who bought Swedish bonds floated on the Hamburg and Paris markets (Franzén, 1998, p. 110). Compared with the other countries in the figure, Sweden was the largest net debtor and only the U.S. had a negative foreign position, but at a smaller level, whereas France, Germany and the U.K. were instead net creditors on international capital markets.[21] Gauging the quantitative importance of these foreign funds for Swedish industrialization is difficult. During the expansive industrial period 1880–1910, the net foreign assets were about the same size as the stock of commercial bank credit and roughly 150 percent of central government debt.[22] But when comparing the 1908 cumulate stock of private Swedish bonds floated abroad to all corporate bank credits in that year, the share is only one tenth.[23]

[Figure 6 about here]

During the late twentieth century, foreign capital mattered less in all Western economies, including Sweden. However, perhaps a part of this could be due to capital flows taking less disclosed forms. A particular debate in Sweden has concerned the tax-driven capital flight that according to some was substantial in the 1980s, 1990s and 2000s when Sweden combined high internationally high capital tax rates and a liberalized capital account (from 1989). Roine and Waldenström (2009) attempted to estimate this potential illicit offshore wealth stored in

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[20] Related to this discussion is a broader debate about the overall importance of open economy forces in the Swedish industrialization. While some argue that these were key by generating export revenues, facilitating capital imports and new world out-migration of displaced workers (e.g., Jörberg, 1961; O'Rourke and Williamson, 1995), others stress the importance of the rise of a domestic demand that was more due to the income growth and institutional developments (e.g., Schön, 2012).

[21] If non-market colonial appropriations were an important part of these foreign funds alongside true market-related capital exports, however, that could call for a reinterpretation of Britain, France and Germany being the bankers of the industrializing world.

[22] See the main SNWD file, sheets SE2.3 (memo: commercial banking statistics) and SE3.1 (government wealth).

[23] Flodström (1912) reports both all foreign-issued bond loans until 1908 and summary statistics for corporate balance sheets in 1908.

tax havens by cumulating the net errors and omissions in the Balance of Payments statistics.[24] Figure 7 prolongs their series to 2014, and adds also estimations of the fortunes of some named super-rich Swedish individuals living abroad but who are still included in journalistic rich lists over Swedish billionaires.[25] This figure implies that as much as 10–15 percent of Swedish private wealth could be located in tax havens. While this is indeed a sizeable number, it does not suffice to alter the main conclusions drawn in previous sections of Sweden being a relatively capital-scarce country among the other Western nations.

[Figure 7 about here]

5.3 The role of government institutions

A vast body of research literature has shown how political and economic institutions are key in the evolution of both size and scope of government.[26] Little is known about how this materializes in terms of national balance sheets and with such small number of countries in the historical sample it is not possible to investigate the issue in detail. Nevertheless, this section examines two specific dimensions in which the role of political institutions could be expected to influence national wealth: the size of government wealth and the importance of a unfunded public pension system.

5.3.1   Government wealth in the Social-Democratic welfare state

It is well-known that Sweden after the Second World War developed one of the world's most extensive welfare states, encompassing a broad scheme of universal social insurance, centralized wage-setting and far-reaching redistribution via the tax bill (Lindbeck, 1997). This institutional setup is bound to have influenced the structure of aggregate wealth, in particular through slashing individual incentives to save privately for services already paid for via the tax bill (Feldstein, 1974). Governments, on the other hand, have potentially opposite incentives, facing a need to complement the tax receipts with financial buffers to ensure a stable financing the welfare services.

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[24] This is roughly at the same level that Zucman (2013) finds for all of Europe. Swedish estimates are reported in the main SNWD file, sheets SE2.3 (offshore financial assets) and SE2.1 (private wealth).

[25] Data on super-rich Swedes residing outside of Sweden (most of them in Switzerland, England and the U.S.) come from the magazines *Affärsvärlden*, *Månadens Affärer* and *Veckans Affärer*. Valuations are highly uncertain and should therefore be interpreted cautiously.

[26] The proposed channels are numerous, including the extension of franchise (e.g., Meltzer and Richards, 1981; Acemoglu and Robinson, 2000) and the structure of the electoral system (e.g., Persson and Tabellini, 1999). See also Acemoglu et al. (2015) for a comprehensive account of how the evolution of political institutions may influence national endowments.

Contrasting the postwar welfare-state arrangements in Sweden with those in France, Germany, the U.K. and the U.S. does not show on worlds apart. The other countries have traditionally relied more on means-testing and previous contributions than universal provision, on private and corporatist rather than public financing. However, even if these differences are sometimes used to characterize fundamentally distinct forms of welfare capitalism (Esping-Andersen, 1990), they contain a mixture of overlaps and dissimilarities.

Figure 8 government wealth-income ratios, β_G, in the five countries over the past 140 years. While Sweden does not differ dramatically some features stand out. First, Sweden had the largest government sector in terms of net assets over almost all time periods.[27] This is particularly fascinating with respect to the nineteenth century, which is long before the expansion of the social-democratic welfare state. Interestingly, the German government was also relatively wealthy during the 1870–1910 period when the Bismarckian social insurance system was introduced. Sweden was an early adopter of the thoughts underlying this new German welfare system, and this could perhaps partially explain why both of these countries had relatively large government sectors in this era. Second, unlike all the other countries Sweden's government wealth has never been negative, not even during the period of extensive foreign borrowing in the late nineteenth century.[28] Possibly this is related to the fact Sweden was not at war after 1813, something which seems to matter when considering the dramatic dips of the other countries around the times of the two World Wars.

[Figure 8 about here]

5.3.2 Pension wealth effects

Pensions are central to everyone's lifetime wealth and thus an integral part of any modern welfare-state arrangement. Nevertheless, standard definitions of wealth exclude an important part of pension entitlements, namely those in defined benefit (unfunded) public and private pension schemes. The main reason for disregarding them is that they are not backed by tangible assets held by the policyholder (the state or an employer). However, if unfunded pension wealth crowds out private wealth accumulation, which is indeed indicated in studies by Feld-

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[27] That Sweden's government sector, measured as β_G, is in the top group internationally is true also after adding Australia, Canada, Italy, Japan and Spain for which data exist from 1970 onwards in Piketty and Zucman (2014).
[28] Note that Swedish central government wealth was negative in the early 1990s but that local governments retained solid and kept total government wealth positive (Waldenström, 2016).

stein (1974) for the U.S. and Berg (1983) for Sweden, then the addition of the estimated net present value of these pensions could be taken to reflect the size of private wealth had there been no defined benefit pension system. Of course, national wealth would not be affected by such adjustment since the additional private assets are balanced by corresponding public sector liabilities.

Figures 9 and 10 present evidence on the impact of unfunded defined benefit (*DB*) and funded defined contribution (*DC*) public and private pension assets of the private sectors in Sweden, the U.K. and the U.S. households and its evolution over time. Figure 9 shows four newly estimated series on Swedish pension assets:[29] $\beta_P = W_P/Y$, the Swedish private wealth-income ratio, which includes DC pension assets; $\beta_P^{-DC} = (W_P - A_P^{DC})/Y$, which is the same excluding all DC pension assets; $\beta_P^{DC+DB} = (W_P + A_P^{DB})/Y$, which includes all DC and the present value of DB pension wealth; $\beta_P^{DC+DB+AP} = (W_P + A_P^{DB} + A_G^{AP})/Y$, which also adds the total value of government-controlled pension buffer funds, called *AP-funds*, which were built up in the 1960s and 1970s by income tax payments and sometimes referred to as "forced personal savings". In 2014, the sum of private wealth and total pension wealth in the public and private systems amounts to seven years of national income, i.e., approximately 1.5 times the private wealth-income share. Before the postwar era, pension entitlements were, according to my estimates, unimportant relative to other private net assets. Particularly notable is the quantitative insignificance of the universal public pension system, and its first set of basic guarantee pensions (*folkpensioner*), that came in 1914. More important were the dramatic extensions of the pension system coming with the 1947 reform (substantially raising basic guarantee pensions) and the 1960 reform when public pensions for white-collar workers were elevated. These two events lifted the value of pension wealth from a tiny fraction of private wealth to one hundred percent of total private wealth in 1960.

[Figure 9 about here]

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[29] The data on Swedish pension wealth comprise all public and private defined contribution (DC) and defined benefit (DB) pensions since 1810. Public DB pensions are basic guarantee pensions and income-based pensions and DC premium pensions (introduced in 1996). Private occupational pensions are both DC and DB. Finally, individual pension savings are always included. All pensions are pre-tax (following ESA 2010). The value of DC pensions is relatively easily observed in historical sources (e.g., Statistics Sweden, 1960), but DB pensions are more difficult. For public DB pensions I use tables of pension payment by age in Elmér (1960, tables I-V, pp. 532–541) and calculations since 1950 by Berg (1983, Table A3.3, for 1950-1979), Ståhlberg (1981) for 1978 and since 2001 by the Swedish Pension Agency's Orange Reports. Occupational DB pensions are very difficult to value and are estimated using information in (see online appendix, section C6) for details.

Does Sweden differ from other countries when one accounts for the net present value of DB pensions? Unfortunately, answering this question is difficult due to a general lack of aggregate pension wealth data, particularly over longer time periods (recall that Piketty and Zucman excluded DB defined-benefit pensions from their analysis). However, there are some pieces of historical time series evidence on both DC and DB pension wealth for the U.K. and the U.S. For the U.K., Blake and Orzag (1999) present estimations of the size of pension assets on a yearly basis between 1948 and 1994.[30] For the U.S., Wolff (1989, 2011) and Wolff and Marley (1989) estimate variants of private and pension wealth in various years since 1922 using data from national accounts, estate tax records and wealth surveys, and the Investment Company Institute (2015) reports annual totals since 1974.[31] I also include a share of the net present value of Social Security benefits related to old-age and survivors insurance (OASI) which are essentially retirement payments.[32]

Figure 10 shows the role of pension wealth for wealth-income ratios in the U.K., Sweden and the U.S. during the twentieth century. All three countries exhibit increasing trends in the share of DB pension wealth of total private wealth over the period (or at least until the late 1990s), but the levels of these shares differ between the countries by an order of magnitude. Before the 1940s, defined benefit pension wealth was insignificant, amounting to only five to ten percent of total private wealth. During the 1950s unfunded pension wealth became more important as the countries expanded their social security systems and amounted to around one-third of private wealth in all three countries. However, from the 1960s onwards, Sweden's DB pensions were made even more encompassing and equally valuable as all private wealth whereas they still amounted to only one-third in the U.K. and one-half in the U.S. Almost all this new pension wealth was in Sweden tied to public pension schemes, whereas in the Anglo-Saxon countries it was more of a mixture between private and public schemes.

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[30] The series with unfunded DB pensions are "Basic state pension wealth", "SERPS pension wealth" and "Unfunded occupational pension wealth" (Blake and Orzag, 1999, table 12).

[31] Wolff and Marley (1989, table 15.3) report different concepts of aggregate wealth for single years between 1922 and 1983. For W_P, I use their series W1. For total pension wealth, W_P^{DC+DB}, I include the additional wealth in their series W3, which is defined as W1 plus "the full reserves of trust funds less their actuarial value in W1" and "the total value of pension reserves less the CSV of pensions (which is included in W1 and W2)". They also present a series called W4, which is W3 plus "the expected value of future social security benefits". I back out this social security wealth (SSW) and multiply it by the share of old-age and survivors insurance (OASI) benefits in total Social Security benefits (Social Security Administration, 2015, table 4.A4). Wolff (2011, tables 4.6 and 5.3) presents augmented wealth, which includes private wealth, retirement wealth and SSW, for 1989, 2001 and 2007 based on the Survey of Consumer Finances. Comparing these series (except for the SSW wealth) with series published by ICI ("Private-sector DB plans", "State and local government DB plans", "Federal DB plans" and "Annuities") from 1974 onwards give essentially the same result (ICI, 2015, table 1).

[32] This value is substantial and was not included in the analysis in previous versions of this paper.

[Figure 10 about here]

Taken together, this comparative account of the historical evolution of government wealth suggests that Sweden was not drastically different from the large European economies or the U.S. The era when Sweden differs the most in terms of government wealth-income ratios or the relative importance of public pension wealth is the 1960s and 1970s. This was also the rea of the most ambitious egalitarian policies of the social-democratic governments, bringing wide-ranging reforms of the tax-benefit systems and rules regulating the labor market (Lindbeck, 1997).

6.   Summary and conclusions

This paper set out to analyze the historical development of aggregate wealth-income ratios in the Western world. While such trends were studied recently by Piketty and Zucman (2014), the unique contribution of this paper is to contrast their evidence for a group of very large and advanced economies with similar evidence on another, smaller and relatively backwards, economy: Sweden. At the core of the analysis lies a new historical dataset on Swedish national wealth and its components spanning two centuries.

What lessons can be learnt from a comparative analysis such as the present one? The limited number of countries for which long-run series are available naturally bounds the possibility to make a full account of all relevant aspects. However, the considerable cross-country variation at hand in terms of size, level of development and institutional structure still allows for some tentative conclusions to be made.

A first main finding is that Sweden did not follow the same pattern as the other European countries, especially not during the nineteenth century but to some extent also in the twentieth century. Throughout history Swedes were been poorer, both in terms of per capita wealth and as regards aggregate wealth-income ratios. Before the First World War Sweden's wealth-income ratio were similar to that of the U.S., but an examination shows that the underlying reasons differed; Sweden's low ratio was due to a very low saving rate whereas the low U.S. ratio was due to high income growth.

A second finding is that capital gains mattered much more for private wealth accumulation in Sweden than in the large economies, also over the longer-run periods. Although measurement errors (poorly estimated saving rates) could potentially explain some of this difference, the Swedish estimates square with evidence on capital gains recorded from historical market prices of housing and stock exchange-listed corporate equity.

A third main result considers the role of political and economic institutions for wealth accumulation, a largely overlooked question in past studies. Sweden's different political context and welfare-state institutions vis-à-vis those in Continental European and Anglo-Saxon countries offer a unique opportunity to examine this issue. The evidence indicates an extraordinarily large growth of Swedish government wealth in the postwar era, precisely at the time of the most intensive expansion of the social democratic welfare state. A particularly important component appears to have been the establishment of a comprehensive public pension system, which slashed private incentives to save privately for old age. When comparing the total retirement wealth, including the net present value of defined benefit pensions, in Sweden with estimates for the U.K. and the U.S., results suggest that Sweden stands out also in this respect.

Acknowledging the fact that these findings are bounded by several shortcomings, in particular the small number of countries in the current long-run dataset, they nevertheless offer a first comprehensive account of the nature of national wealth and its evolution over time when considering both large and small developing countries. Future studies encompassing more countries will hopefully be able build on these results to further contribute to our understanding of this highly significant macroeconomic issue.

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Figure 1: Steady-state wealth-income ratio β across growth models.

Version of Harrod-Domar-Solow model:

|	Net saving	Gross saving
Gross output	$\dfrac{s^n}{g + s^n \delta}$	$\dfrac{s^g}{g + \delta}$
Net output	$\dfrac{s^n}{g}$	$\dfrac{s^g}{g + \delta(1 - s^g)}$

Note: s^g and s^n denote saving rates net and gross of capital depreciation, respectively, g is the national income growth rate and δ the depreciation rate (consumption of fixed capital).

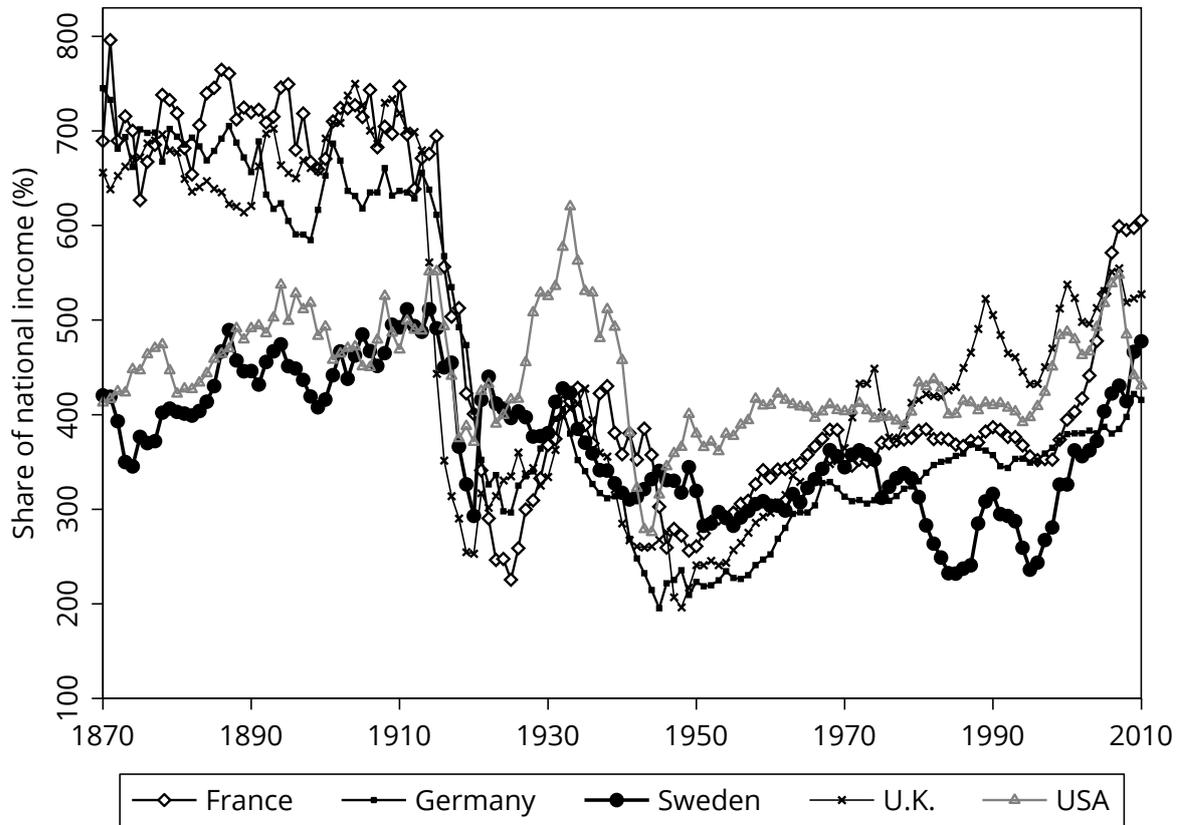Figure 2: Wealth-income ratios in Europe and North America, 1970–2010.
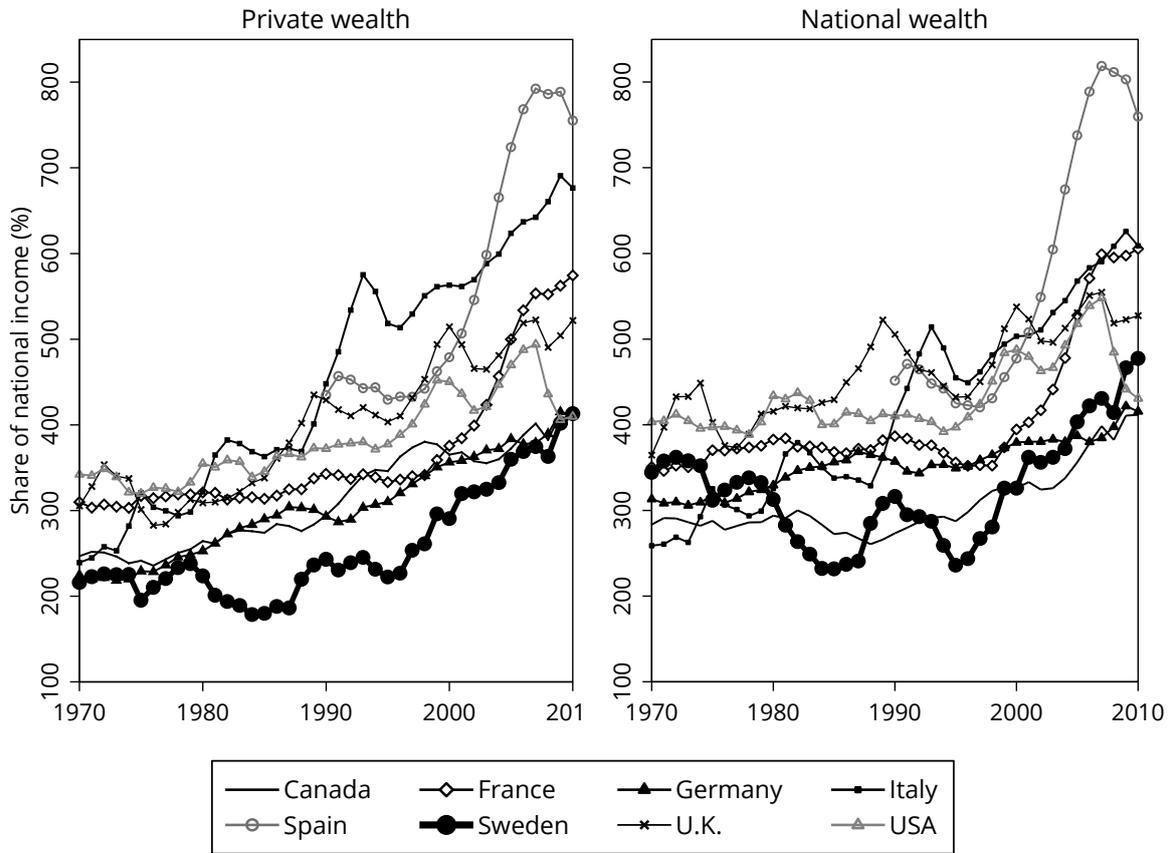
Sources: Sweden: SNWD, v1.2, table SE1.1. All other countries: Piketty and Zucman (2014), appendix tables A1 (national wealth-income ratios) and A5 (private wealth-income ratios).

Figure 3: Evolution of private wealth-income ratios, five countries, 1810–2010.
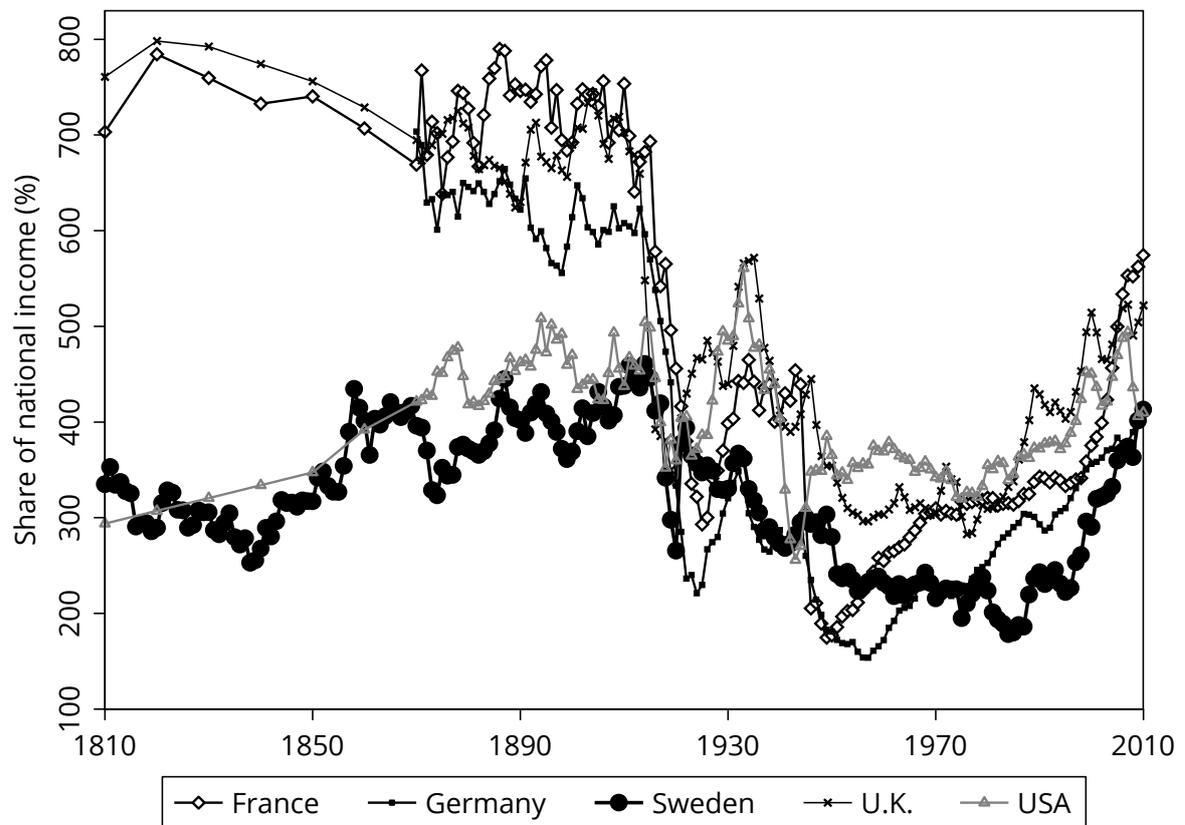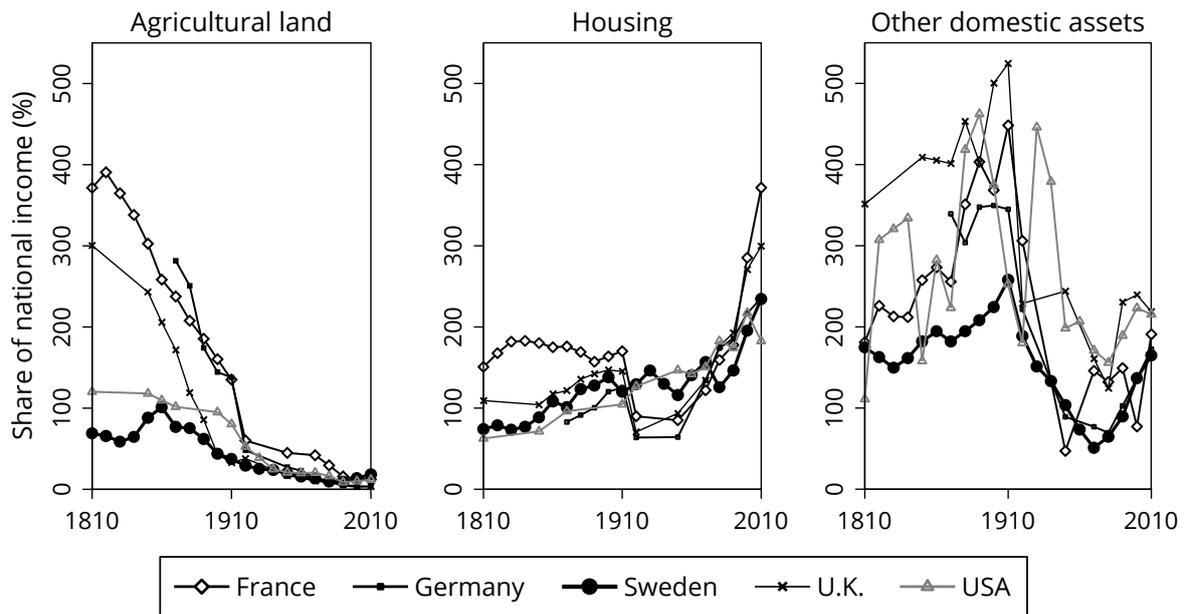

Sources: Sweden: SNWD, v1.2, table SE1.1. All other countries: Piketty and Zucman (2014), appendix tables A5, A6 (private wealth-income ratios).

Figure 4: National wealth-income ratios, five countries, 1870–2010.

Sources: Sweden: SNWD, v1.2, table SE1.1. All other countries: Piketty and Zucman (2014), appendix table A1.

Figure 5: Composition of private wealth, five countries, 1810–2010.

Note: Piketty and Zucman (2014) emphasize the potential problems with comparisons across countries and why these numbers must be interpreted cautiously. Housing in Sweden is the sum of buildings (houses, apartments) and land used for personal housing. Agricultural land in Sweden equals the sum of farmland values and 50 percent of the total value of forestry and timber tracts.

Sources: Sweden: SNWD, v1.2, tables SE2.2, SE2.3. All other countries: Piketty and Zucman (2014), appendix tables A17 (housing), A20 (agricultural land) and A23 (other domestic assets).
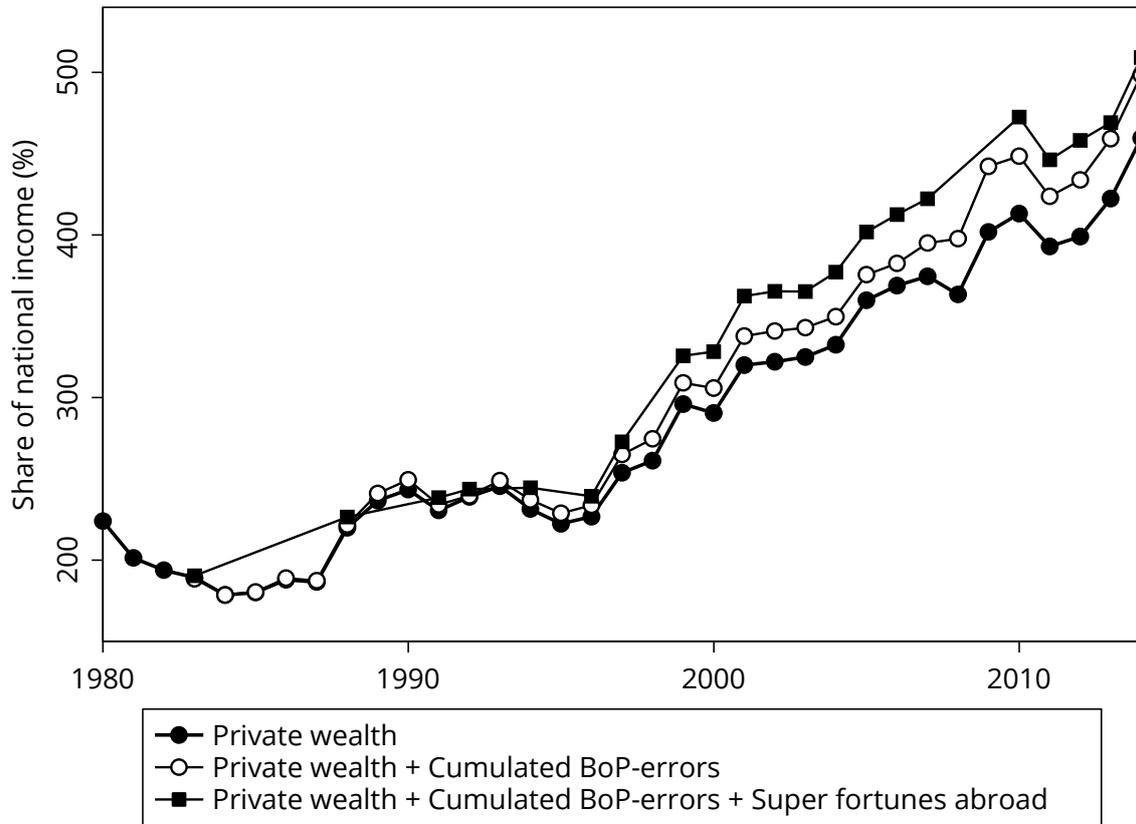
Figure 6: The role of foreign capital, 1810–2010.
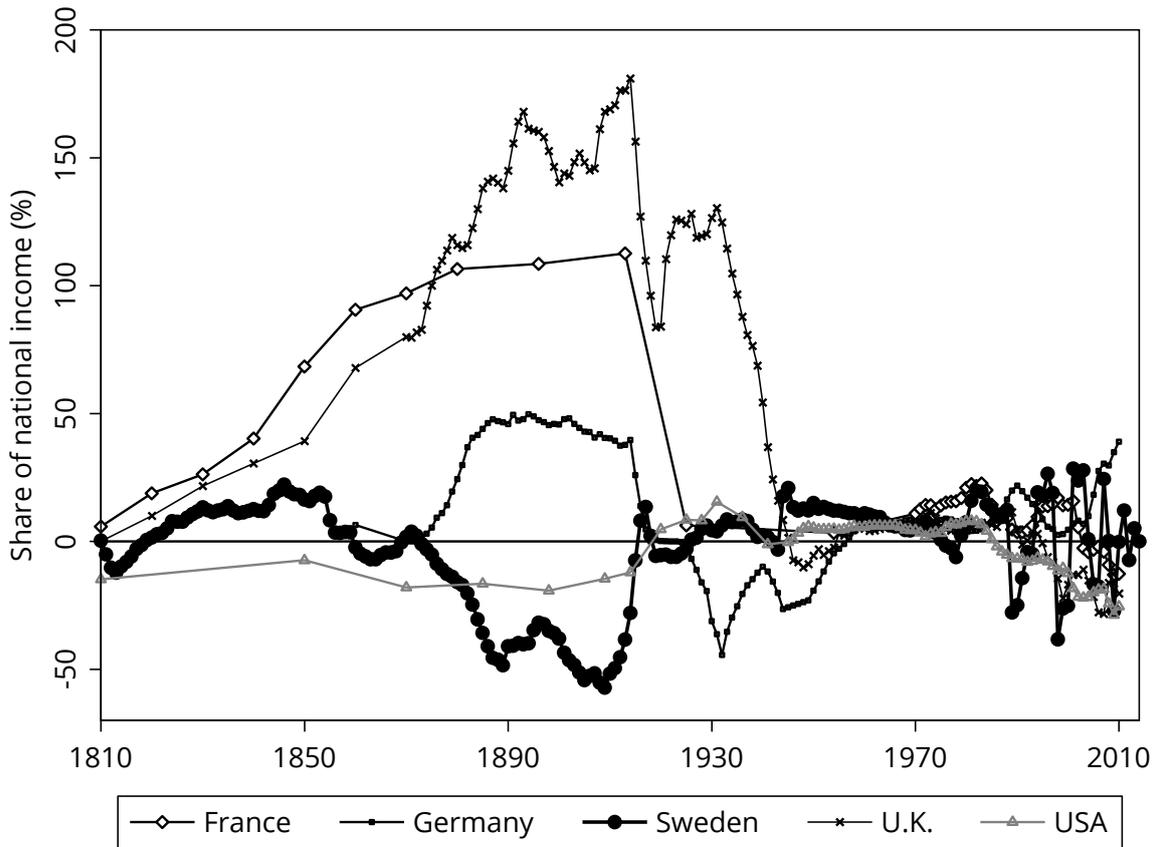
Notes: Net foreign assets are defined as the difference between citizens' financial claims on foreigners and foreigners' financial claims on citizens.
Sources: Sweden: SNWD, v1.2, table SE1.3. All other countries: Piketty and Zucman (2014), appendix tables A25 and A26.

Figure 7: Offshore hidden wealth of Swedes since 1980.

Notes: "Cumulated BoP errors" denotes net errors and omissions in the Balance of Payments that are cumulated over time. "Super fortunes abroad" denotes the estimated wealth of named super-rich individuals according to journalistic rich lists. For details, see text and Roine and Waldenström (2009).

Figure 8: Government wealth-income ratios, five countries, 1870–2010.
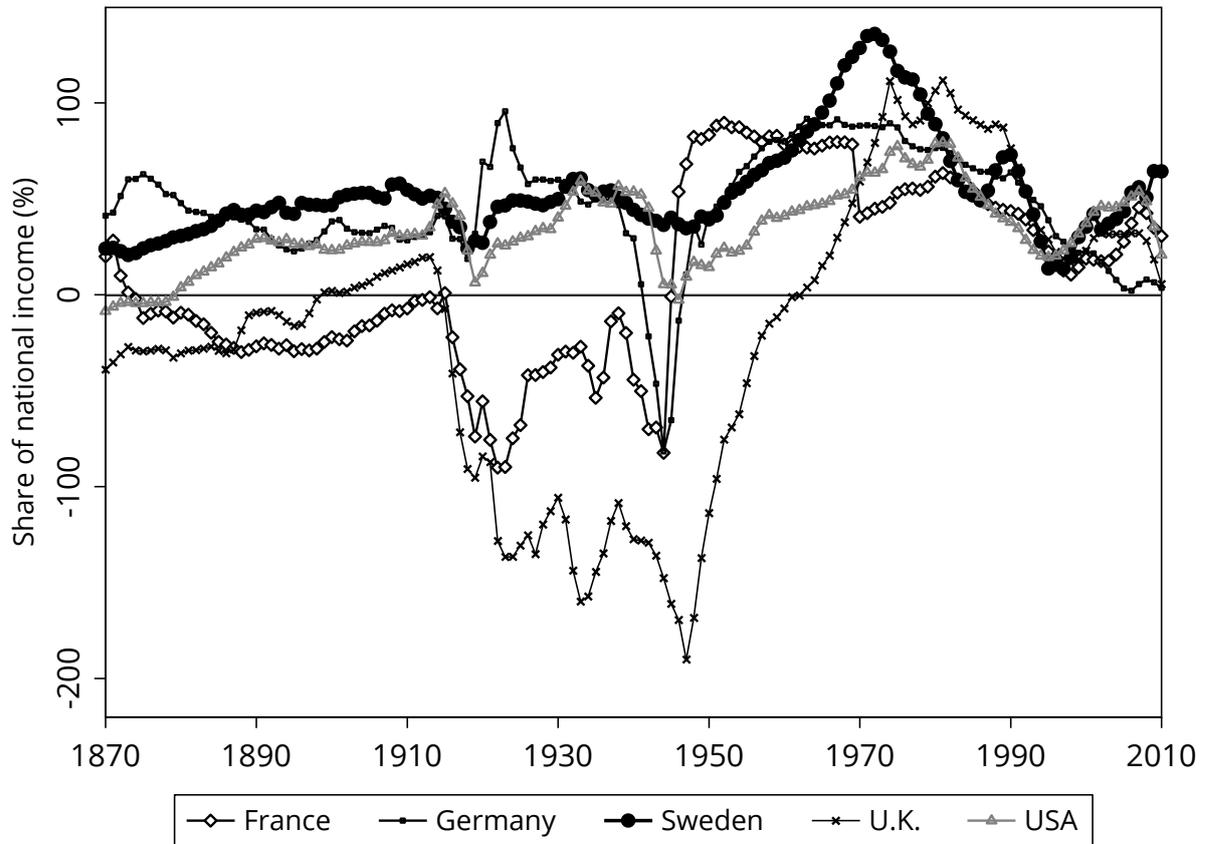
Sources: Sweden: SNWD, v1.2, table SE3.1. Rest: Piketty and Zucman (2014), appendix tables A9 and A10.

Figure 9: The role of pension wealth in Sweden.
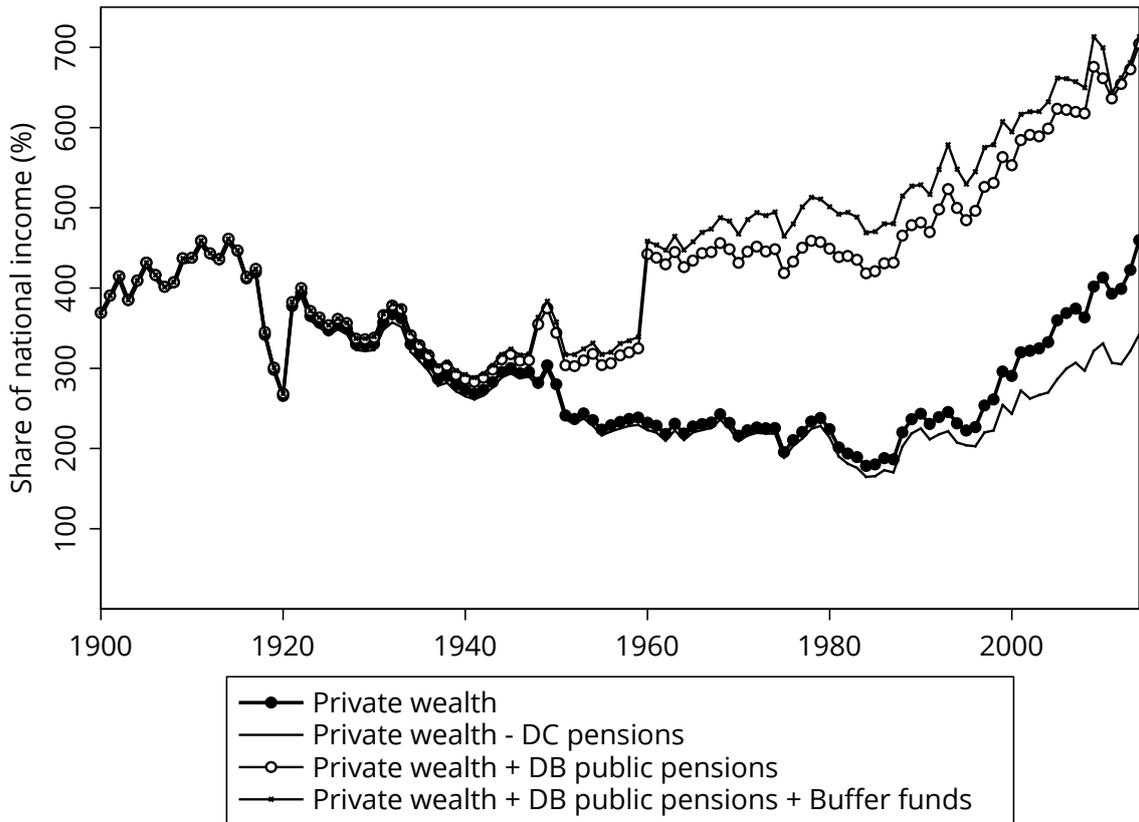
Note: There are four series in the figure: 1) "Private wealth" ($\beta_P = W_P/Y$) is the Swedish private wealth-income ratio, which includes pension assets that are part of funded, often work-related defined-contribution (DC) plans; 2) "Private wealth – DC pensions" ($\beta_P^{-DC} = (W_P - A_P^{DC})/Y$) excludes all funded occupational pensions; 3) "Private wealth + DB public pensions" ($\beta_P^{DC+DB} = (W_P + A_P^{DB})/Y$) sums private wealth (which includes the DC pension wealth) and the net present value of unfunded, defined-benefit pension wealth (DB); 4) "Private wealth + DB public pensions + Buffer funds" ($\beta_P^{DC+DB+AP} = (W_P + A_P^{DB} + A_G^{AP})/Y$) is based on 3) but adds the value of government pension buffer funds, so-called *AP-funds*, which were built up in the 1960s and 1970s through private tax contributions and controlled by the government but paid in by the households and generally considered to belong to households.
Source: SNWD, v1.2, table SE2.4.

Figure 10: Defined-benefit pension wealth in Sweden, the U.K. and the U.S.
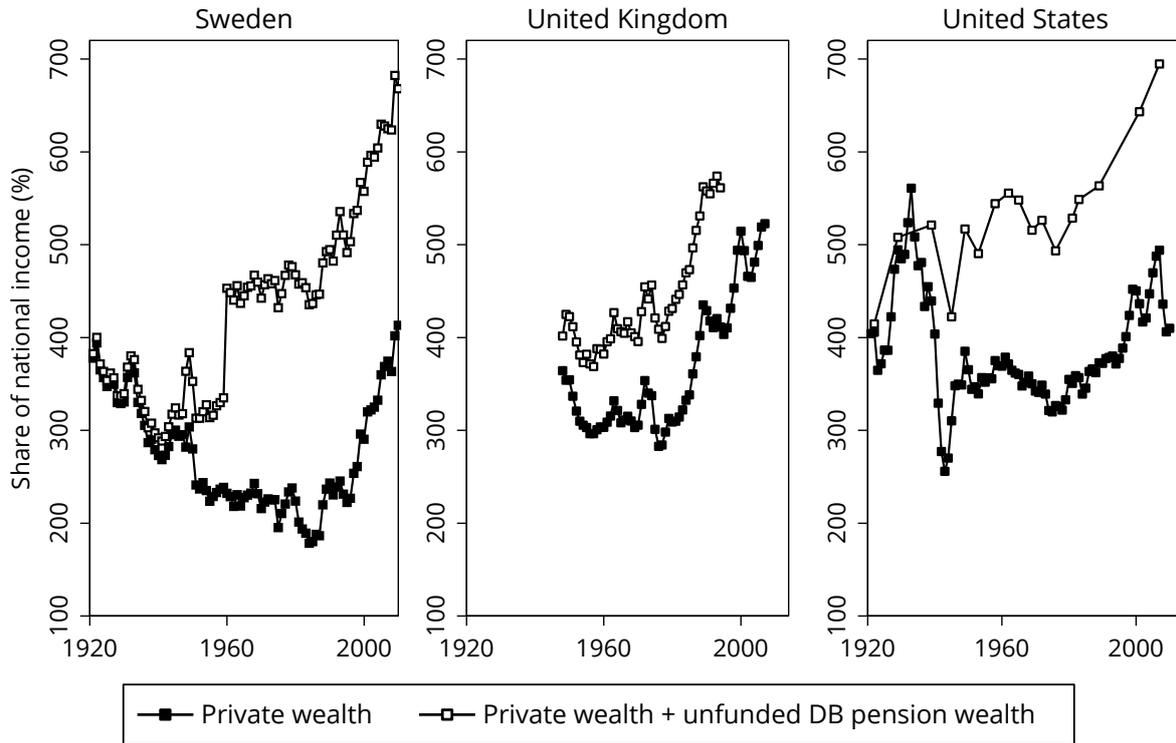
Note: Definted benefit (DB) pension wealth is defined as follows. For Sweden, it is the sum of estimated public and private income pensions over the whole period. For the U.K., it is the sum of "Basic state pension wealth", "SERPS pension wealth" and "Unfunded occupational pension wealth" (Blake and Orzag, 1999, table 12). For the U.S., DB wealth is until 1983 the difference between the wealth concept W4 in Wolff and Marley (1989, table 15.1) and net worth (W1), adjusting for the fact that not all of social security wealth was retirement wealth (the ratio of OASI retirement benefits from Social Security Administration, 2015, table 4.A4). From 1989 data in Wolff (2011, tables 1, 6 and 8) are used. See text for further details.

Table 1: Decomposing wealth accumulation into savings and capital gains.

Period / saving rate	Sweden			France			United States		
	Wealth growth (%)	Contributions: Savings (%)	Contributions: Capital gains (%)	Wealth growth (%)	Contributions: Savings (%)	Contributions: Capital gains (%)	Wealth growth (%)	Contributions: Savings (%)	Contributions: Capital gains (%)
1810–1870									
Private		0.7 (38%)	1.1 (62%)	1.1	1.3 (113%)	–0.1 (–13%)	3.4	2.9 (86%)	0.5 (14%)
Personal	1.8	0.2 (13%)	1.6 (87%)	1.3	1.4 (111%)	–0.1 (–11%)			
1870–1910									
Private		0.9 (37%)	1.5 (63%)	1.4	1.5 (106%)	–0.1 (–6%)	4.1	2.9 (72%)	1.1 (28%)
Personal	2.4	0.3 (12%)	2.1 (88%)						
1910–1950									
Private		1.8 (95%)	0.1 (5%)		1.9 (–91%)	–3.9 (191%)	2.8	2.7 (97%)	0.1 (3%)
Personal	1.9	0.6 (32%)	1.3 (68%)	–2.2	0.7 (–38%)	–2.9 (138%)			
1950–1980									
Private		3.7 (124%)	–0.7 (–24%)		5.5 (83%)	1.1 (17%)		3.8 (111%)	–0.4 (–11%)
Personal	3.0	2.5 (84%)	0.5 (16%)	6.6	4.5 (70%)	2.0 (30%)	3.4	2.7 (80%)	0.7 (20%)
1980–2010									
Private		3.8 (102%)	–0.1 (–2%)		3.0 (80%)	0.8 (20%)		2.3 (72%)	0.9 (28%)
Personal	3.7	1.0 (27%)	2.7 (73%)	3.8	2.4 (65%)	1.3 (35%)	3.3	1.6 (48%)	1.7 (52%)
1870–2010									
Private		2.4 (89%)	0.3 (11%)	1.4	1.5 (106%)	–0.1 (–6%)	3.4	2.9 (86%)	0.5 (14%)
Personal	2.7	1.0 (38%)	1.7 (62%)						

Notes and sources: The contributions from savings (g_{Ws}) and capital gains (q) are based on the two-sector model described in Section 2 using private net saving rates (s_P^n) and personal net saving rates (s_H^n). Data sources: France: Piketty and Zucman (2014), appendix table FR.4b (NB: 1870-1810 is actually 1810-1910). United States: Piketty and Zucman (2014), appendix table US4b. No data reported before 1870; no decompositions with personal saving data reported before 1950.

Table 2: Comparing actual and model-imputed capital gains in Sweden, 1870–2010.

| | Capital gains (average real annual percentage change) | | | |
| | Historical asset prices | | Wealth accumulation model | |
	House price gains	Stock returns	Contribution to g_W using *private* saving	Contribution to g_W using *personal* saving
	(a)	(b)	(c)	(d)
1870–1910	+1.3	+3.0	+1.5	+2.1
1910–1950	+1.8	−3.0	+0.1	+1.3
1950–1980	+0.7	+0.1	−0.7	+0.5
1980–2010	+2.0	+9.9	−0.1	+2.7
1870–2010	+1.4	+2.1	+0.3	+1.7

Notes and sources: (a): Housing price gains are derived from the prices of houses and apartments reported by Blöndal, Söderberg and Edvinsson (2014) for Stockholm and Bohlin (2014) for Gothenburg, with all series combined into an unweighted average. (b): Stock returns are computed from the composite market index at the Stockholm Stock Exchange as reported by Waldenström (2014). (c) and (d): Capital gains-induced wealth growth comes from the Piketty-Zucman decomposition approach described in section 2, where the saving rate is for either the private sector as a whole (s_P^n) or households only (s_H^n).

Table 3: Steady-state wealth-income ratios: Actual vs. Theoretical

	Private wealth-income ratio β_P (%)					Empirical parameters			
	Empirical	Net saving		Gross saving					
		Gross output	Net output	Gross output	Net output				
	$\dfrac{W_P}{Y}$	$\dfrac{s_P^n}{g + s_P^n \delta}$	$\dfrac{s_P^n}{g}$	$\dfrac{s_P^g}{g + \delta}$	$\dfrac{s_P^g}{g + \delta\left(1 - s_P^g\right)}$	s_P^n	s_P^g	g	δ
1810–1870	364	192	207	117	122	3.0	6.1	1.4	3.8
1870–1910	431	140	149	138	147	3.6	9.2	2.4	4.2
1910–1950	362	212	235	197	216	7.1	14.7	3.0	4.5
1950–1980	242	202	226	174	191	8.4	15.5	3.7	5.2
1980–2010	259	333	418	240	282	9.3	20.1	2.2	6.1
1810–2010	342	303	352	252	284	8.5	17.6	2.4	4.6

Notes and sources: Empirical and theoretical steady-state expressions from Figure 1. "Y" and "Y_d" denote gross and net output, s_P^g and s_P^n denote gross and net private saving rates (weighted by national income), g is the national income growth rate and δ is the depreciation rate. Data on wealth-income ratios, saving rates, income growth and depreciation rates from SNWD, v1.2, tables SE1.1, SE5.1.

Table 4: Land values in Sweden and the U.S., 1800–1920.

| Year | Land value per acre | | Ratio Sweden/United States |
	Sweden	United States	(%)
1800	103	10	1077
1850	110	27	403
1865	98	39	253
1870	108	31	350
1875	115		
1880	101	42	239
1885	95		
1890	71	52	136
1895	65		
1900	68	54	125
1905	84	70	120
1910	57	103	55
1915	77	104	74
1920	76	85	90

Notes and sources: The Swedish land value per acre (4,047 square meters transformed from the Swedish unit hektar, 10,000 square meters) is computed by simply dividing the farmland value by the size of the farmland. Lindert (1993, table 1) reports data from agricultural censuses and the official U.S. Department of Agriculture averages for the 48 states. Prices are in 1960 USD.

Table 5: Saving and growth in four countries, 1810–2010.

	France			Sweden			United Kingdom			United States		
	s	g	$\dfrac{s}{g}$	s	g	$\dfrac{s}{g}$	s	g	$\dfrac{s}{g}$	s	g	$\dfrac{s}{g}$
1810–1870	10.3	1.2	8.6	3.0	1.5	2.1						
1870–1910	10.9	1.1	9.9	3.6	2.4	1.5	11.4	1.9	6.0	13.0	4.0	3.3
1910–1950	8.2	1.4	5.9	7.1	3.1	2.3	13.0	1.4	9.3	10.4	3.2	3.3
1950–1980	14.0	4.5	3.1	8.4	3.7	2.3	7.2	2.1	3.4	10.2	3.5	2.9
1980–2010	10.5	1.8	5.8	9.3	2.2	4.2	7.1	2.5	2.8	7.1	2.8	2.5

Source: The table shows net private saving rates (s_P^n). Data on private net saving rates and growth are from Piketty and Zucman (2014), appendix tables for France (table FR.4b), the U.K. (table UK.5a) and the U.S. (table US.5a). Data for Sweden's calculations are from SNWD, v1.2, tables SE1.1, SE5.1.