Inherited wealth over the path of development: Sweden, 1810–2010

Henry Ohlsson, Jesper Roine, and Daniel Waldenström*

Abstract:

We present evidence on the role of inherited wealth in Sweden over the past 200 years. The trends are similar to those previously found in France and the U.K.: beginning at high levels in the nineteenth century, falling sharply in the first half of the twentieth century, and staying low thereafter with a clear increase in the recent decades. Levels, however, differ greatly. Swedish inheritance flows as a share of income were only half of those in France and the U.K. before 1900 and also clearly lower than in France after 1980. The main reason for the low Swedish inheritance flows in the nineteenth century seems to be low savings rates resulting in less capital accumulation than in France and the U.K. The differences in the more recent past are due mainly to aspects of the welfare state.

JEL: D30, J10, N10

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* Ohlsson: Sveriges Riksbank and Department of Economics, Uppsala University, PO Box 513, SE-751 20 Uppsala, Sweden (email: henry.ohlsson@nek.uu.se); Roine: SITE, Stockholm School of Economics, PO Box 6501, SE-113 83 Stockholm, Sweden (email: jesper.roine@hhs.se); Waldenström: Department of Economics, Uppsala University, PO Box 513, SE-751 20 Uppsala, Sweden (email: daniel.waldenstrom@nek.uu.se). We are very grateful for helpful comments and suggestions from Tony Atkinson, Tommy Bengtsson, Jørgen Modalsli, Thomas Piketty, Lennart Schön and seminar participants the Paris School of Economics, 10th Swedish Economic History Meeting, 4th SEEK Conference in Mannheim, May, 2014, the MILLS Workshop 2014 at the Università degli Studi di Milano Bicocca, the 4th National Conference in Economics in Sweden are gratefully acknowledged. Financial support from Riksbankens Jubileumsfond and the Handelsbanken Foundations is gratefully acknowledged. We are grateful to Oscar Erixson for help with data.

1. Introduction

A fundamental question raised in the recent economics literature has to do with the determinants of an individual's lifetime income; it can be the result of either one's own efforts or, alternatively, founded on inheritance. Based on the work by Piketty (2011) on long-run inheritance flows in France, work on corresponding flows in the United Kingdom by Atkinson (2013), and the work by Piketty and Zucman (2014) on long-run aggregate private wealth-income ratios, a contrast between Europe and the U.S. has emerged. The key historical difference found is that between aristocratic France and England, on the one hand, and the American "land of equal opportunity", on the other hand. This is mainly based on differences in wealth-income ratios, where a lack of historical accumulation in the U.S., together with initial land abundance explains why past wealth did not dominate new incomes in the U.S. in the same way as it did in Europe in the nineteenth century. Differences in shocks, in particular wealth destruction by wars and policies related to them, as well as differences in the growth rate of the economy, account for the different developments over much of the twentieth century. In recent decades, however, wealth-income ratios seem to be rising everywhere and with them the potential importance of inherited wealth. Piketty (2011) shows that this is the case, at least in France, where the annual flow of inheritance as a share of national income has steadily been increasing since the 1950s.

In this paper we present new annual estimates of inheritance flows as well as new estimates of the share of inherited wealth in total private wealth in Sweden during the period 1810–2010. Our results show that the dichotomy between "Old Europe" and America may not be so straightforward, and also that it is important to think about how and under what circumstances increases in the wealth-income ratio, as observed over the recent decades, translate into increased inheritance flows. Historically Sweden was a small and poor agricultural country that experienced a relatively late but rapid industrialization in the end of the nineteenth century and eventually become one of the world's richest nations during the postwar era. But Sweden's most distinguishing feature in the twentieth century is perhaps its extensive welfare state in which the government finances many of the services that individuals in most other countries save for privately. This has important effects both on savings behavior and life-cycle consumption. All of these features turn out to be of importance when trying to explain the role of inheritance in Sweden.

When comparing our results to those for France in Piketty (2011), and also to the series for the U.K. in Atkinson (2012), we find notable differences as well as similarities. The largest difference lies in the historical importance of inheritance in the nineteenth century. The share of inheritance flows in national income was around 20 percent in France and the U.K. throughout the nineteenth century up to the First World War but only half that level in Sweden according to our main specification. We show that the biggest contributor to this difference is a substantially lower Swedish wealth-income ratio, being 300–500 percent in Sweden compared to 600–700 percent in France and the U.K. In fact, the Swedish wealth-income ratio looks much more like the U.S. ratio at the time. But this is not because Sweden was a "frontier country" with cheap land and a short history of accumulation in the same sense as the U.S. Instead we find that the most likely explanation is the very low Swedish savings rate before 1900, being only a third of that in the larger U.S and French economies. As a consequence Sweden simply did not accumulate the same levels of wealth before industrialization, resulting in low wealth-income and inheritance-income ratios. This relative lack of domestic wealth accumulation meant that when Swedish industrialization took off in the second half of the nineteenth century it was largely financed by borrowing abroad associated with deficits in the current account. Importantly, however, it also meant that the ratio of inherited wealth to total wealth was high, in fact higher than in France at the time. Whatever wealth there was in Sweden before industrialization was mainly inherited but it was still relatively small in relation to income.

In the twentieth century, Swedish inheritance flows resemble those in France and the U.K.: there were sharp reductions up until reaching historical lows in the decades right after the Second World War. The similarity in both time series patterns and levels is notable since Sweden did not take active part in any of the World Wars. This stresses the relative importance of institutional factors such as capital regulation and taxation in addition to outright war destruction. After 1970 the wealth-income ratio in Sweden has, as in France, the U.K. and in many other countries, increased rapidly. This increase, it seems, has not (at least not so far) resulted in a corresponding increase in inheritance flows in Sweden. We attribute parts of this to retirement savings patterns which shows that Swedes above the age of 65 have lower private wealth, and also that they seem to be running down their wealth faster than their likes in France and the U.K. do. But it may also be the case that much of the new wealth is being accumulated by

those who are still to pass it on. In addition, there are reasons to believe that some private Swedish wealth is also not fully visible in the tax-based statistics.[1]

Our final new set of empirical results concerns estimations of the share of inherited wealth in aggregate private wealth. Understanding this relation has attracted a lot of attention in the previous literature, in part originating from the debate between Modigliani (1986) and Kotlikoff and Summers (1986, 1988) about whether the share in the U.S. during the early 1960s was 20 percent (Modigliani) or 80 percent (Kotlikoff-Summers). We estimate this share since the mid-nineteenth century from data on the capital share in value added, private net savings and the aggregate inheritance-income ratio using an estimator suggested by Piketty and Zucman (2014a). As mentioned above the results for Sweden show a high level, around 80 percent, in the era before the First World War and then a decrease down to half that level immediately after the Second World War at which it has remained until present day. The low levels of inheritance to income and the high level of inherited wealth in total wealth illustrate the importance of separating these flows. The Swedish pattern resembles that found for France over the same period by Piketty and Zucman (2014a) except for the fact that there is a slight upturn in France over recent decades while in Sweden there is no evidence of a return of inherited wealth measured in this way. Compared to the U.S. estimates of the early 1960s, our results for Sweden falls roughly in between the low level found by Modigliani and the high level found by Kotlikoff and Summers.

The rest of the paper is structured as follows. Section 2 explains how we estimate inheritance flows in Sweden, using mainly the macroeconomic identity by which the inheritance flow can be calculated as the product of the private wealth/national income ratio, the ratio between the average wealth of those who die and the average wealth of the living population, and the mortality rate (the so-called "economic flow" of inheritance). In Section 3 we relate our results to the issue of how important accumulated past inheritances are in relation to the existing stock of private wealth. In Section 4 our findings for Sweden are contrasted against those of other countries for which there are data. Here we again decompose the differences according to how much can be explained by different mortality rates, different wealth-income ratios, and differ-

[1] Roine and Waldenström (2009) accumulate the net errors and omissions in the Balance of Payment statistics to get a rough estimate of offshore capital, and these stocks are between one sixth and one third of national income in the 1990s and 2000s. This level of wealth is potentially very important for measures of wealth concentration, assuming the wealth belongs to the very top group but the impact on the aggregate flow is much smaller.

ences in the ratio of average wealth of the deceased to the average wealth of the living, respectively. We also try to interpret these differences in light of what is known about Sweden's economic development over the period. Finally Section 5 concludes with a summary and discussion of the results in a broader context.

2. Inheritance share of national income

2.1 Conceptual framework

We wish to estimate the annual flow of aggregate inheritances B in relation to national income Y, denoting this ratio as $b_Y = B/Y$.[2] By "inheritance" we mean the annual total market value of all real and financial tangible assets less financial debt that is passed on at death or transferred as *inter vivos* gifts.

As shown in Piketty (2011) there are basically two ways in which we can estimate the inheritance-income ratio b_Y. One is based on using estate data to directly measure how much is passed on as inheritance. Unfortunately, available Swedish inheritance tax and estate data do not allow us to follow this approach in a systematic manner. Nevertheless, in Subsection 2.5 below we present a handful of relatively coarse estimates using direct observations of inheritance that give support to our main findings.

Our main estimation procedure instead relies on the second alternative, which is to compute b_Y from the structural macroeconomic relationship between the ratio of the aggregate stock of private wealth W to national income Y, a ratio labeled β, the ratio of the average wealth of those who pass away to the average wealth of the living, μ, and the rate at which people pass away, i.e., the mortality rate, m. Since we wish to include all intergenerational wealth transfers each year, also including *inter vivos* gifts transferred during the donor's lifetime, we must also

[2] Our preferred measure of national income is the net national product (NNP). NNP is GDP minus the depreciation of the capital stock plus net factor income from abroad. An alternative income concept to national income would be disposable income, i.e., national income net of taxes and transfers. Choosing national income or disposable income is of some quantitative importance given the rise of government involvement over the twentieth century, but, as pointed out by Piketty (2010, p. 2) which one is to be preferred ultimately depends on perspective. We are concerned with the ratio of "old" to "new" wealth amongst individuals and one could therefore argue that disposable income is best. However, this would be assuming that government expenditures are useless to individuals. If one views government spending as mostly a substitute for things that individuals would otherwise have had to save and pay at least the same for on the market, then national income seems the better choice.

use a gift-corrected μ ratio denoted μ^*. Our main series, calculated annually for the period 1810–2010, is then the gift-corrected annual inheritance flow as given by:

$$b_Y = \beta \cdot \mu^* \cdot m\,. \tag{1}$$

In the following, we will go through in some detail how each of these three components is constructed and how they have developed in Sweden over the past two centuries. The full description of the construction of the dataset can be found in our set of appendices.

2.2 Wealth-income ratio (β)

The ratio between the stock of private wealth and one year's national income can be interpreted as how many years it takes for the economy to reproduce all of its household and corporate net assets. Piketty (2011) and Piketty and Zucman (2014) present a simple accounting framework for analyzing changes in the wealth-income ratio, decomposing real wealth growth into saving and capital gains components. They also use the classical Harrod-Domar-Solow model to show that it is possible to express the steady-state level β as the direct relationship between the net private saving rate s^n and the income growth rate g, i.e., as $\beta = s^n/g$.[3]

Data on the aggregate wealth-income ratio β for Sweden comes from a newly constructed annual national wealth database in Waldenström (2015a, b), covering the full balance sheet of Swedish households and the corporate stock for the period 1810–2010. These series follow the main principles of the United Nation's System of National Accounts from 2008 and comprise of market-valued non-financial assets (mainly buildings and land) and financial assets (mainly deposits, shares and insurance savings) and the sum of liabilities to the private and public sectors. All series are constructed from observed stocks rather than cumulated investment flows (the so-called perpetual inventory method) similar to the historical wealth-income ratios recently generated by Piketty and Zucman (2014) for a number of countries.

Figure 11 depicts the development of the wealth-income ratio β in Sweden during the two hundred year-period 1810–2010 and Table 1 decomposes the accumulation of private wealth

[3] Piketty (2011) and Piketty and Zucman (2014, 2015) show how this expression holds for a number of models using different savings motives.

into saving and capital gains. In the pre-industrialization era up to 1870 β increases from around 300 percent to 400 percent. Private savings was low in this period, only a little over two percent per year, and half of the wealth growth came from capital gains in the housing and emerging stock markets. In the period after 1870, often described as the beginning of the industrial revolution in Sweden, the capital stock begins expanding faster than the economy grows; average compounded annual GDP growth was over two percent 1870–1910 whereas average compounded annual growth in private net wealth was 3.2 percent in the same period. As a result, β grew to about 450 percent in the beginning of the twentieth century, mostly due to asset price increases and less due to accumulated private savings. This development thus reflects a number of fundamental changes in the Swedish economy such as the expansion of industrial production and the infrastructure associated with it, in particular the rise of urban housing structures, and the emergence of a financial system (financial assets as share of national income increased from one half in 1870 to almost three over just forty years).

[Figure 1 about here]

[Table 1 about here]

The wealth-income ratio during the twentieth century turned in the opposite direction, following a steadily decreasing trend, reaching a historical low at around 200 percent in the early 1980s. There are many potential explanations to this dramatic decline of private wealth. First, income growth accelerated in this period, averaging between 3.1 percent per year in the 1910–1950 period and 3.6 percent per year in the 1950–1980 period. One reason for this income growth is the marked expansion of educational attainment in Sweden, with especially secondary education becoming accessible to the majority of the population. Second, real wealth grew much slower than real income did. Table 1 shows that this was not primarily due to low private saving as in the nineteenth century; in fact, private saving was around 5–6 percent in the first half of the century. Neither was it due to World War-related capital destruction as seen in several continental countries (Piketty and Zucman, 2014), simply because Sweden stayed out of both of these wars. Instead, it appears that capital losses in asset markets account for the major part of this decline. We cannot fully disentangle all relative price developments, but they appear to be driven by a combination of increased supply of private housing pushing down prop-

erty prices and, perhaps most importantly, rigorous postwar regulations of private market activities and increased taxation of profits and other forms of capital income (Waldenström, 2015b).

A third explanation of the downward trend in twentieth century private wealth could be that the welfare state could have an impact on the growth rate of private capital. Some would argue that an important aspect of this is regulation and taxation of private wealth and capital income, which expanded during the century and hampered the incentives for wealth accumulation.[4] Others would rather emphasize the expansion of universal social security systems and welfare services such as healthcare and public pensions. The total effect from all these changes on aggregate private wealth accumulation has not been fully examined, but several researchers have found evidence of a notable crowding out of private savings.[5] In Section 2.5, we will discuss the potential impact of different ways of treating public pension assets and their impact on private wealth stocks.[6]

Since 1990, the private wealth-income ratio has increased quickly and doubled its level in only twenty years. Most of this increased wealth accumulation arises from savings, and as shown by Waldenström (2015b) primarily saving in the corporate sector whereas households saved much less in this period. The parameter μ^* is the gift-corrected ratio of average wealth of the deceased, $\overline{W}_d$, to the average wealth of the living, $\overline{W}_l$. It is the most difficult parameter to estimate in equation (2). Unlike in the case of France, where the wealth of the deceased is observed directly through large samples of estates alongside reported stream of taxable gifts, the Swedish μ is constructed using historical evidence on age-wealth profiles in the living population combined with age-specific mortality rates (adjusted for differences across social classes) as follows:

$$\mu = \frac{\overline{W}_d}{\overline{W}_l} = \sum_a \frac{M_a}{M} \left(\frac{\overline{W}_{l,a}}{\overline{W}_l} \right) . \tag{3}$$

The mortality data in this expression do not pose a problem as they are available on a detailed yearly basis. The challenging part in equation (3) is instead the average wealth of the

[4] For an overview of twentieth century capital income taxation, see Du Rietz, Johansson and Stenkula (2015) and Du Rietz and Henrekson (2015) on the evolution of Swedish wealth taxation.
[5] See, e.g., Feldstein (1974) and Gale (1998) for the case of the U.S. and Berg (1983) for Sweden.
[6] See also the analysis in Waldenström (2015b).

deceased, $\bar{W}_d$. This is not directly observable (as we lack a full set of estates for the Swedish population) so we calculate it by combining observed information about the average wealth of living individuals at age a, $\bar{W}_{l,a}$, with information about adult death rates at specific ages, M_a, and for the whole adult population, M. Taken together this allows us to compute the age-specific average wealth of the deceased, $\bar{W}_{d,a} = (M_a \cdot \bar{W}_{l,a})/M$. When normalizing this expression by the average wealth of all living and then summing over a we get the μ ratio for the whole population as shown in (3). We call this methodological approach the *inverse mortality multiplier method* (IMMM) with obvious reference to the more commonly used mortality multiplier method; instead of multiplying the wealth of the deceased by inverse mortality rates we multiply the wealth of the living by the morality rates.

In doing the above IMMM estimation we also need to adjust for so-called social mortality differentials. Wealthy people typically live longer than the poor and this calls for adjusting the observed death rates across social classes. Ignoring this adjustment would ascribe too high death rates to the wealthy individuals which, in turn, would generate too large inheritance flows. To remedy this, we use a similar approach as Piketty (2011) in which we separate between two broad groups in the population: "the rich" (i.e., the ones owning most of private wealth and having markedly lower mortality rates than the rest of the population) and "the rest" (i.e., those owning a small share of all private wealth and having higher mortality rates than the rich). This correction results in a differential mortality-adjusted estimate of the average wealth of the deceased. Doing so over time clearly raises questions about not just the difference in mortality between social groups but also how this might have changed over time. Data on this are available as early as 1910 (Finansdepartementet, 1910) and recent work by Bengtsson and Dribe (2011) present evidence covering almost the full time span of our analysis (for details about our methodology, sources and references, see Online Appendix C).

Historical evidence on actual age-wealth distributions in Sweden is scarce. We have assembled all information known to us from Censuses and previous scholarly work about the average wealth of Swedes at different age classes, $\bar{W}_{l,a}$, yielding a database with age-wealth distributions in nine different periods between the 1840s and the mid-1960s and annually since 1968 based on administrative tax records.[7] These observations are described in detail in Online Ap-

[7] Note that this yields comparable wealth concepts in $\bar{W}_d$ and $\bar{W}_l$. Specifically, we cannot use the aggregate private wealth W divided by the adult population for estimating $\bar{W}_l$ since the aggregate private wealth is both mar-

pendix A.[8] Since our final aim is to compute annual observations of μ^* over the period 1810–2010, as opposed to the few points in time for which we observe the age-wealth profiles, we simulate historical age-wealth annual profiles by using fitted values from the following kind of linear regressions:

$$\left(\frac{\bar{W}_{l,a}}{\bar{W}_l}\right)_t = b_0 + b_j \sum_{j=1}^{4} Age_{a,t}^{j} + c_j Year_t + d_k\left(\sum_{k=1}^{2} Age_{a,t}^{k} * Year_t\right) , \qquad (4)$$

where the ratio $\bar{W}_{l,a}/\bar{W}$ is regressed on a set of polynomials for average age (Age) and calendar year ($Year$) aimed at capturing the adequate curvatures in the age-wealth pattern over time. Finally, the fitted values from the regressions of equation (4) are inserted into equation (3), yielding the parameter $\hat{\mu} = \sum_a \left[(M_a/M)(\widehat{\bar{W}_{l,a}/\bar{W}_l})\right]$.[9]

Gift correction, finally, allows us to go from μ to the final parameter of interest, μ^*. Accounting for transfers made in the form *inter vivos* gifts made before the time of death is obviously important. To do so we calculate the ratio of gifts to inheritances, υ, and finally the parameter of interest $\mu^* = (1 + \upsilon)\mu$. Data on annual gift and inheritance revenue tax data since 1915 are reported by Ohlsson (2011). We also observe fiscal inheritance flows directly for some single years during 1873–1967, for which gift corrections are in the order of 4–14 percent. For the most recent years, 2002–2004, data on the total taxable gift amounts are close to 20 percent of the aggregate estate values (see further Online Appendix B).[10] This number is also supported

ket-valued and consists of items not always included in the tax-based wealth concepts used in the age-wealth distributions reported by the Censuses or estate tax return-based nineteenth century estimates.

[8] Specifically, the historical sources (before 1968) report the wealth of people divided into between four and 13 age classes. All sources are based on the entire Swedish adult population except for our data from the nineteenth century which is based on a rich estate sample of deceased in a Southern parish (Perlinge, 2003). See Online Appendix A for a detailed description of all historical age-wealth distributions.

[9] In section 4 below we also present a robustness calculation of μ^* for the years when we directly observe the wealth distribution over age, i.e., where we do not use the fitted values for the age-specific ratio of the average wealth of the deceased to the average wealth of the living but instead the observed ratio calculated for the specific year.

[10] The background for the Belinda databases is as follows: Statistics Sweden was commissioned to organize data on intergenerational transfers (estates, inheritances, taxable gifts during the previous ten years, and insurance payments) using the *Inheritance Tax Register* of the Swedish Tax Agency as a starting point. Three data sets have been produced: The first dataset has basic data on assets, debts, and net wealth for all deceased during the period 2002–2004. The second dataset has data on all taxable gifts during the period 2002–2004. Finally, the third dataset has detailed balance sheets at death in 2004 and 2005 for representative samples.

by survey evidence of gifts and inheritances reported in Nordblom and Ohlsson (2011)[11] In addition to the gift correction there are considerable amounts transferred from decedents to heirs via insurance arrangements that, for the most part, do not show up in estate inventory reports. A new Swedish administrative inheritance tax register database (Belinda) provides us with a lower bound for how important insurance was for wealth transfers from decedents to heirs in 2002–2005.[12] Taxable insurance benefits to heirs motivate a correction in the order of 2 percent for these years.

Figure 2 depicts the evolution of μ and μ^* in Sweden and Table 2 decomposes the relative contributions of changes in average wealth of the deceased and of the living to these trends. In terms of level and development during the 1800s, we note that the Swedish series are in line with what Piketty (2011) finds for France.[13] We also note that, like in the French data, in terms of cross-sectional age-wealth profiles these are rising for all observations until the late 1960s. This could, at least in some cases, be an artifact of only observing broad top age groups. Overall, however, clear life-cycle decumulation does not seem to be present in Swedish data until the late 1960s when profiles become hump-shaped.

[Figure 2 about here]

[Table 2 about here]

The decline in the late 1800s up until the 1930s, is consistent with what Roine and Waldenström (2009) have found in previous research on Swedish wealth concentration. Over this period, the wealth share of high-income individuals increases and in terms of wealth over age profiles relatively younger cohorts are accumulating new wealth while the share of older "rentiers" is declining.

The slight upward trend that we observe from the 1930s until the 1970s indicates that the relative wealth held by those who pass away rises compared to the living population. Looking at

[11] Based on answers in the 1998 wave of the "Household market and nonmarket activities" survey (HUS) has answers from close to 3,000 individuals they find that *inter vivos* gifts are about 20 percent of the inheritance amount.

[12] For details on the Belinda database, see Elinder et al. (2014).

[13] It should be noted that the similarity is referring to the final series used. The trend for France changes when taking gifts into account. For Sweden we simply do not have data to capture any differences in gifts over the nineteenth century so the correction is basically the same factor throughout this early period based on late nineteenth century data.

the Swedish institutional context during this period, incentives to accumulate private wealth were weakened. In part this was due to anti-capitalist policies (like in France) of high taxes on wealth and inheritance, but also as a consequence of the build-up of the Swedish welfare state where private wealth accumulation for precautionary reasons became less important.

In the most recent decades, the μ ratio has been relatively stable. There is an up-turn in the 1980s that fits the general picture of asset values increasing more rapidly than income and these increases largely being captured by relatively younger generations (see Roine and Waldenström, 2012).[14] Still, the ratio falls somewhat in the 1990s and 2000s. This could reflect that many of the appreciated assets are still in the hands of the living. In terms of the impact this has on inheritance flows it could then be a situation where there is a lagged impact of the asset price inflation in the sense that values held by the living population are still to be passed on to the next generation.

2.3 Mortality (m)

Data on population mortality are available for all years during 1810–2010 in the Human Mortality Database (see Online Appendix B for details about data and calculations).[15] Specifically, for each age a we observe the number of adult deaths M_a and the number of living adults N_a.[16] Age-specific mortality rates are then computed as $m_a = M_a/N_a$ and the adult population mortality rate equals $m = \sum_a M_a / \sum_a N_a$.

The conventional view of a demographic transition when a country goes from being agrarian to industrialized and later post-industrialized fits the Swedish data fairly well (Bengtsson and Ohlsson, 1993).

As shown by Figure 3, mortality fell from about 30 deaths per thousand inhabitants in 1810 to 20 deaths per thousand a century later and to 10 deaths per thousand in 2010. Annual mortality varied considerably during the nineteenth century due to various shocks and the Spanish Flu, hitting especially young people, caused mortality to spike around 1920. However, when averaging over ten-year periods the decline in mortality is relatively smooth.

[14] We double-check the simulated μ^* during the period 2000–2007 for which we can compute it using annual micro-data on individual wealth in the administrative Wealth Register at Statistics Sweden. The result is comforting, showing a striking similarity between simulated and actual μ^* (results available upon request).
[15] The HMD database (www.mortality.com) is constructed by demography researchers from different countries and made freely available to other researchers.
[16] Throughout we are for obvious reasons concerned only with the adult population.

Population growth was relatively high during the nineteenth century, around 0.7 and 0.8 percent annually, as a consequence of the decrease in mortality while fertility rates remained stable throughout the century. The Swedish population size increased from 2.5 million in 1810 to 5 million in the year 1900. By the early twentieth century, fertility also started falling and population growth declined markedly.

[Figure 3 about here]

2.4 Inheritance flow as share of national income ("economic flow")

Equipped with the annual series of the wealth-income ratio β, the gift-corrected ratio of average wealth of the deceased to the average wealth of the living, μ^*, and the mortality rate, *m*, as explained above, calculating the annual inheritance flow is simply a matter of applying the formula given in equation (1).[17] That is, the value of all inheritances (including *inter vivos* gifts) as a share of national income is given by $b_Y = \beta \cdot \mu^* \cdot m$.

The resulting inheritance flow in Sweden is shown in Figure 4, including both the volatile short run annual estimates and the long run moving average.

[Figure 4 about here]

The overall long run trend seems relatively clear. The inheritance flow is relatively flat at around ten percent of national income throughout the nineteenth century until around 1910. It then falls sharply to about five percent around 1950 at which it stays until around 1970. During the 1990s aggregate inheritance flows increase quite distinctly, reaching a level in 2010 at about eight percent of national income, a level not seen since the interwar period.

Now the question is how we can understand what drives these movements. We will return to this question in more detail when comparing our final series to those in other countries but as a first step it is useful to decompose the changes according to the relative contribution of the three components that make up the annual inheritance flow equation. Table 3 shows the average annual percentage change in the inheritance flow (Δb_Y) over different time periods with

[17] Note, again, that we do not observe everything on an annual basis. The wealth/income ratio is yearly and so is the mortality rate, but the ratio of wealth at death over wealth of the living population, μ^*, is estimated as explained in section 2.3 above. Section 4 contains series based only on actual observed data.

contribution from the change in the wealth-income ratio ($\Delta\beta$), the ratio of average wealth of the deceased and the living population ($\Delta\mu^*$), and the mortality rate (Δm).

[Table 3 about here]

The decomposition in Table 3 shows that in the nineteenth century an increasing wealth-income ratio is balanced by a decreasing mortality rate, resulting in a relatively stable inheritance flow. It also shows that the main contributor to the sharp drop in the first half of the twentieth century comes from the sharp decline in the wealth-income ratio. This, together with a continuing fall in mortality until 1950, is what drives the decline in inheritance.[18]

After 1950 the wealth-income ratio continues to decline as growth accelerates even further but its impact on the inheritance flow is cushioned by an increase in the average wealth of those who die in relation to the average in the living population. After 1980 the increasing wealth-income ratio boosts the predicted inheritance flow but at the impact is again mitigated by the average wealth of those who pass away in relation to the living population but now in the other direction. This could be indicating either a change in retirement spending or that new wealth that has been accumulated since the 1980s is still to be passed on to the next generation.

2.5 A direct inheritance tax-based measure of the inheritance flow ("fiscal flow")

In addition to our series above we can also try to determine the size of inheritance flows by measuring them directly from estate data. As already mentioned, Swedish data on estates are more scattered and of lower quality than those available for calculating the economic flow estimates above. We therefore view the estate-based series mainly as a consistency-check of the previous findings. Online Appendix C contains more details about Swedish estate tax data and explains exactly how we deal with each source of information.

Even if it has been compulsory to file estate inventory reports (or probate records) in Sweden since 1734 there are very few statistical compilations of these.[19] In our search for previous aggregations of the estate and inheritance we have found the following. In an early publication by

[18] The reasons for the movements in the wealth-income ratio are discussed above in section 2.2.

[19] The historical reports are kept by local courts and in regional archives. In 2001 the responsibility was moved to the Swedish Tax Agency, which now registers all estate reports in the Inheritance Tax Register but as the inheritance tax has been abolished this database is, unfortunately, incomplete with respect to economic variables after 2005.

the Finance Ministry (Finansdepartementet, 1879) aggregate values of estates 1873–1877 are reported; as part of a series of empirical studies of economic variables in the beginning of the 1900s the Finance Ministry published a detailed account of estate reports for the years 1906–1908 (Finansdepartementet, 1910b) and one on inheritances for the same years (Finansdepartementet, 1910a); an official government commission on taxation, SOU 1946:79, contains aggregate data on estate inventory reports for the years 1943–1944; the official government commission on inheritance tax; SOU 1957:48, published similar data for the broken calendar year 1954/1955, and yet another official government commission on capital taxes, SOU 1969:54, did a very ambitious study of estate inventory reports registered in 1967; and finally there is the recent administrative estate database for Sweden called Belinda which gives detailed information on bequests and taxable gifts for the years 2002–2005. Taken together this allows us to estimate direct inheritance flows for these years. Gift correction is made in the same way as explained above.

From Figure 5 it is clear that the direct inheritance measure was close to the economic flow during the 1870s and the 1900s. The fiscal flow then became considerably smaller than the economic flow during the 1940s, the 1950s, and the 1960s. Our latest observations suggest that the fiscal flow has increased the last decades. The fiscal flow is, however, still much smaller than the economic flow.

[Figure 5 about here]

What can explain the large discrepancy between the two from the 1940s onwards? A primary candidate is the effects of increased taxation of inheritances, estates, and wealth. The tax non-compliance interpretation is supported by the fact that the early observations (1873–1877, and 1906–1908) are similar for the economic flow and fiscal flow estimates, while the later observations in the 1940s to 1960s, when taxes were much higher, show larger differences.

That tax planning was an issue already in the 1940s is clearly visible in a massive spike in gifts in 1947 when increased taxes on inheritances, estates, and wealth were about to be implemented in the following year (see Ohlsson, 2011 and Online Appendix C for details). More generally, one way of avoiding inheritance and gifts taxes for a parent was to annually transfer

a gift amount to each child at the exemption level for the gift tax. Anecdotal evidence suggests that this type of tax planning was common.

A second potential difference lies in that life insurance assets to a large extent have not been included in estate inventory reports. As previously mentioned, considerable amounts are transferred from decedents to heirs via insurance arrangements. We only have information about the tiny share that was taxable.

A third related explanation has to do with private pension wealth. There are increasing amounts of such wealth accumulated in direct individual accounts (pension funds) or in occupational pensions systems (pension insurance contracts) assigning individual pension wealth to each person involved. These types of direct and indirect individual pension wealth are not included in estate inventory reports. When someone passes away this pension wealth is transferred to named beneficiaries. We do not have any exact information on how large these transfers are. If there are no named beneficiaries for a deceased's occupational pension wealth, this wealth is distributed among the other members of the particular occupational pensions system.

Fourth, there are also increasing amounts of public pension wealth accumulated in the public pension systems (public pension reserve funds) assigning individual pension wealth to each citizen. When someone passes away this individual's public pension wealth is transferred to the citizens alive. These transfers are considerable. In 2004 SEK 8 billion was transferred from the deceased to the living, this can be compared to the total estate value of SEK 41 billion. The following year the corresponding amounts were SEK 9 billion and SEK 53 billion.[20]

The bottom line is that there are several plausible reasons for why the aggregate estate amounts do not capture all transfers from the deceased to the living. Our estimate of the economic flow is, therefore, more likely to show the actual inheritance flow than the flow derived from estate inventory reports.

3. Share of inherited wealth in aggregate wealth

A long-standing issue in the analysis of intergenerational transmission concerns the importance of accumulated past inheritances W_B in relation to the existing stock of private wealth

[20] OECD (2013) reports that the sum of pension wealth (pension funds, pension insurance contracts, and public pension reserve funds) as a share of GDP was 94 percent for Sweden in 2012. The corresponding share for France was only 13 percent while the share for the U.S. was 142 percent. For the U.K. the wealth in pension funds alone corresponded to 96 percent of GDP.

W. In a famous debate, Modigliani (1986, 1988) and Kotlikoff and Summers (1981, 1988) presented different, widely diverging, estimations of the share of inherited wealth in total wealth, $\varphi = W_B/W$, using U.S. data from the early 1960s. Modigliani measured W_B as the sum of all past inheritances, accounting for inflation but otherwise assuming that any capital returns are consumed away, which produced a φ of 20–30 percent. Kotlikoff and Summers, on the other hand, argued that one should add a rate of return to capital (proxied as the average GDP per capita growth) to the accumulation process, and found that φ was 80–90 percent.

Recently, Piketty et al. (2013) proposed an alternative theoretical model which allows past inheritances to grow over time with some rate of return but also acknowledges that some fraction of inheritances may be diverted through consumption, bad investments, or some other reason. Building on this framework, Piketty and Zucman (2014b) show that it is possible to estimate a simplified version of φ using aggregate statistical parameters, assuming that the economy is in steady-state.[21] In brief, under the assumption that the propensity to save is the same regardless of the income source, it is possible to relate the share of inherited wealth b_Y to the total wealth flows: those that stem from inheritances (b_Y) and those that emanate from people's savings of their non-capital income $(1-\tilde{\alpha})s^n$, with $\tilde{\alpha}$ being the capital share in national income and s^n being the net saving rate, according to the following equation:

$$\varphi = \frac{b_Y}{b_Y + (1-\tilde{\alpha})s^n} \ . \tag{3}$$

We are able to estimate equation (2) for Sweden annually back to 1850 when the first evidence of total compensation to employees is available. Specifically, we compute the capital share of value added, $\tilde{\alpha}$, as one minus the labor share, which is measured as the ratio of total compensation to employees (including incomes of self-employed) to national income at factor prices (i.e., net of indirect taxes on production and imports less indirect subsidies).[22] The Swe-

[21] Piketty and Zucman emphasize that this formula is a simplification, e.g., by assuming that the savings rate is the same for the whole population although it may depend on whether incomes come from capital or labor (or on the size of incomes). The authors are able to compare micro-level estimates of φ in Piketty et al. (2013) and macro estimates using equation (2) and they find that the macro-based approach tends to underestimate the true share of inherited wealth by between a tenth and a fifth.

[22] The reason for why we use $\tilde{\alpha}$ instead of simply α is that we do not relate the capital income to gross domestic value added but instead the net national value added, which is in line with the use of net savings and national income. For the period 1850–1979, we replace national income at factor prices with gross domestic product,

dish net private savings rate s^n is calculated as the sum of net investments, net exports, (difference between exported and imported goods and services) and net foreign income.[23] Figure 6 shows the evolution of $\tilde{\alpha}$ and s^n, the net savings rate of the private sector.

[Figure 6 about here]

Figure 7 reports φ for Sweden based on 30-year moving averages of the parameters used in the estimation. According to these series, the Swedish φ was stable at a high level of around 80 percent in the nineteenth century and up to the 1910s. After that it declines steadily to the 1950s to just below 50 percent of aggregate private wealth, a level at which it stays for the rest of the period up until present day.[24] Looking at the trends in the underlying parameters it becomes obvious that the main drivers behind the twentieth century fall in φ is the simultaneous fall in the inheritance-income ratio and secular increase in net private savings which, again, suggests that inheritance flows may grow in importance in the future as we seem to be in a phase where accumulation is taking place. It should be noted, however, that replacing the private net savings rate with the personal net savings rate, i.e., excluding corporate savings, implies an almost halved savings accumulation and markedly higher levels of φ when using the formula in equation (3).

[Figure 7 about here]

4. Interpreting Swedish inheritance flows in international comparison

4.1. Comparing inheritance flows as share of national income, b_Y

The upper left panel of Figure 8 shows the inheritance flows for Sweden, France and the U.K. and Table 4 decomposes the country differences in b_Y in relative contributions of β, μ^*

which generates roughly the same levels and trends in the post-1980 period, using data from Edvinsson (2005, appendices A and W).

[23] Data on private saving are available in the national accounts back to 1950. Before this we use net investment data from Edvinsson (2005, appendices I and J), current account data from Edvinsson (2014) and net foreign income from this paper (see Waldenström, 2015c, for further details on net and gross private and national saving rates in Sweden).

[24] Laitner and Ohlsson (1997, p. 8) reports a φ for Sweden in 1981 of 0.51.

and m. Whenever possible we also include data on the U.S. because of it's importance in the comparative discussion. The inheritance flow in Sweden was clearly lower than in France and the U.K. during the nineteenth century. During the last decades the inheritance flow in France has increased considerably while the flows in Sweden and the U.K. also have increased but less dramatically.[25]

[Figure 8 about here]

If we look at the three components of the inheritance flow measure, starting with the wealth-income ratio β, Sweden exhibits a development very similar to the U.S. during the nineteenth century. France and the U.K. had β's in the nineteenth century at almost twice the level found in Sweden, and also the U.S. Over the first half of the twentieth century the β's in all countries go down but after the second world war the ratio starts moving up again in France, the U.K., and the U.S. In Sweden there is also an increase in the second half of the twentieth century, but it starts later. The decomposition in Table 4 shows that these changing differences in β accounts for most of the changes in the difference in b_Y, especially in the beginning and end of the studied period.

Turning to the μ^* it is clear that Sweden has had a similar development as France except for the last decades.[26] The μ^* in the U.K., however, has evolved differently when compared to the other two countries. Finally there are no major differences in how mortality has decreased, even though the level of the mortality rate has been somewhat different across these countries at different points in time. In particular, mortality rates in Sweden were quite a bit lower than in France around 1900-1910. This explains part of the lower inheritance flow in Sweden.

So mechanically the differences between inheritance flows in Sweden, on the one hand, and France and the U.K., on the other, are mainly due to differences in β. Differences in μ^* have also played some role during the last decades especially when it comes to the difference between Sweden and France. But can we go further in understanding why there are such differences in the wealth-income ratios (the β)?

[25] Note that we don't have an estimate of the inheritance flow in the U.S. we still include it in some of the comparisons as it helps to illustrate some important points.

[26] A conjecture is that the age-wealth profiles in Sweden and France have diverged. This in turn might be because age-savings profiles have become less similar.

One way is to make use of the long-run equilibrium condition (2) according to which the wealth-income ratio equals the net savings rate divided by the growth rate. The upper left panel of Figure 2 shows the net savings rates for the four countries. This figure illustrates a remarkable difference in the case of Sweden in the nineteenth century: the extremely low savings rate. In relation to France and the U.K. this suggests that the reason for why inheritance flows were less important in Sweden was that wealth accumulation did not occur on any major scale before industrialization in Sweden simply because savings were too low. In relation to the U.S. it suggests that, while the wealth-income ratios in the two countries were similar, the underlying reasons were somewhat different. In the U.S. the lack of historical accumulation, initially low land values and rapid growth combined to produce a low wealth-income ratio in the nineteenth century. In Sweden it was instead a combination of low savings and low growth that gave the same result.

An interesting question that follows from the finding that Sweden had low levels of capital accumulation concerns how the industrialization, which started in the second half of the nineteenth century in Sweden, was financed. The answer is clear when looking at Sweden's net foreign positions, shown in Figure 9. While both France and the U.K. had substantial foreign assets Sweden started borrowing from abroad around 1850 and continued to do so until the beginning of the twentieth century. The importance of this capital import to the Swedish industrialization has been debated by economic historians, some pointing at the fact that bank credit accounted for the bulk of corporate debt at this time while others have argued that it was actually foreign money that had capitalized the Swedish commercial banks in the first place.[27]

[Figure 9 here]

Over the course of the nineteenth century the Swedish savings rate gradually increases and during the past decades the savings rates in Sweden seem to converge toward the levels in France, the U.K. and the U.S.

Looking at differences in the growth rate there has been a continuous increase of the 30 year averages for Sweden shown in Figure 10 except for last period. At the same time there has

[27] See further Waldenström (2015b) for more details and discussion on the importance of foreign capital in the evolution of the Swedish private and national stock of wealth.

been an almost continuous decrease in growth for the U.S. (mainly due to a slowdown in the rate of population growth).

[Figure 10 about here]

Overall it seems that the paths of the wealth-income ratios in Sweden and the U.S. are similar but the explanations are not the same. Over the long run Sweden started out from low savings and low growth and has gone to high savings and high growth. The U.S., on the other hand, started from high savings and high growth and has gone to lower savings and lower growth. Comparing Sweden to France and the U.K. it is clear that it was lower savings, not higher growth, which made the Swedish wealth-income ratio lower than in the other two countries in the nineteenth century.

When it comes to explaining the difference in inheritance flows in Sweden as compared to France and the U.K. in recent decades the main difference seems to lie in the μ^*. In particular it seems that wealth accumulation over the life-cycle is different in Sweden when comparing it to the U.K. and France in particular. Private wealth seems to have grown rapidly in Sweden over the past decades but average private savings of people over the age of 65 are substantially lower, and individuals also run down their savings more in Sweden than in France and the U.K. (as shown in Nakajima and Telyukova, 2013). This could in part be explained by various welfare state arrangements that have given less reason to hold private saving in retirement and, at least until recently, that private wealth was heavily taxed.[28] When it comes to the possibility that individuals transfer more of their wealth before death, as seems to be the case in France, we do not find any evidence of changing *inter vivos* patterns in Sweden over the past decades.[29]

A final point, which may explain the lower level of observed private wealth in Sweden, is that cross-border capital flight may have been more important than in many other countries. An attempt at estimating this is made in Roine and Waldenström (2009). Even though the estimate is very uncertain the order of magnitude, between one sixth and one third of national income, says something about the potential importance.

[28] Various reforms over the past decades have lowered taxation of capital and wealth substantially in Sweden. In particular, inheritance and gift tax as well as wealth tax has been abolished completely in 2005 and 2007 respectively.

[29] As already noted in section 2.2, the data on this is limited in the case of Sweden so there is admittedly some uncertainty around this development.

4.2. Comparing the share of inherited wealth in aggregate wealth, φ

Figure 11 compares the share of inherited wealth in aggregate wealth in Sweden and France. The developments are very similar until the 1950s. Why does φ reach a minimum in France in the 1960s and start to increase thereafter while the φ in Sweden decreases to slightly below 50 percent in the 1950s and has stayed at this level? From equation (3) above we know that a higher wealth share, α, tends to raise φ, and α has increased in both countries. We also know that a higher b_Y tends to raise φ. The inheritance flow b_Y has increased in both countries, indeed more in France but also in Sweden. Finally we know that the savings rate s^n tends to decrease φ. The savings rate in France has decreased during the last decades whereas the savings rate in Sweden has increased. To sum up, all three factors in France suggest an increase in the inheritance share. For Sweden, on the other hand, the effects go in different directions and given the flat development the opposing effects seem to cancel out.

[Figure 11 about here]

5. Summary and concluding discussion

In this paper we have shown that the value of inheritance flows in relation to national income in Sweden has fluctuated quite significantly over the period 1810–2010. From a relatively stable level of around ten percent throughout the nineteenth century, inheritance flows dropped sharply to a lowest level of about five percent around 1970. Starting around 1980 there is a clear upward trend and inheritance has grown in importance. The increase, however, is, at least so far, relatively small.

A decomposition analysis shows that the main driver of the long run changes is the wealth-income ratio, which in turn is affected by a number of factors. Most important are changes in the aggregate savings rate and fluctuations in the economic growth rate. In the pre-1900 era low savings dominated low growth keeping the wealth-income ratio at a relatively low level and even though growth picked up during the country's industrialization and capital was accumulated in the latter half of the nineteenth century it was not enough to build up large wealth holdings. It is indeed telling that much of the initial investments in the early industrialization

came from abroad. In addition, some Swedes were so poor that one sixth of the population migrated to North America in this period.

In recent decades inheritance flows have increased slightly in importance mainly because wealth-income ratios have increased, this time in part related to new savings and capital gains stemming from asset price increases in the housing market and, in particular, in financial markets. However, the impact on inheritance flows has been dampened by the fact that the ratio of wealth amongst those who pass away to the living population has gone down. Whether this is due to changed life-cycle consumption or to new wealth being accumulated amongst the relatively young remains unclear and is a question that we think warrants further attention by researchers. But if the latter is true, inheritance flows can be expected to increase in the future since those who are young today will eventually also pass on their wealth to coming generations. Also, when judging the importance of inheritance flows in Sweden in recent decades it is important to note that large sums pass between generations in the public system and not as inheritance.

Going back to the fundamental question of the relationship between what each generation inherits from the past and what it creates, the Swedish case is interesting in its own right but, perhaps more importantly, it also sheds new light on some more general questions in a broader context. First, it complicates our understanding of the often-made distinction between an American, as opposed to a European experience.[30] The role of inherited wealth and all of its consequences for society, most famously noted by Alexis de Tocqueville (1835) has always been a key aspect of this dichotomy. Piketty (2014) also emphasizes the difference in accumulated wealth between "Old Europe" and America.[31]

Our results, however, suggest that historically Sweden was different to both France and the U.K., on the one hand, and the U.S., on the other hand. Old wealth was not as important in Sweden as it was in France and the U.K. in the 1800s. In fact, aggregate accumulated capital seems to have been at around the same level in relation to national income as in the U.S in the early nineteenth century. Importantly, however, the reasons for why wealth in relation to in-

[30] There are numerous studies that revolve around the issue of "American Exceptionalism" (Lipset, 1996) such as *Fighting Poverty in the US and Europe* by Alesina and Glaeser (2004) and *Inequality and Prosperity: Social Europe Vs. Liberal America* by Pontusson (2005) and many others. In many of these Sweden is depicted as the "most European" of countries due to the extensive level redistribution and the size of government, as we discuss more below.

[31] See also the overview by Piketty and Saez (2014b) where, again, the Europe vs. U.S. case is emphasized.

come was low in Sweden in the 1800s was different than in the U.S. Sweden before industrialization had a combination of low savings and low growth and eventually financed it's early industrial development through international borrowing. In the U.S. on the other hand high savings and accumulation from a historically low level, and a high economic growth rate, in particular through population growth, combined to produce a low wealth-income ratio. Our results obviously do not tell us exactly in what way this played a role in how society evolved – and, no doubt, the developments in Sweden over time turned out to be very different from those in the U.S. – but it remains an interesting fact that, at the eve of industrialization, the tension between aggregate old wealth and new developments was not as strong in Sweden as in France and the U.K.[32]

With respect to the more recent twentieth century growth of government, the European versus American division has often been modified into a distinction between an Anglo-Saxon, a Continental European, and a Scandinavian model of society.[33] With respect to this division our results illustrate how inheritance flows are likely to be affected by aspects of the extensive welfare system. For example, it has often been noted that personal savings are very low in Sweden for the simple reason that many things that individuals save for in other countries (higher education, health care) are partly or completely financed by the government and the public pension system and occupational pensions systems also to a large extent are organized collectively. Looking at retirement savings profiles across countries it is also clear that the average private savings of people over the age of 65 is substantially lower, and also that individuals also seem to run down their savings more in Sweden (and in the other Scandinavian countries) than in France, the U.K., and the U.S.[34] This, of course, also influences inheritance flows. The relatively more extensive collective aspects of the pension systems also means that non-trivial amounts of wealth pass between generations, but not in the form of private (typically family-based) transfer flows but through collective systems. For some questions this is an important difference. It is possible to have a low level of "new wealth" in relation to "old wealth" but at

[32] Acemoglu and Robinson (2000) explain the extension of the franchise in the nineteenth century based on a model where the elite responds to a threat of social unrest. Sweden is taken to be similar to England, France and Germany in this respect. Quoting Tilton (1974) they note that: "Swedish democracy had triumphed without a revolution — but not without the *threat* of a revolution". Without suggesting that industrialization or democracy arrived in Sweden without resistance, another possibility is that perhaps tensions were actually smaller in Sweden.
[33] For example, Titmuss (1974) and Esping-Andersen (1990).
[34] See, for example, Nakajima and Telyukova (2013).

the same time have low inheritance flows if most passes between generations in collective systems.

Finally, there is the real possibility of relatively large amounts not being accounted for due to, in part, low valuations, and in part to assets being "hidden", so as to avoid what have historically been high taxes on both wealth and inheritance. After the repeals of these taxes, capital flows and developments of private wealth indicate that tax avoidance and evasion may have been substantial in the past.[35]

Overall, our analysis of inheritance flows in Sweden since the early nineteenth century teaches us two major lessons about the development of wealth and its impact on inheritance. Historically, Sweden does not, despite a long history of aristocracy, fit the picture of a country where accumulated wealth was large in relation to income (even though inequality and wealth concentration most probably was high). In more recent times, Sweden stands out as a country where the return of wealth has not automatically translated into a return of inherited wealth. To what extent this is just a delay based on new wealth being accumulated mainly among the relatively young, or if inheritance will remain low due to aspects of how intergenerational transfers of wealth are organized in society remains to be seen. In both these respects, the case of Sweden suggests that there is likely to be variation across countries, both historically and today, when it comes to the role of inheritance and the form it takes.

[35] The estimates of evaded offshore capital by Roine and Waldenström (2009) suggested that about one billion SEK were placed abroad, which equaled about one third of national income.

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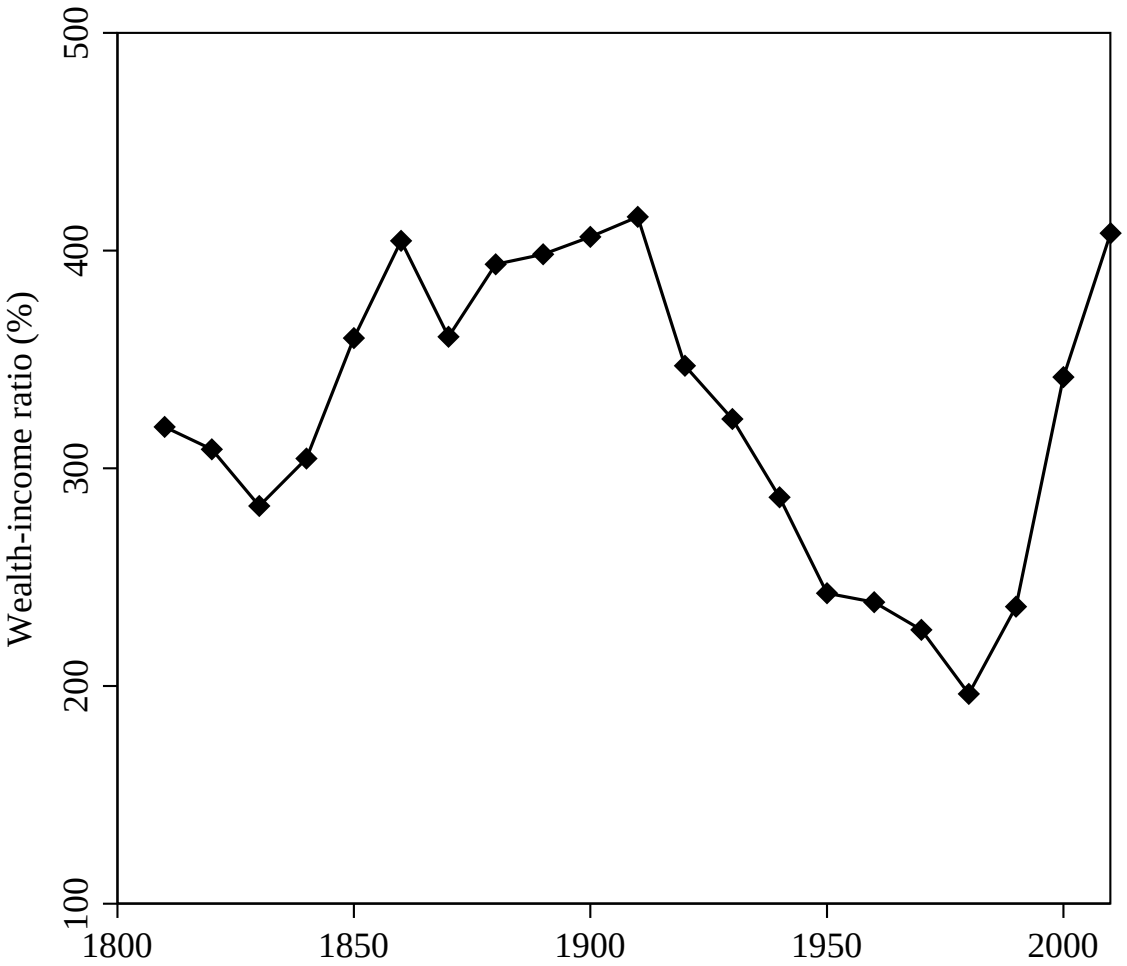

FIGURE 1: PRIVATE WEALTH-NATIONAL INCOME RATIO IN SWEDEN, β, 1810–2010.

Source: Waldenström (2015b).

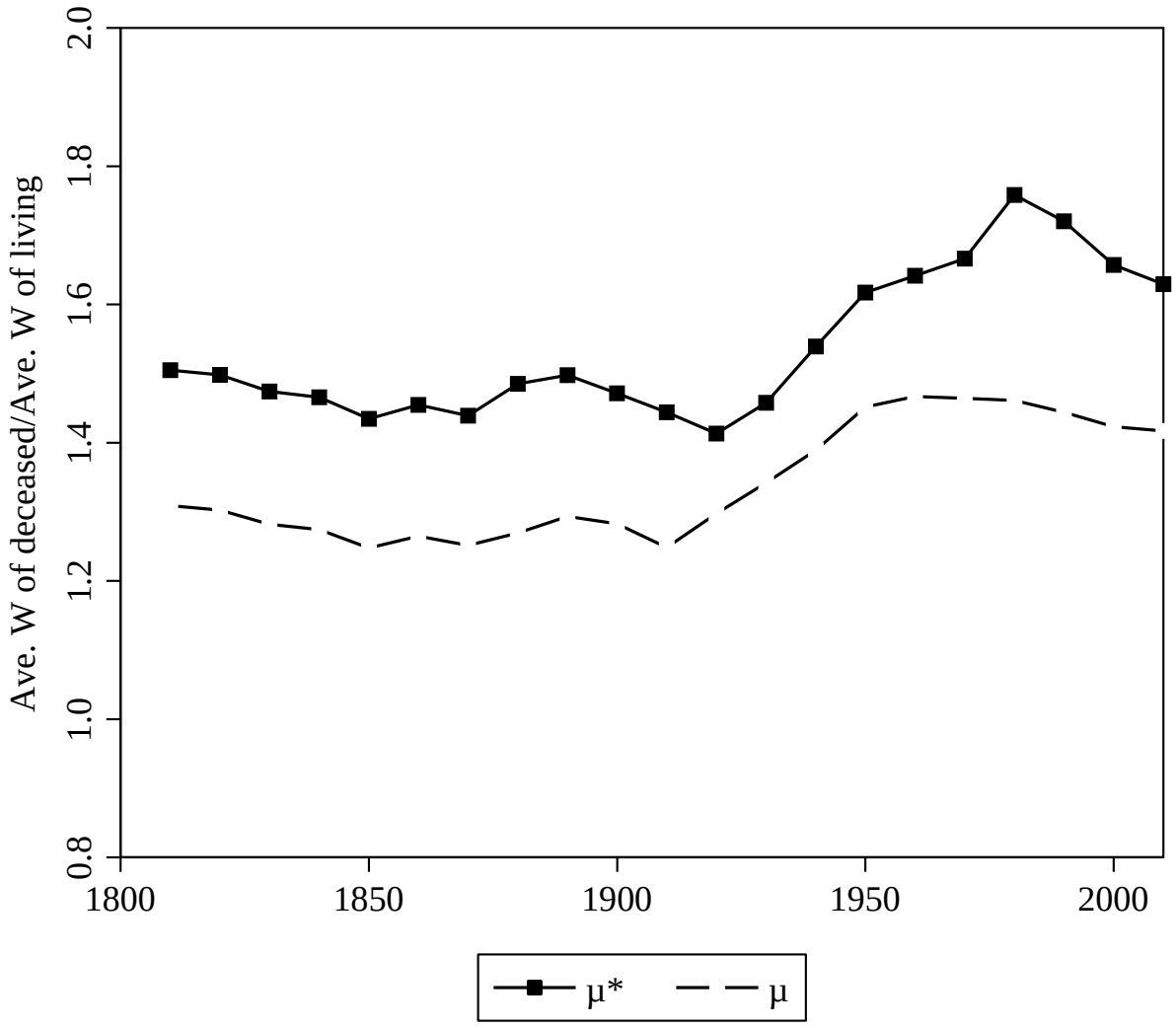

FIGURE 2: RATIO OF AVERAGE WEALTH OF THE DECEASED TO AVERAGE WEALTH OF THE LIVING, WITH CORRECTION FOR GIFTS *INTER VIVOS* (μ^*) AND WITHOUT (μ).

Source: Own calculations (see text).

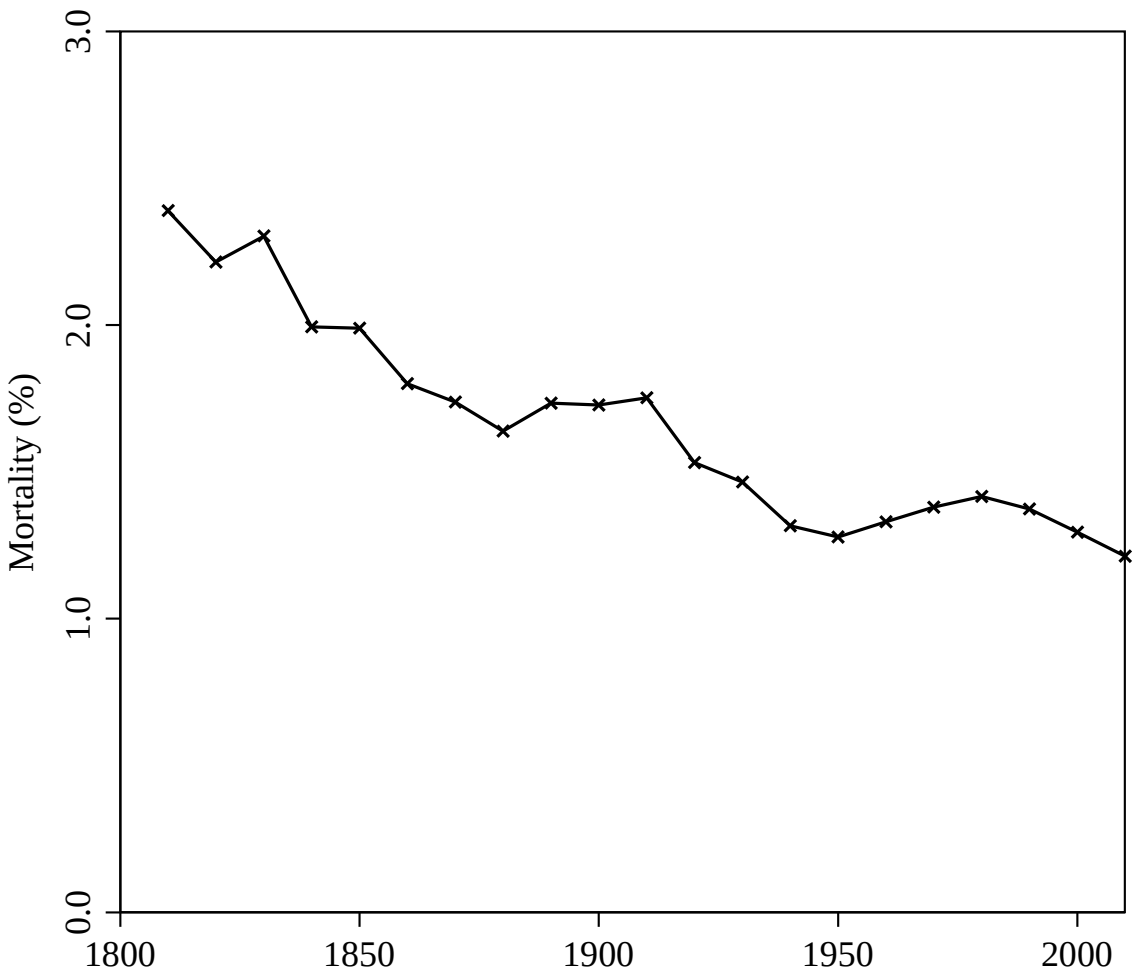

FIGURE 3: MORTALITY AMONG ADULTS IN SWEDEN, m, 1810–2010

Notes: Mortality is measured among people aged 18 years or more as the number of deaths as a share of the living population. Source is Human Mortality Database.

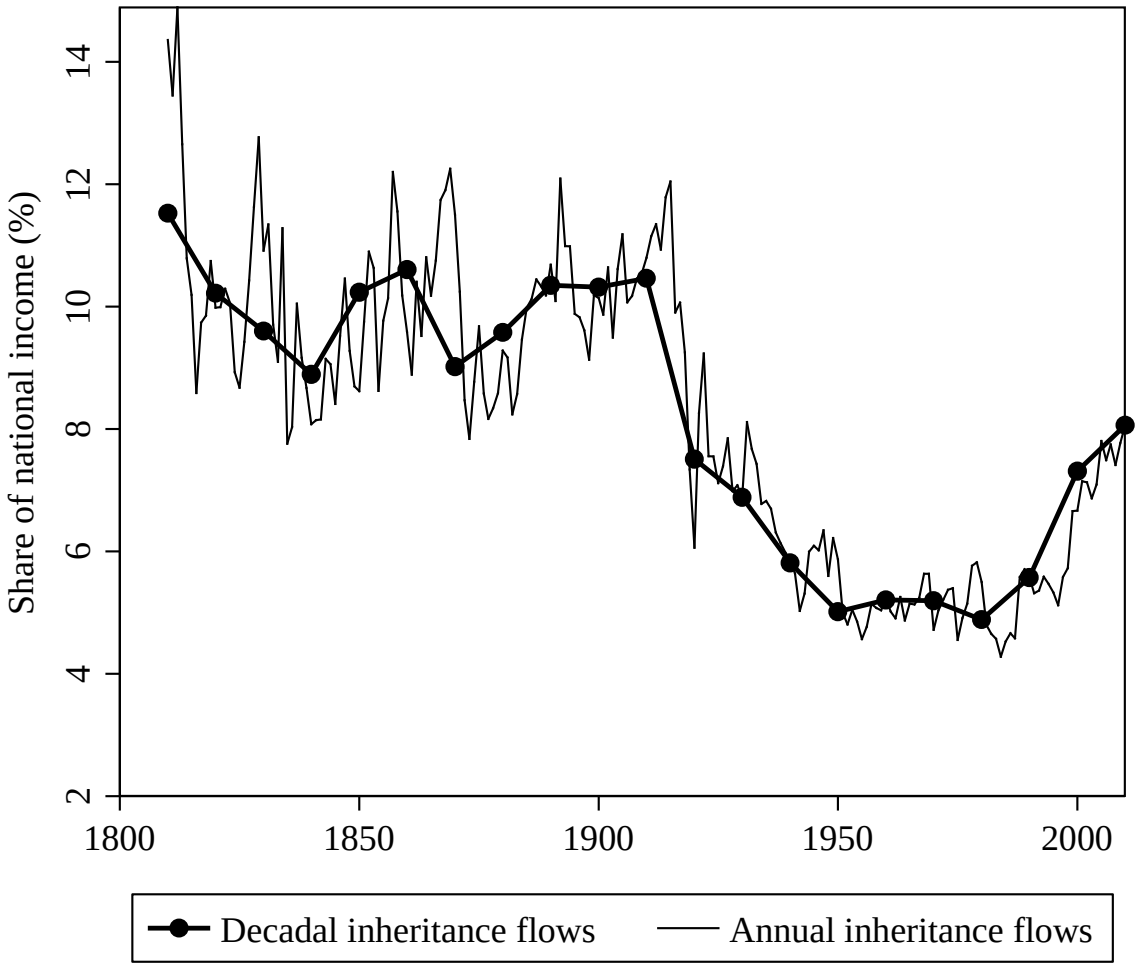

FIGURE 4: INHERITANCE FLOW OVER NATIONAL INCOME IN SWEDEN, b_Y, 1810–2010

Source: Own calculations (see text).

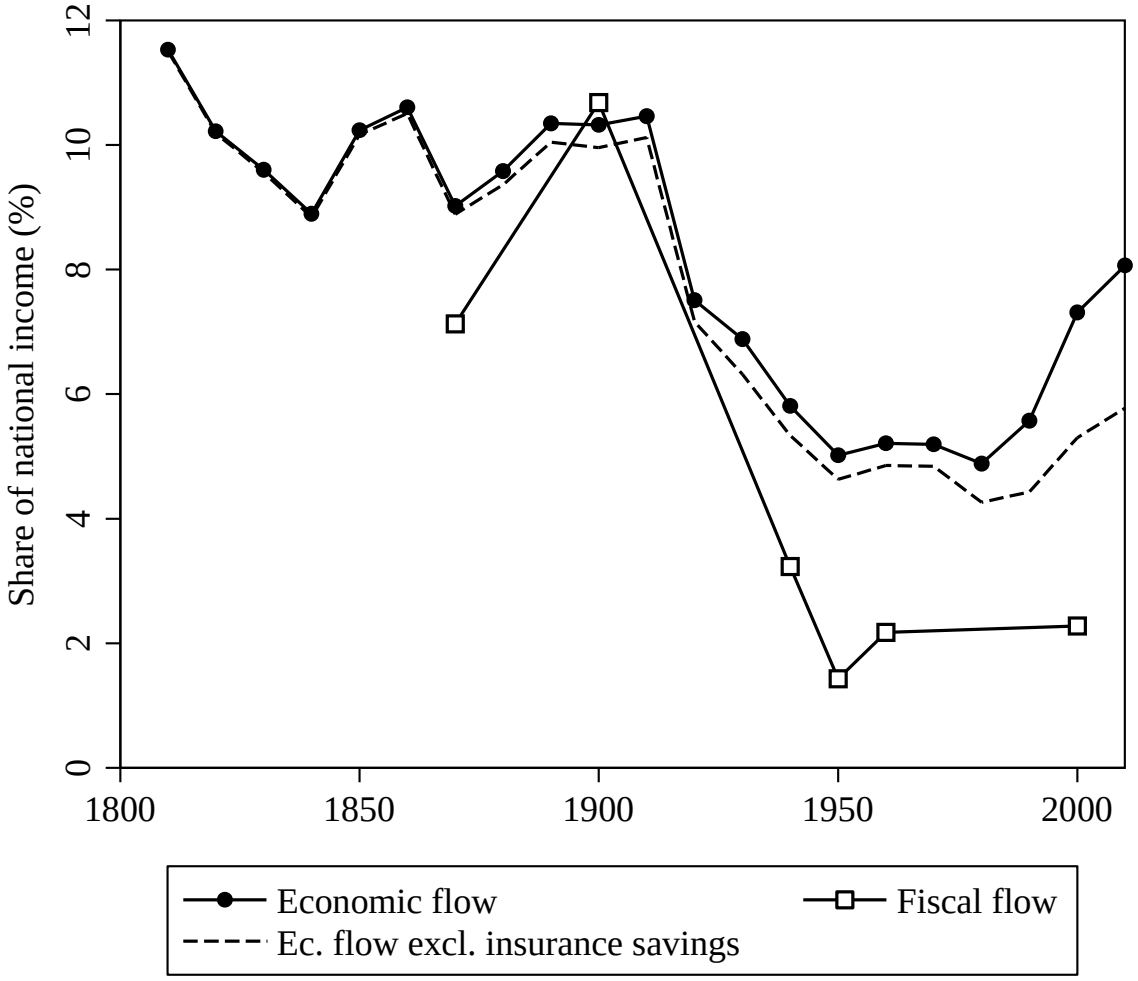

FIGURE 5: COMPARING "FISCAL FLOW" AND "ECONOMIC FLOW" ESTIMATES.

Source: Own calculations (see text).

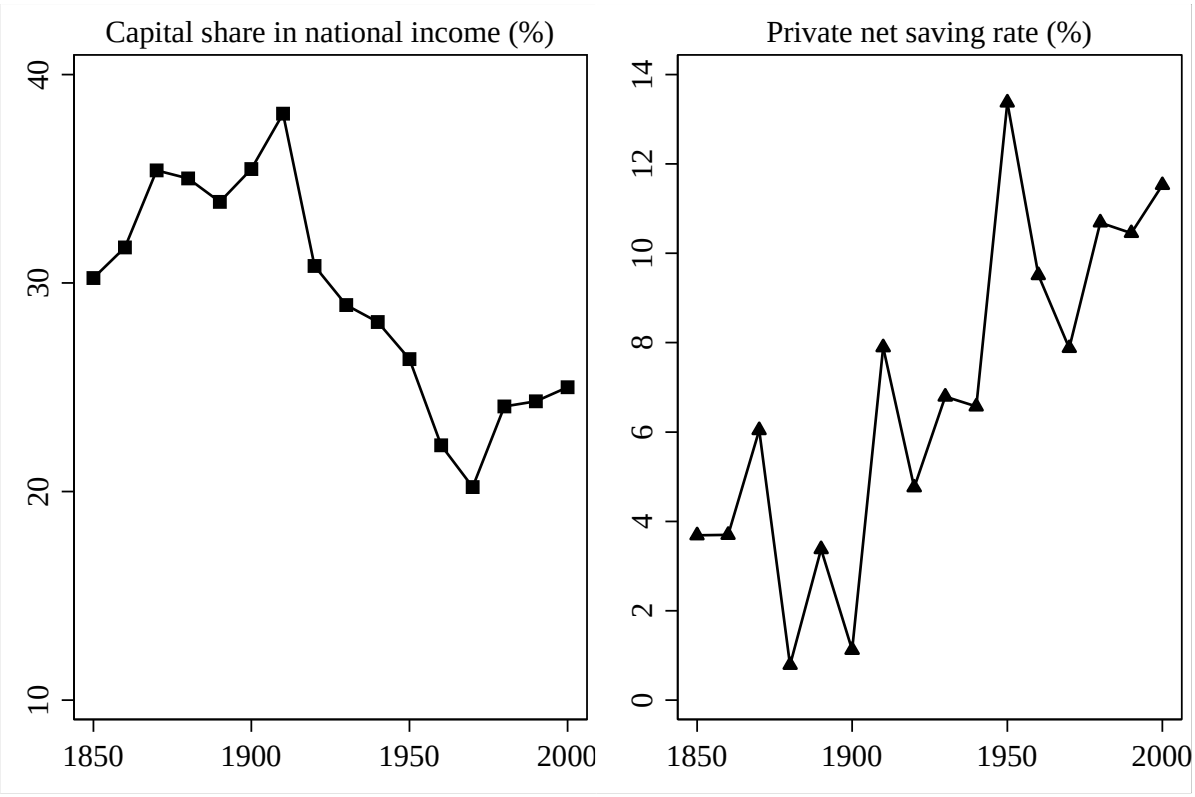

FIGURE 6: CAPITAL SHARE OF VALUE ADDED AND PRIVATE NET SAVING RATE FOR SWEDEN

Source: Own calculations (see text).

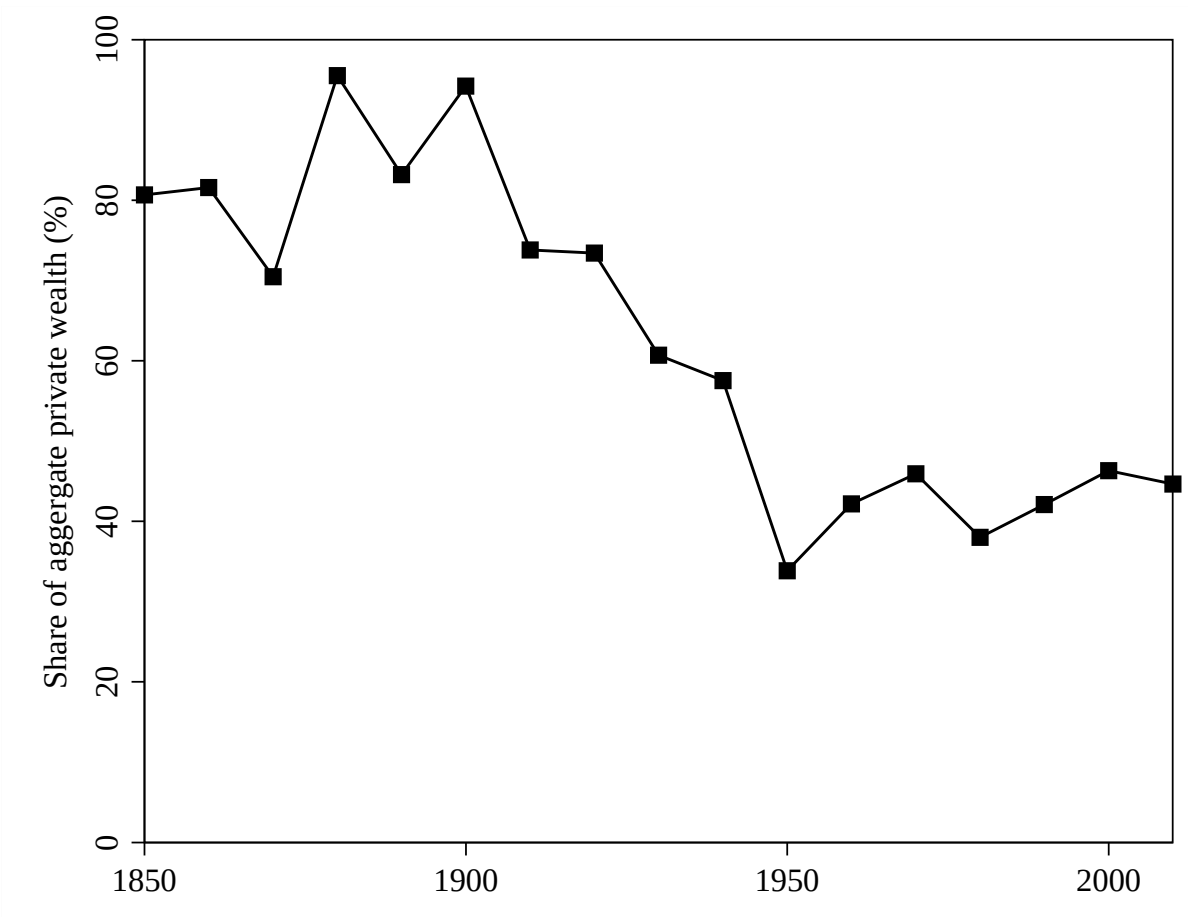

FIGURE 7: INHERITED WEALTH AS SHARE OF AGGREGATE WEALTH, φ.

Note and source: The smoothed series is based on 30-year moving averages of the variables in equation (3), b_Y, s^n and $\tilde{\alpha}$. For sources of the calculations, see text.

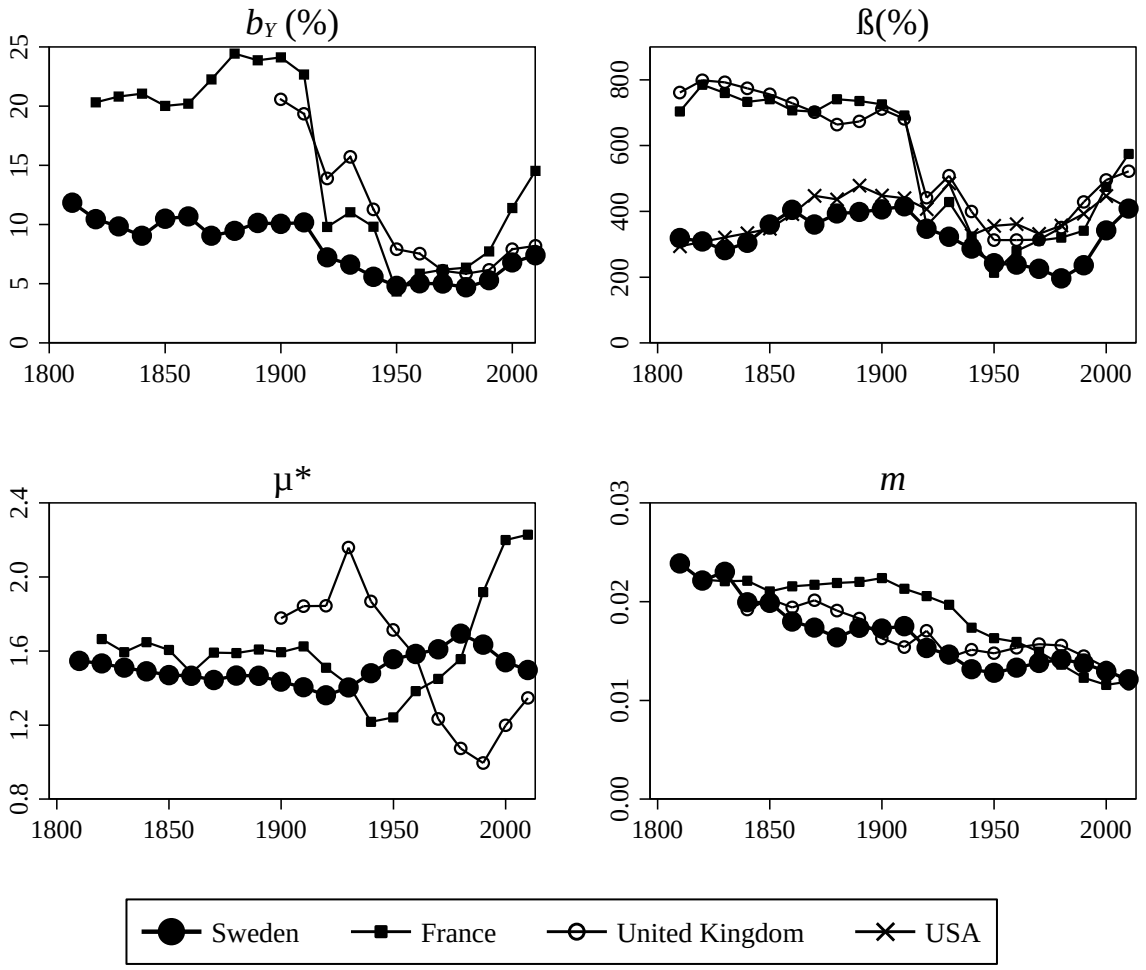

FIGURE 8: INTERNATIONAL COMPARISON OF THE DETERMINANTS OF b_Y.

Notes and sources: Data on β from Waldenström (2014) for Sweden and Piketty and Zucman (2014a) for the other countries. Mortality for France comes from Piketty (2011), for Sweden and the U.K. from the Human Mortality Database. Data on μ^* come from this study for Sweden and from Piketty (2011) for France, and for the U.K. we have estimated it by dividing the inheritance flow (b_Y) by the product of β and the mortality rate based on the economic flow logic of equation (1).

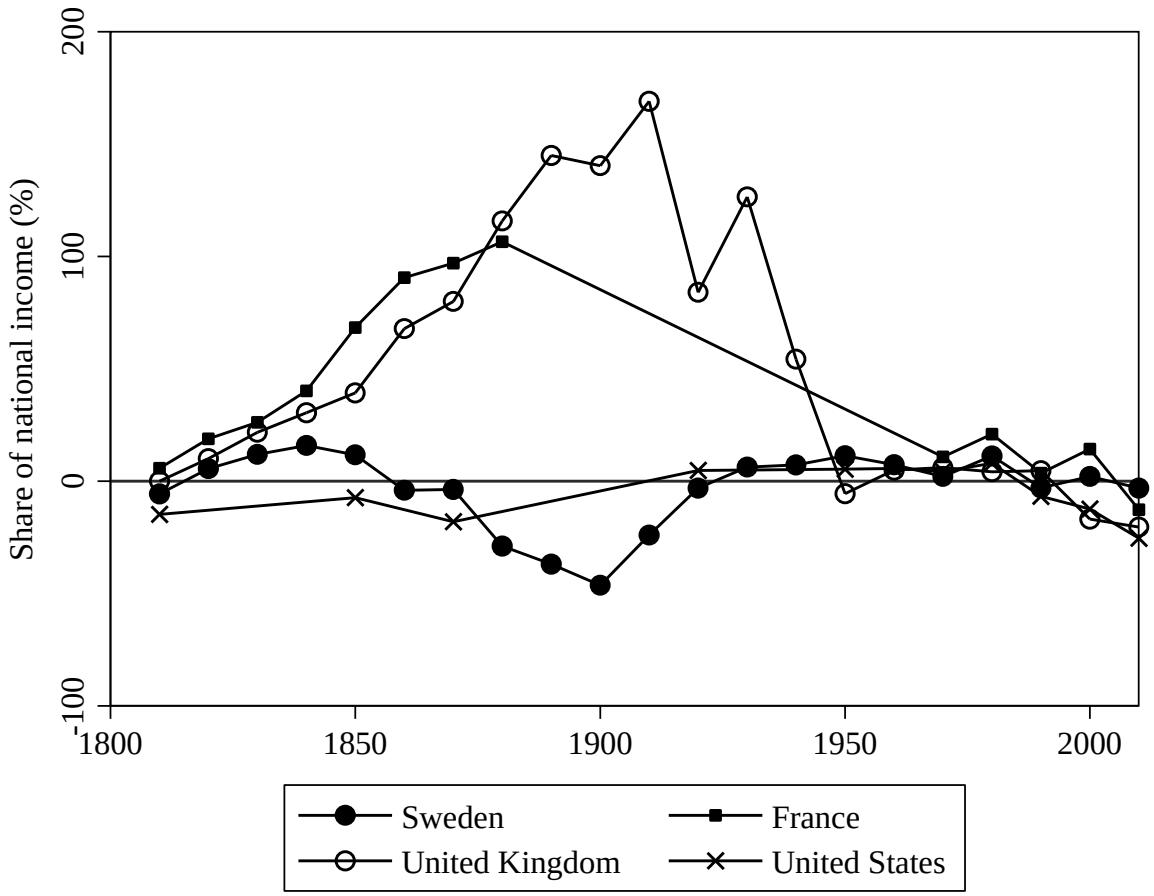

FIGURE 9: NET FOREIGN POSITION.

Source: Own calculations (see text).

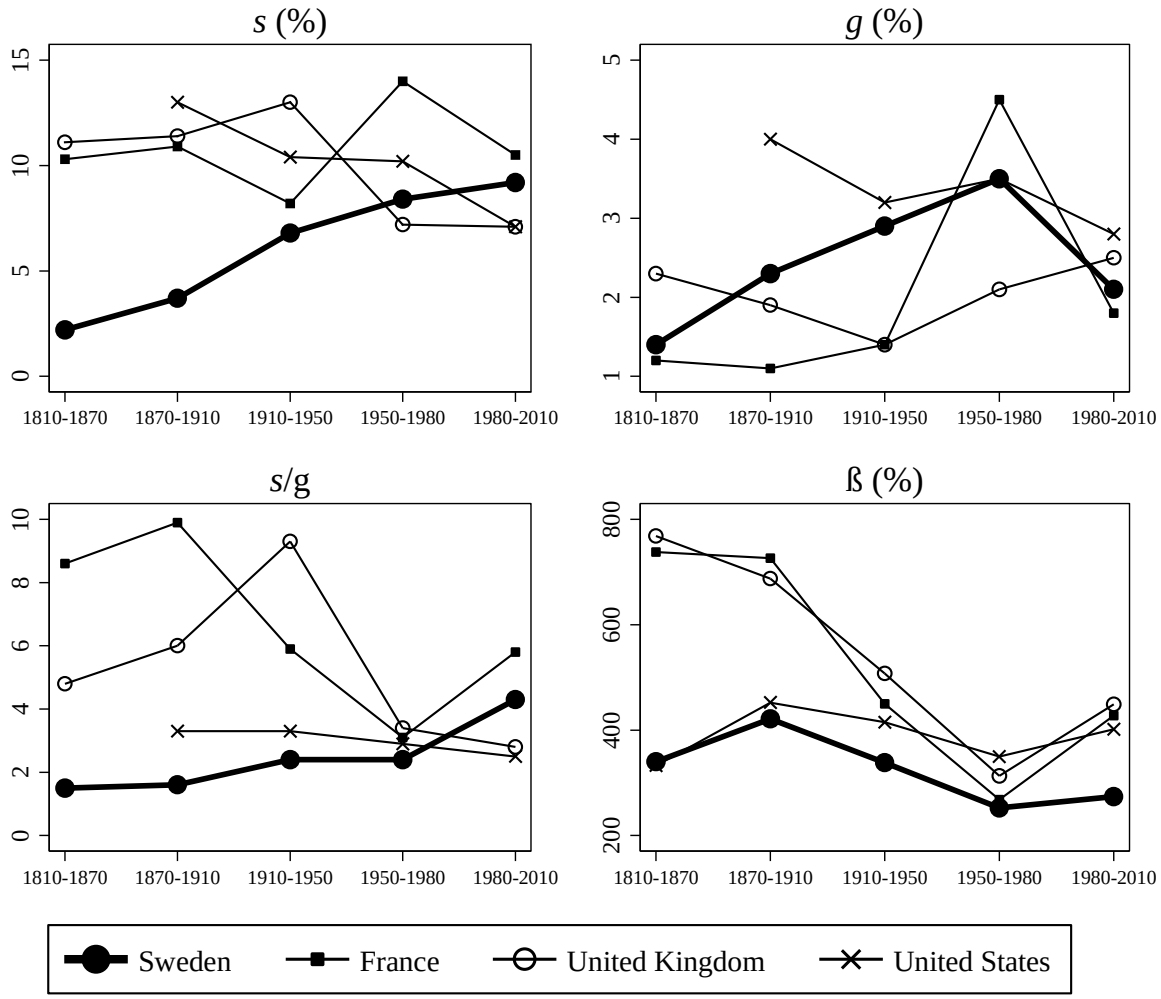

FIGURE 10: SAVINGS, GROWTH AND WEALTH-INCOME RATIOS IN FOUR COUNTRIES.

Source: Growth rates are compounded annual average growth rates of real national income, using data for France, the U.K. and the U.S. from Piketty and Zucman (2014a) and for Sweden from Waldenström (2014) and this study.

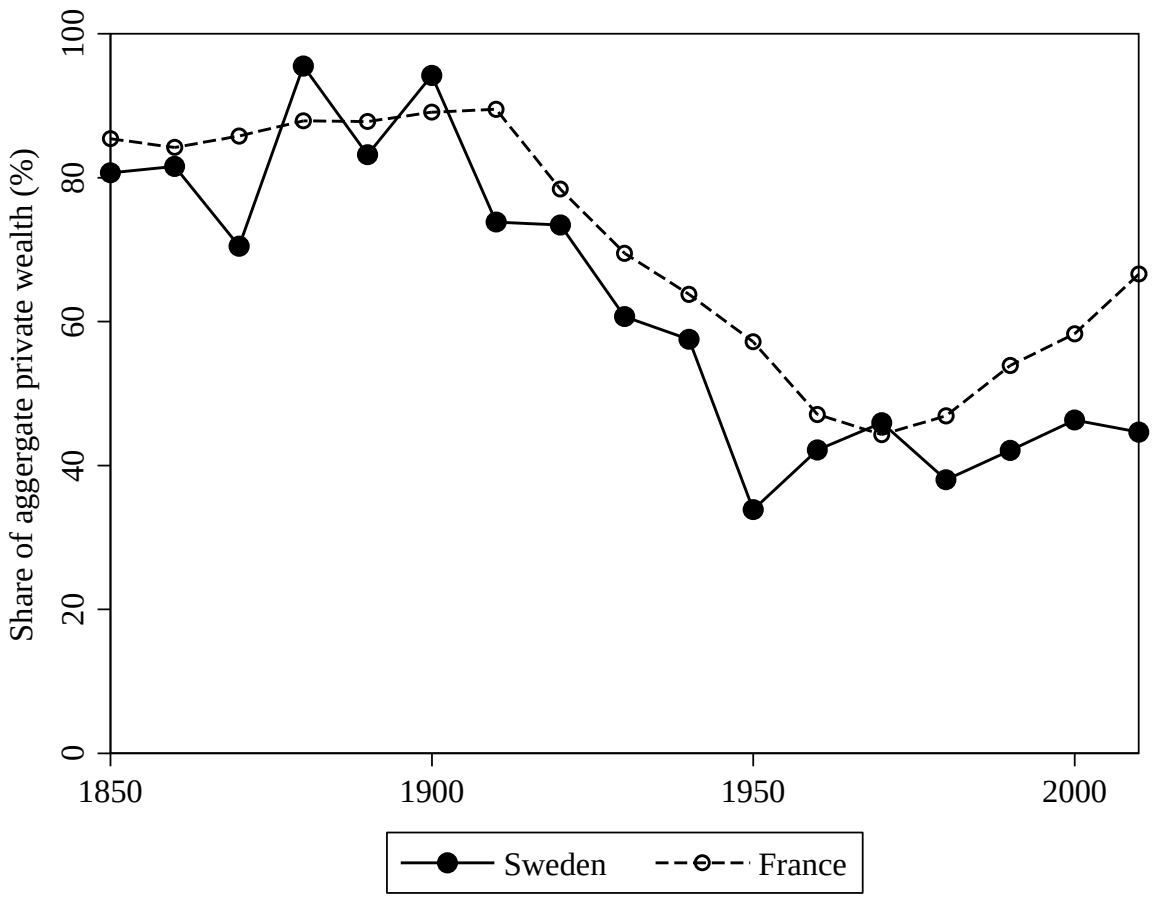

FIGURE 11: SHARE OF INHERITED WEALTH IN FRANCE AND SWEDEN, φ, 1850–2010

Source: For France, see Piketty and Zucman (2015) and for Sweden, our own calculations.

TABLE 1: ACCUMULATION OF PRIVATE WEALTH IN SWEDEN, 1810–2010

Period	β in starting year	β in ending year	Real growth rate of national income	Real growth rate of national wealth	Savings-induced wealth growth rate	Capital-gains-induced wealth growth rate
1810–2010	336%	408%	2.4%	2.5%	2.0%	0.5%
					(79%)	(21%)
1810–1870	336%	396%	1.5%	1.7%	0.8%	1.0%
					(44%)	(56%)
1870–1910	396%	438%	2.4%	2.6%	1.0%	1.6%
					(39%)	(61%)
1910–1950	408%	282%	3.1%	2.0%	1.9%	0.0%
					(100%)	(0%)
1950–1980	282%	223%	3.6%	2.9%	3.8%	–0.9%
					(132%)	(–32%)
1980–2010	223%	408%	2.3%	4.3%	3.8%	0.5%
					(88%)	(12%)

Note: Decennial averages are being used. In parentheses are the relative contribution of saving and capital gains to the wealth growth.

TABLE 2: DECOMPOSING CHANGES IN INHERITANCE FLOWS IN SWEDEN (%).

	Average annual percent change in inheritance flow (Δb_Y)	with contribution from:		
		Wealth-income ratio ($\Delta\beta$)	Ratio of average wealth of de-ceased and living ($\Delta\mu^*$)	Mortality (Δm)
1810–1870	–0.4	0.2	–0.1	–0.5
1870–1910	0.4	0.4	0.0	0.0
1910–1950	–1.8	–1.3	0.3	–0.8
1950–1980	–0.1	–0.7	0.3	0.3
1980–2010	1.7	2.5	–0.3	–0.5

Note: Percentage points reflect the compounded average annual change between periods. Decennial averages are being used.

TABLE 3: DECOMPOSING CHANGES IN INHERITANCE FLOWS IN SWEDEN (%).

	μ	$\bar{W}_d$	$\bar{W}_l$
1870–1930			
1870	1.56	6,492	4,149
1930	1.36	24,488	17,964
Yearly percentage change	–0.2	2.2	2.5
Contribution to change in μ		48%	52%
1930–1970			
1930	1.36	24,488	17,964
1970	1.74	16,573	9,498
Yearly percentage change	0.6	–1.0	–1.6
Contribution to change in μ		38%	62%
1970–2000			
1970	1.74	16,573	9,498
2000	1.71	274,227	160,794
Yearly percentage change	–0.1	9.8	9.9
Contribution to change in μ		50%	50%

Note: Data are based on historical observations of age-taxable wealth profiles described in the text. Wealth in current SEK. Contribution to change in μ shows the relative contribution to the total change in the denominator and numerator of the μ ratio.

TABLE 4: COMPARATIVE b_Y-DECOMPOSITION: SWEDEN VS. FRANCE AND THE U.K.

	Difference in b_Y between France/U.K. and Sweden (%)	with contribution from differences in (%):		
		Wealth-income ratio (β)	Ratio of average wealth of deceased and living (μ^*)	Mortality (m)
France				
1820–1870	108	90	10	7
1870–1910	137	90	12	35
1910–1950	60	27	–1	34
1950–1980	12	14	–11	9
1980–2010	51	41	17	–7
United Kingdom				
1910–1950	98	56	38	4
1950–1980	35	37	–13	11
1980–2010	10	19	–11	1

Note: Percentage points reflect the ratio of levels in France and the UK to the respective levels in Sweden. Decennial averages are being used.

ONLINE APPENDICES: NOT INTENDED FOR PUBLICATION IN MAIN PAPER!

Online Appendix A: Age-wealth profiles in Sweden: Historical evidence and simulations

1. Historical age-wealth profiles in Sweden

Data on the historical evolution of age-wealth profiles in Sweden are scarce. We have searched for evidence in Censuses, public investigations and academic research and managed to locate half a dozen of observations of early sources that allow us to estimate age-wealth profiles recorded in the 1840s–1890s, 1908, 1920, 1930, 1945, 1951 and 1966. From 1968 up to 2007 administrative public register databases at Statistics Sweden are available. After 2007, individual information about wealth is no longer available due to the removal of the wealth tax.

In this appendix, we describe how historical age-wealth profiles for Sweden are recorded and estimated for the full period 1810–2010. We begin by describing each of the historical observations in separate subsections. Thereafter we continue by explaining how we simulated annual age-wealth profiles, and provide results from a number of goodness of fit and sensitivity analyses associated with these simulations.

The structure of the historical data on Swedish wealth distributions across age is relatively homogenous over time, with most sources describing the population divided into age classes, with the number of wealth holders and the sum of their net wealth in each of these classes. However, some differences are worth noting.

i) The *unit of observation* is the individual, but in the 19th century probate wealth data we rely on probated, i.e., deceased, individuals.

ii) The *sample population* is the full adult Swedish population (18 years and older). One exception is one of the 19th century observations, which only covers a parish in Southern Sweden. Another is the tax-return based register data between 1968 and 2006, for which we only have annual information about tax-assessed wealth for those in the population with high enough net wealth to reach the tax threshold. The share of wealth taxpayers was between five and ten percent of all taxpayers during this period (Hochguertel and Ohlsson, 2012). For the period 2000–2007, we also observe the market-valued net wealth of all Swedish individuals in a parallel register database built Statistics Sweden called the Wealth Register (Statistics Sweden, 2006).

iii) The *concept of wealth* is tax-assessed wealth except in the 2000s. For the observations in the 20th century up until 2006, this means that wealth is the net assets taxable according to contemporary wealth tax assessments ("skattepliktig förmögenhet"). Wealth is here defined as the sum of real and financial assets less debts. Assets are reported in tax-assessed values, meaning that some assets, e.g., real estate and corporate stock, are not always reported at their full market value (see Roine and Waldenström, 2009, for a detailed discussion). The 19th century wealth is based on probate records, and thus refers to the rules of the 19th century estate and inheritance tax legislation (see Ohlsson, 2011; Henrekson and Waldenström, 2015).

For the years in the 2000s, we observe wealth both from the tax return-based registers and in

the Wealth Register. The concept of wealth in the latter database deviates from the former in several ways. Most importantly, the Wealth Register reports assets in current market values as opposed to tax-assessed values in all the other sources. For housing equity, market values are retrieved from average sales price ratios computed at the municipal level by Statistics Sweden. For financial assets, market prices at year end for corporate stocks, mutual funds, and bonds are used. Additionally, there are some items included that do not generally appear in tax-assessments and personal tax returns, e.g., condominiums. Despite the important differences between the Wealth Register data of the 2000s (using market-valued wealth for the entire population) and the tax register wealth of the period between 1968 and 1999 (using tax-valued wealth for a small share of the population), we show below that the age-wealth profiles derived from these sources do not differ greatly.

iv) Age classes are not homogenously reported across observations. Specifically, we do not observe wealth at each yearly age but rather in intervals of ages. These intervals also differ across data points as shown by the appendix tables below. For the period from 1968 onwards, however, we have microdata allowing us to use either yearly or year-interval age classes.

To homogenize the age classes across samples, we compute weighted average ages using actual population statistics on the number of living men and women in each age class times their respective age divided by the total number of men and women in each age class. Note that this weighting procedure becomes especially important for the calculation of a representative age for the open age interval in the top of the age distribution when otherwise an arbitrarily set top age could bias the results. Through this procedure, we get a certain age that corresponds to a certain average wealth for all years, which allows for the imputation strategy to attribute age-wealth profiles for all ages and all years in the studied period.

1.1 The 19th century age-wealth profile

There exist a number of studies where Swedish economic historians have collected data from probate records and estate tax returns with the ambition to reconstruct household portfolios (see, e.g., Isacson, 1979; Magnusson, 1983; Ericsson, 1992; Lindgren, 2002; Hellgren, 2003; Lilja, 2004; Perlinge, 2005). Unfortunately, few of these report the net (or gross) wealth across age classes.

The only two sources of 19th age-wealth distributions to our knowledge are Håkan Lindgren's study of the extent of informal credits in the mid-sized city of Kalmar between 1840 and 1900 and Anders Perlinge's dissertation about the evolution of household indebtedness in the Vånga parish in Sothern Sweden between the 1840s and the 1890s (Perlinge, 2005). In both these studies, information is provided about the total number of deceased, the sum of their net wealth, and the total wealth of the living population (calculated by multiplying the wealth of the deceased by inverse mortality multipliers). These numbers are reported for each decade and men and women in six age cohorts.

An important drawback of both of these studies is their limited geographical coverage. Kalmar was by all means a significant city, being Southwestern Sweden's principal commercial and shipping center Sweden's seventh most populous city. In fact, Lindgren (2002) argues that the

city of Kalmar may be a quite typical region for the whole of 19th century Sweden, placed in the country-side and yet taking part in the industrial boom of the end of the century. Perlinge's studied parish is much smaller and exclusively rural. Yet his database is rich both in terms of the number of studied estates, as well as the level of detail regarding the composition of estates in terms of different asset and debt components.

In order to reduce some of the small sample bias coming from having such a small number of deceased in each decade, we sum all the deaths and sums of wealth landing at three 19th century observations: 1840s (encompassing the 1841–1845 Kalmar and the 1840–1859 Vånga), 1870s (1871–1875 Kalmar and 1860–1879 Vånga) and the 1890s (1901–1905 Kalmar and 1880–1899 Vånga). Figure A1 shows the normalized average wealth of these summary series.

[Figure A1, and Tables A1a, A1b and A1c about here]

1.2 The 1908 age-wealth profile

The earliest source of a nationally representative Swedish age-wealth distribution is to our knowledge a public investigation from 1910 which reports average net wealth across age classes in 1908 (Flodström, 1910). These data are based on a rich sample of estate reports for Swedish deceased in 1908, with estate wealth multiplied by inverse mortality multipliers for a number of groups of different age, gender and civil status.[36] Additional data were also collected by the investigators for the years 1906 and 1907. These years were not analyzed at the same depth as 1908, but they allow for robustness checks especially with regard to the possibility of observing extreme values in estate samples in individual years. These checks do not suggest any oddities in the 1908 data.[37] Figure A2 shows the observed age-wealth profile in 1908.

[Figure A2 and Table A2 about here]

1.3 The 1920 age-wealth profile

The Census of 1920 was the first Census to report information about income and wealth for the Swedish population. We use information on taxable net wealth reported for different age-classes in Statistics Sweden (1927, p. 124).

[Figure A3 and Table A3 about here]

1.4 The 1930 age-wealth profile

We use data from the 1930 Census to get information about age-wealth profiles in this year. Data were collected from Statistics Sweden, Statistical Yearbook of 1945 (table 254, p. 302-303), and further information is provided in the Census volume Statistics Sweden (1938, pp.

[36] See Flodström (1910, Table K). The classes are, except age (which can be found in Table A2): unmarried men; unmarried women; married men; married women; widowers and divorced men; widows and divorced women.
[37] We use all the data from 1906–1908 when estimating the fiscal inheritance flow, shown in the paper's sections 2 and 3.

114ff).

[Figure A4 and Table A4 about here]

1.5 The 1945 age-wealth profile

We collect information about the Swedish age-wealth population in 1945 from the Census of that year (Statistics Sweden, Statistical Yearbook of 1950, table 303, p. 320–321). Further information is available in Statistics Sweden (1951, table 1, p. 2). This Census observation differs somewhat from the 1920 and 1930 observations since the 1945 data are based on an eight percent sample of the population and not the full population as in the previous years. The listed numbers are scaled up so as to cover the whole population.

[Figure A5 and Table A5 about here]

1.6 The 1951 age-wealth profile

Information about the Swedish age-wealth profile comes from the Census of 1950, collected from Statistics Sweden, Statistical Yearbook of 1957, table 388, p. 316. Further information can be found in Statistics Sweden (1956, table 1, p. 2).

[Figure A6 and Table A6 about here]

1.7 The 1966 age-wealth profile

A public investigation called The Capital Taxation Committee ("Kapitalskatteberedningen") was summoned in 1967 to make a complete overhaul of the taxation of capital in Sweden. As part of the investigation, data on the Swedish age-wealth were collected and compiled (SOU 1969:54, tables 17 and 18, pp. 217–218). The numbers are based on a large stratified sample of the Swedish adult population, based on the tax register over individual taxable net wealth for the year 1966.[38]

[Figure A7 and Table A7 about here]

1.8 Age-wealth profiles since 1968

From 1968 onwards, Sweden launched comprehensive population register databases with demographical and taxation-related information. These registers have been compiled into smaller, nationally representative databases, and we use one of these, the LINDA database, to retrieve information about the average taxable wealth across age classes. LINDA consists of a 3,35% sample of the population, representing between 200,000 and 300,000 individuals during the studied period. While this sample size is sufficiently large for our purposes, there is still a risk

[38] Specifically, 2 percent of individuals with wealth between 0.1 and 0.3 million SEK were sampled, 5 percent between 0.3 and 1 million SEK, 20 percent between 1 and 5 million SEK and 100 percent with wealth above 5 million SEK. The average taxable net wealth in 1966 was 0.027 million SEK. See further SOU 1969:54, pp. 188–191.

that single extreme observations may influence the results and we therefore use three-year averages to smooth out the influence of single-year/individual observations. As noted above, we have no information about wealth after 2007 due to the abolishment of the wealth tax in 2007.

In our estimation of μ, we wish to combine the historical evidence presented earlier and the modern data. To avoid unbalancing the age-wealth sample, especially avoiding giving too much weight to the modern era when we have annual observations, we restrict the modern sample in two ways. First, we only use five dates, 1970 (1969–1971), 1980 (1979–1981), 1990 (1989–1991), 2000 (1999–2001) and 2005 (2004–2006). These years are used since they cover the entire register period. Second, we harmonize these modern observations with the historical evidence by collapsing the yearly age levels into age intervals. We choose the 13 age classes reported in the 1908 sample. Figure A8 shows the resulting age-wealth profiles for the four modern reference years.

[Figure A8 and Tables A8a and A8b about here]

As discussed above, the register data consists of tax-assessed wealth for all years up to and including 2006, but also third-party reported market-valued wealth for the period 2000–2007. In our main analysis, we only use the tax-assessed wealth to retain consistency with the historical evidence which exclusively consists of tax-assessed wealth. However, we argue, and also show in the paper's robustness analysis, that the tax-assessed wealth provides a sufficiently good view of the true age-wealth patterns in the Swedish economy.

One indication of the robustness of using tax-assessed wealth to conjecture age-wealth profiles is shown in Figure A9. Here we use yearly ages and instead age-classes as before. The main message is that the age-wealth profile looks roughly the same when one uses tax-assessed wealth of a small share of the population (those with taxable wealth) and market-valued wealth of the whole population. This result provides support for using tax-assessed wealth in our analysis.

[Figures A9 and A10, Tables A9 and A9 about here]

2. Simulation of annual age-wealth profiles, 1810–2010

In this section, we show how we go from the historical observations of Swedish age-wealth profiles during a few years to having a full set of age-wealth observations for each year and age during the entire period of study, 1810–2010.

As is explained in the main paper, the estimation of Swedish inheritance flows across time requires historical values for the model parameter μ^*, the ratio of average wealth of the deceased population to the average wealth of the living population adjusted for the flow of *inter vivos* gifts across generations that takes may not be captured in the probates. This can actually be done using information about the distribution of wealth of Swedish adults at different ages using the formula

$$\mu^* = \frac{\bar{W}_d}{\bar{W}_l} = \sum_i \frac{M_a}{M}\left(\frac{\bar{W}_{l,a}}{\bar{W}_l}\right) \quad , \tag{1}$$

where M_a is mortality in age class a and W_a wealth in age class a. Note that our μ^* includes all *inter vivos* gifts since we incorporate the observed wealth of the whole living population at a certain point in time, and any gifts that have been given should thus be included in the wealth of the living individuals regardless of their age.

The challenge with estimating μ^* for the full time period is that we lack complete historical information about wealth of Swedish adults across all ages and years back to 1810. Our solution is to use the historical observations reported above to construct a complete dataset by way of simulation. From the Human Mortality Database, we get mortality in each age class M_a (and thus population mortality M) during the full period.

We compute the ratio between the average wealth of different age groups and the average wealth of the adult population as a whole, $\frac{\bar{W}_{l,a}}{\bar{W}_l}$, for all years and ages by regressing the observed historical ratios (reported above) on a set of age and year polynomials. Our main specification looks as follows:

$$\left(\frac{\bar{W}_{l,a}}{\bar{W}_l}\right)_t = b_0 + b_j \sum_{j=1}^{4} Age_{a,t}^j + c \cdot Year_t + d(Age_a * Year_t) \tag{2}$$

The results from this regression are shown in the first column of Table A1. As can be seen from the table, not all age and year regressors are significantly different from zero, but the overall explanatory power (R^2) is still relatively high, around 80 percent. The table also reports the output from four alternative specifications in which variants of the age and year polynomials, and interactions between them, are included. The resulting model parameters associated with these regressions are presented in the subsections below.

Based on the regression output in Table A10, we impute fitted values, $\left(\widehat{\frac{\bar{W}_{l,a}}{\bar{W}_l}}\right)_t$, for each age between 18 and 110 and year between 1810 and 2010. Then we multiply these fitted age-average wealth ratios with the age- and year-specific mortality ratios, $\frac{M_{at}}{M_a}$. Summing these products over ages, we obtain a time series with annual values equal to the right hand side of equation (1) above, i.e., $\widehat{\mu^*}_t$.

Figure A11 contains three panels. The upper left shows the estimated normalized average wealth ($\widehat{\bar{W}_{l,a}/\bar{W}_l}$) over the life cycle for three years, 1810, 1910 and 2010. The ratio equals one when the age group has an average wealth equal to the population average wealth. As can be seen, the simulated ratios are below one for people up to about 45 years of age and then above one up to their 80's or low 90's when it starts decreasing rapidly.

Is this simulated life cycle pattern with accumulation (relative to the average) up to a certain

age and then decumulation evidence in favor of the standard hump-shaped life cycle profile of the Ando-Modigliani model? Actually no. It is crucial to note that the decumulation begins very late in life. In 1810, when the expected life span was 40 years for newborns and 70 years for people living to see their 50th birthday (see Statistics Sweden, 1969, table 42, p. 118), the estimated relative average wealth increases up to age 70. That is, people accumulated wealth virtually to their expected point of death! Similarly, in 1910 people accumulated wealth up to the age of 72 while the average life span was 54 years and the expected life at 50 was 74 years. In 2010, the pattern is somewhat weakened. People accumulated up to the age of 74 while the expected life span had increased to around 80 (see Statistics Sweden, 2013), suggesting an earlier decumulation than in historical periods.

Figure A11 also presents the estimated μ^* and the implied inheritance flow (B/Y), which is the same series as in our main paper.

[Figure A11 about here]

How well does the simulated age-normalized wealth profile match the underlying historical observations? Figure A12 provides a simple goodness of fit test, in which we simply plot the simulated profiles onto the actual evidence for the respective years. This check is mainly ocular, and inspecting the results gives a good sense of how well the model fits the data. Especially during the 19th century the differences are at times quite large, which is expected given the small and highly specific sample of age-wealth observations used for these early years.

One common pattern seems to be that the decumulation presented in the simulated profiles is not as evidence in the historical evidence up to the 1950's. Since we are using grouped data for all years before 1968, it is possible that the grouping of individuals in age classes may explain why we cannot see any decumulation in earlier times.

[Figure A12 about here]

3. Robustness checks: different models when simulating age-wealth profiles

One element of uncertainty in our estimations of historical age-wealth profiles is the assumed model specification in equation (2) and its impact on the resulting μ^* and inheritance flow. Because of this uncertainty, this section presents the results from using four alternative specifications.

3.1 Using linear age and year trends and age-year interaction

In our first alternative specification, we remove the polynomials in age and run a linear model with an interaction term between age and year.

$$\left(\frac{\bar{W}_{l,a}}{\bar{W}_l}\right)_t = b_0 + b \cdot Age_a + c \cdot Year_t + d(Age_a * Year_t) \qquad (3)$$

Figure A13 presents the results from using simulated age-wealth profiles based on this linear specification (see also Table A11, column 2, for the regression output). The age-wealth profile is quite different, naturally due to the fact that there are no polynomials in age and thus no room for a gradual transition from accumulation to decumulation. The estimated μ^* is at the same level as in the main model but only up to the postwar era, thereafter it continues to increase all the way up to 2010. This increase reflects that the relative wealth decumulation among the elderly observed in the main model is not present in the linear model (by construction through the absence of age polynomials). The increase in β therefore translates into a higher μ^*in the period after 1980.

Looking at the inheritance flow in the linear model, the overall level is slightly higher than in the main model, with the flow surpassing ten percent in 2010 (as opposed to eight percent in our main model). Still, the time profile looks similar as in the main model, with a relatively high level during the 19th century up to the 1910s, and thereafter a secular decline up to the late 1980s when the inheritance flow increases sharply.

[Figur A13 about here]

3.2 Using age polynomials but no time trend

Another alternative specification used is one where we remove time entirely from the regression model:

$$\left(\frac{\bar{W}_{l,a}}{\bar{W}_l}\right)_t = b_0 + b_j \sum_{j=1}^{4} Age_{a,t}^{j} \quad (1)$$

Figure A14 shows the results from a simulated age-wealth profile without time trend. The result is quite striking: there is remarkably little difference between the main results in Figure A12 and these results. Of course, the simulated age-wealth profiles are constant over time, but the implied μ^* is only slightly lower than in the main model. For this reason, the resulting inheritance flow is almost the same.

[Figure A14 about here]

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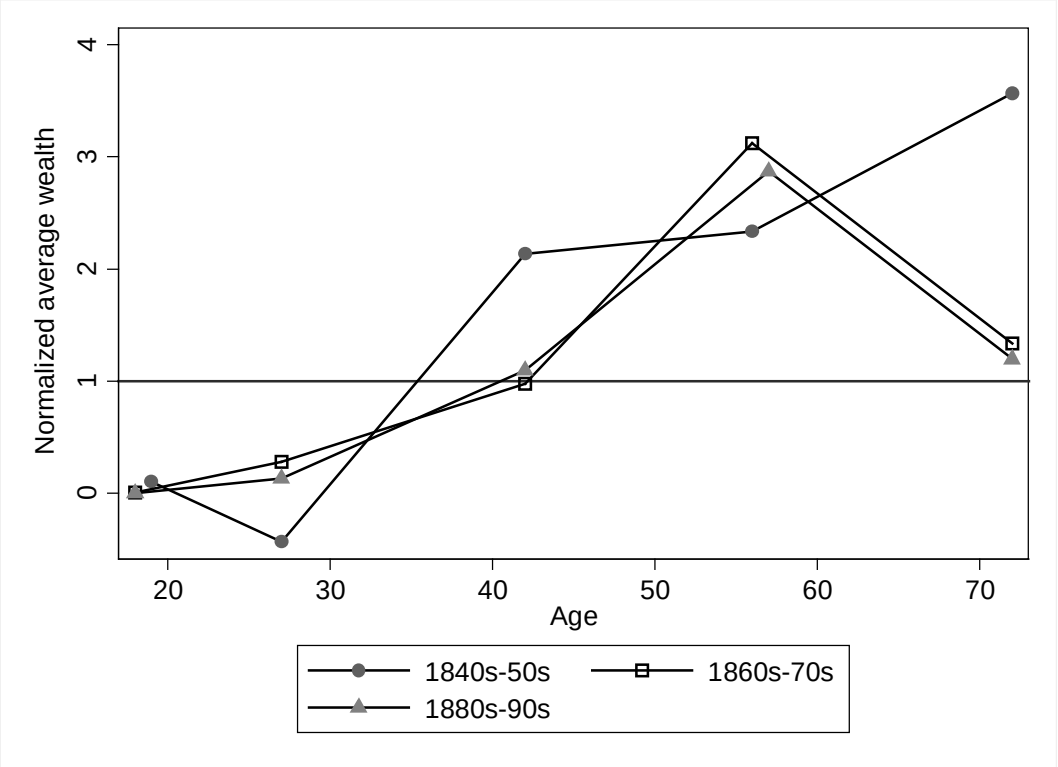
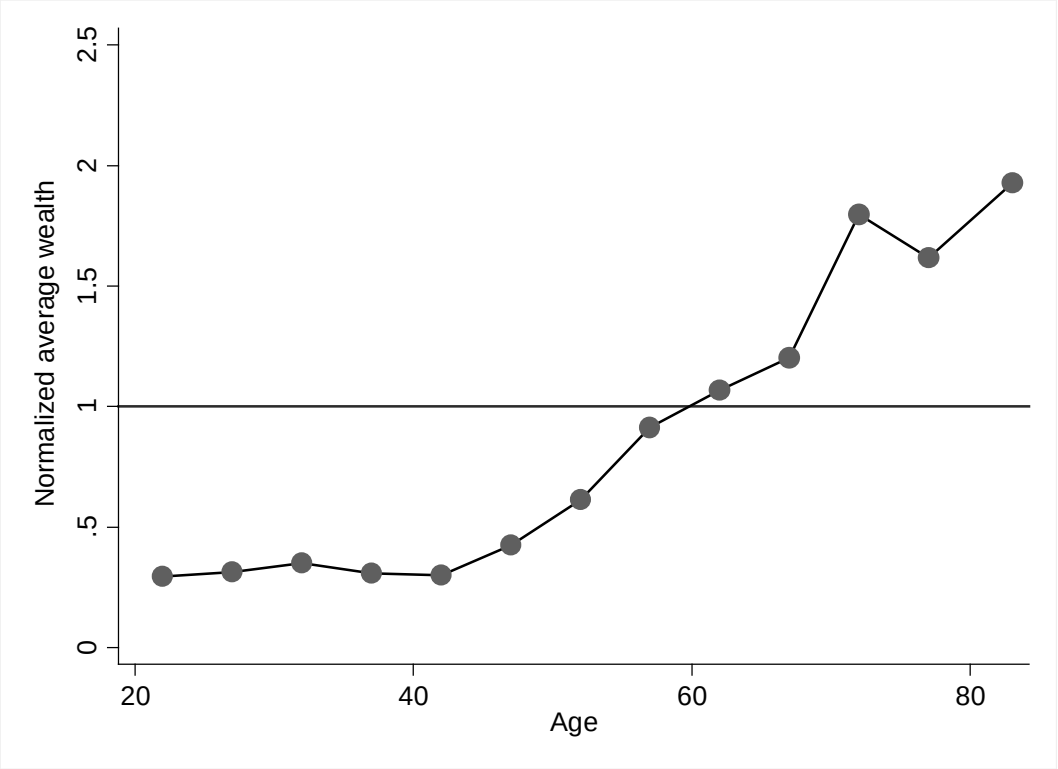
Figure A1: Age-wealth profiles between 1840s and 1890s.



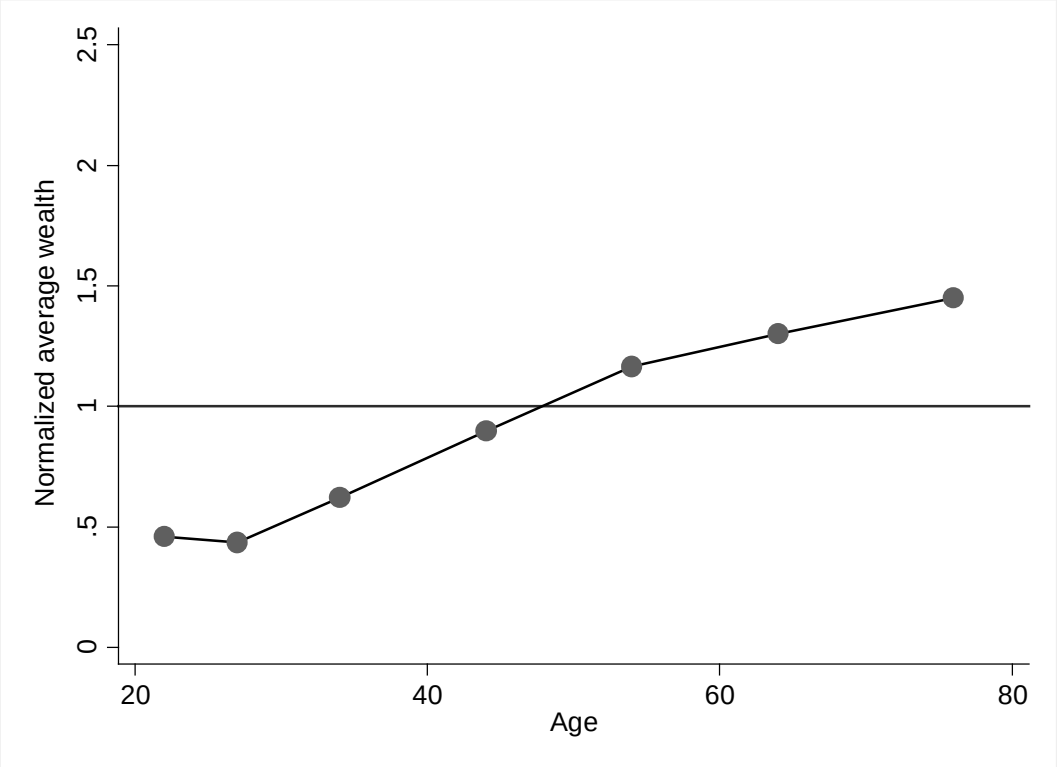
Note: Normalized average wealth is defined as $\bar{W}_{l,i}/\bar{W}_{l}$. Data come from Table A3.

Figure A2: Age-wealth profile in 1908.



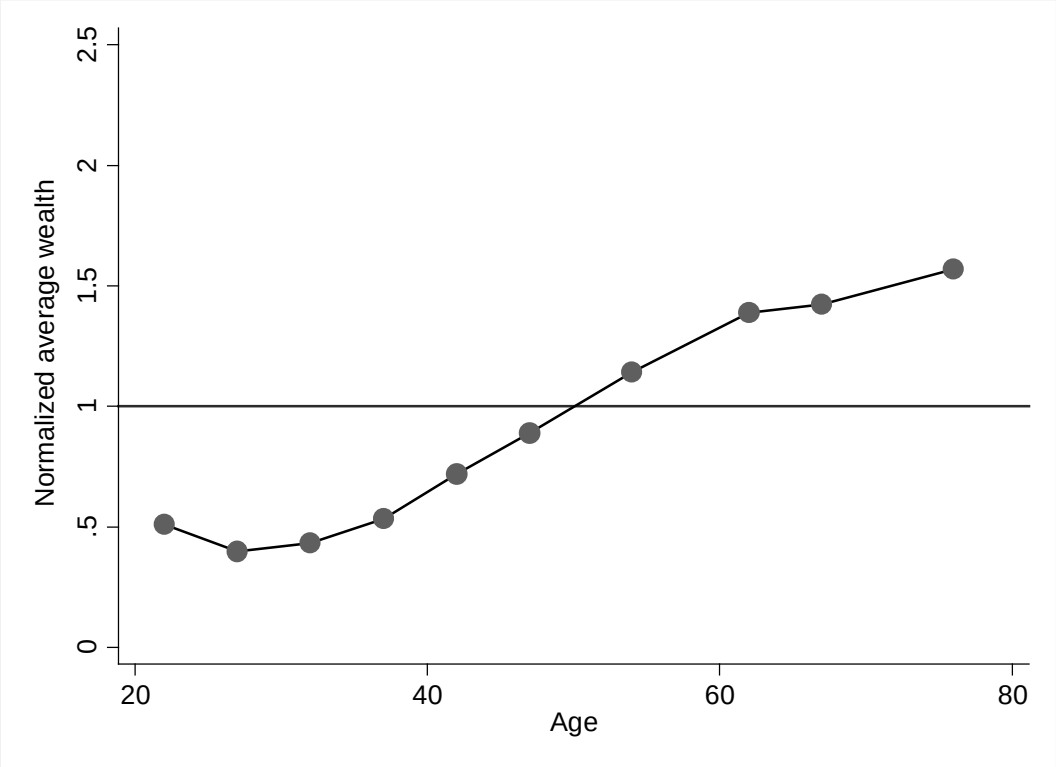
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A2.

Figure A3: Age-wealth profile in 1920.



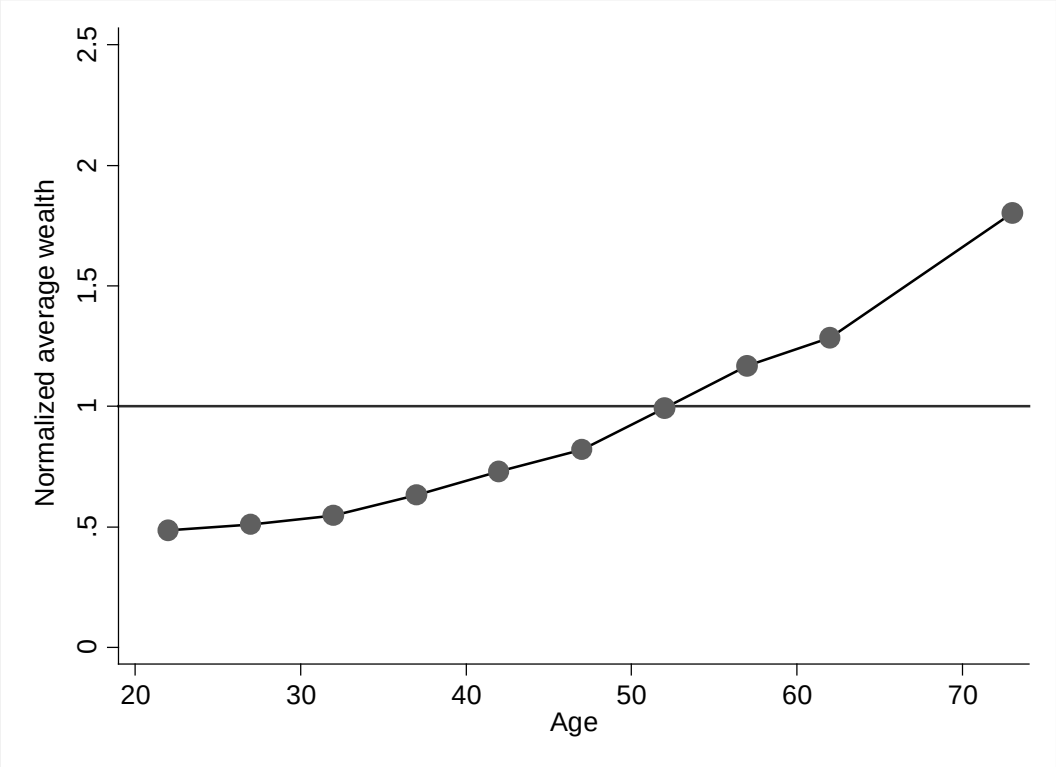
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A3.

Figure A4: Age-wealth profile in 1930.



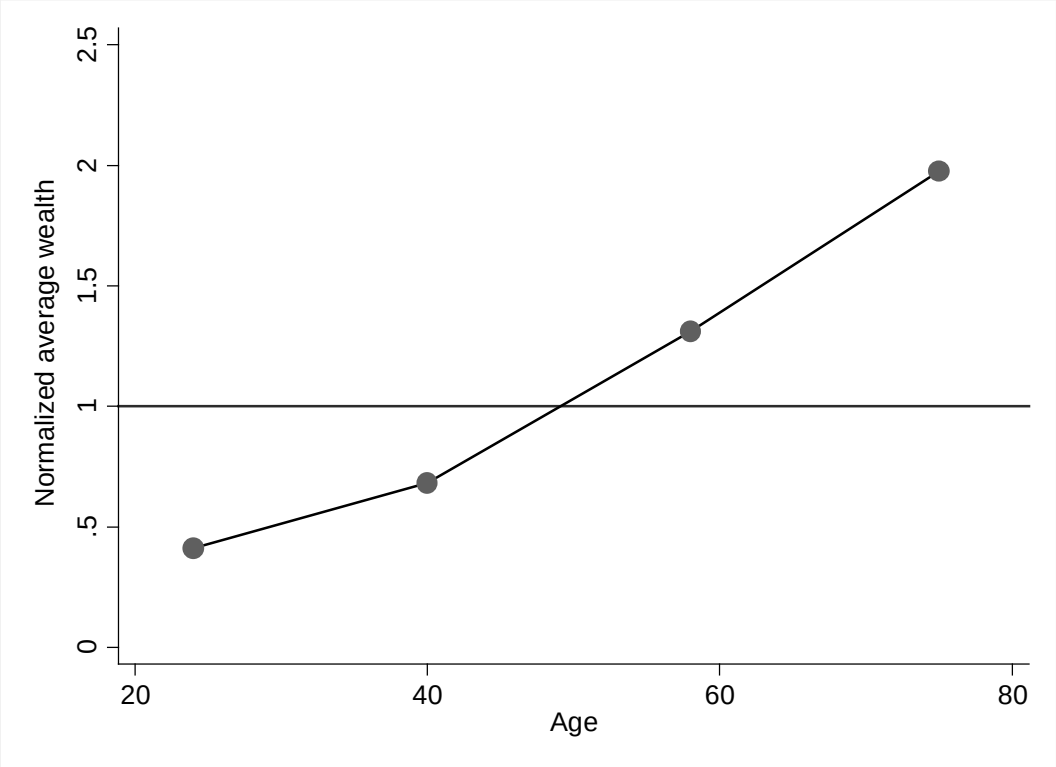
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A4.

Figure A5: Age-wealth profile in 1945.



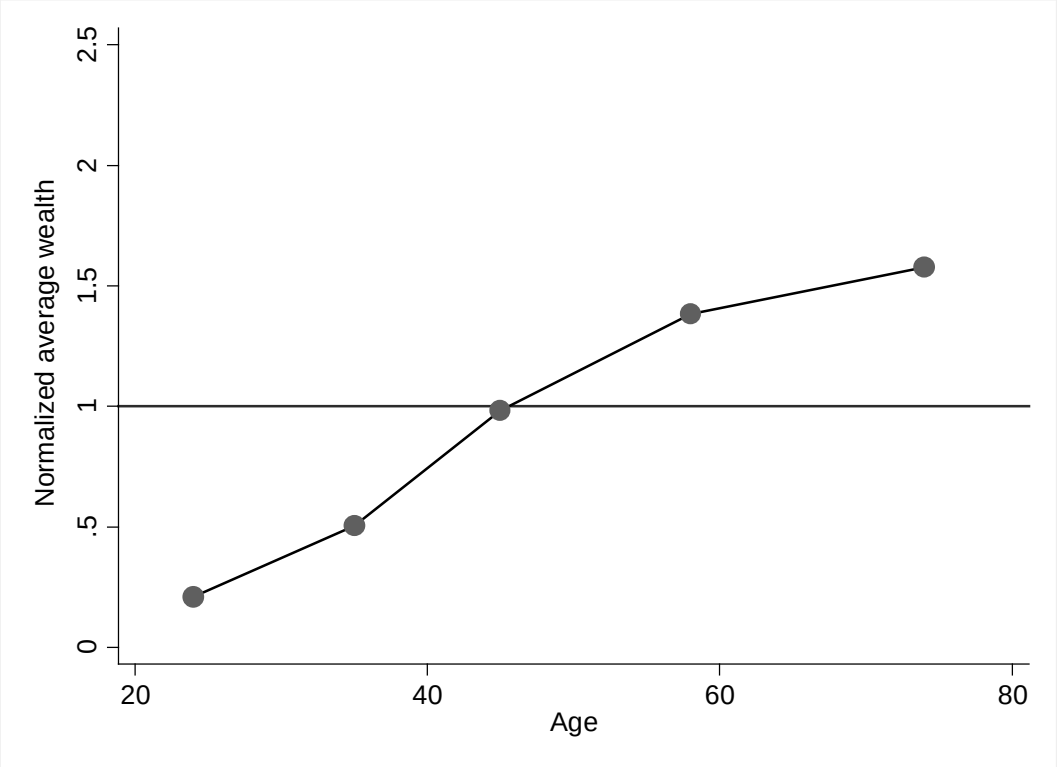
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A5.

Figure A6: Age-wealth profile in 1951.



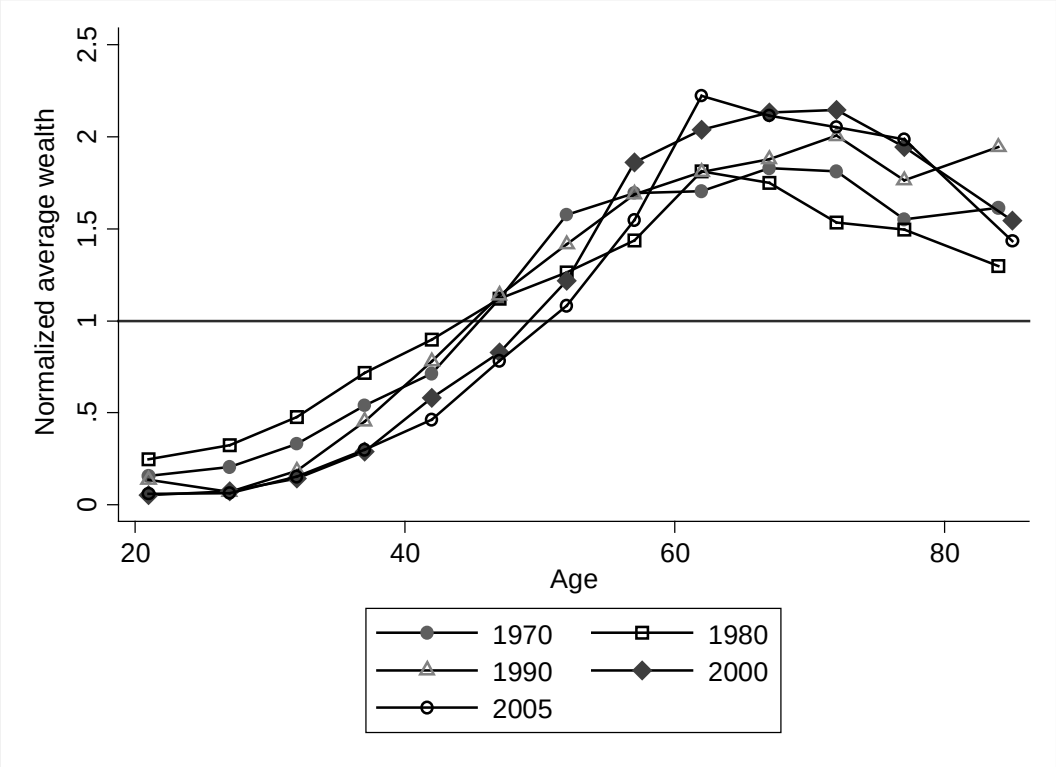
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A6.

Figure A7: Age-wealth profile in 1966.



Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A7.

Figure A8: Age-wealth profiles in 1970, 1980, 1990, 2000 and 2005.

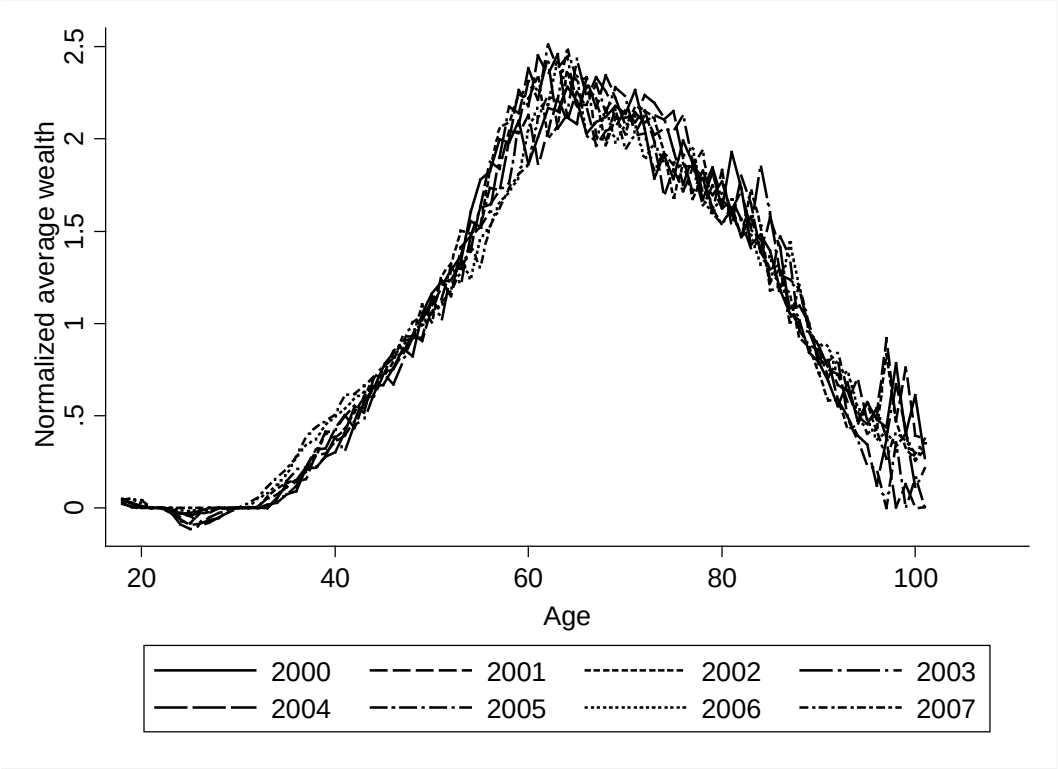


Note: Normalized average wealth is defined as $\bar{W}_{l,i}/\bar{W}_l$, (see, e.g., Table A1). Observations are three-year averages, with the denoted years as midpoint.

Figure A9: Age-wealth profile in 2005, tax-valued vs. market-valued wealth.

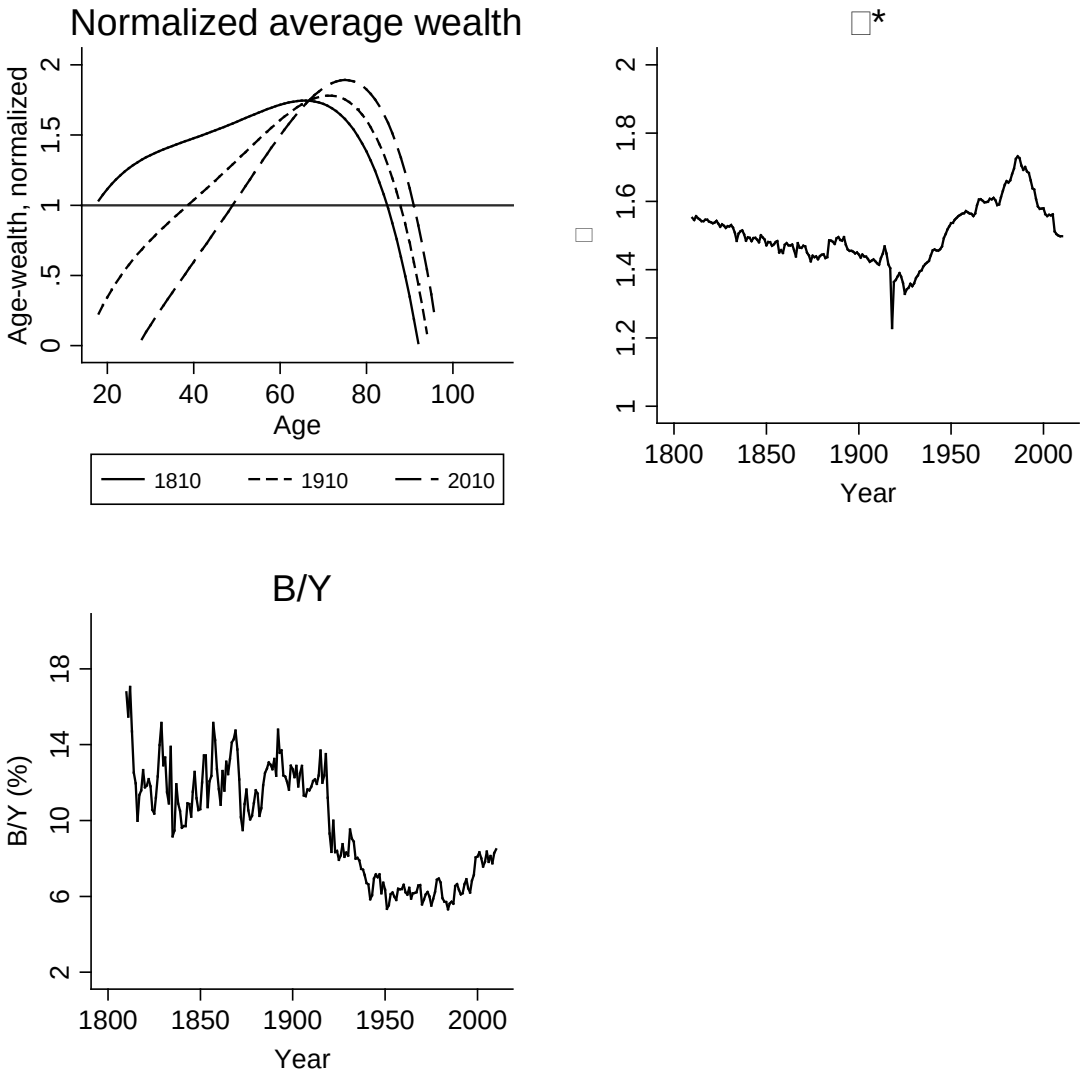
Note: Normalized average wealth, $\bar{W}_{l,a}/\bar{W}_l$, annual values corresponding to values in Tables A8b and A9. Observations are three-year averages, with the denoted year as midpoint.

Figure A10: Age-wealth profile in 2000–2007, market-valued wealth.



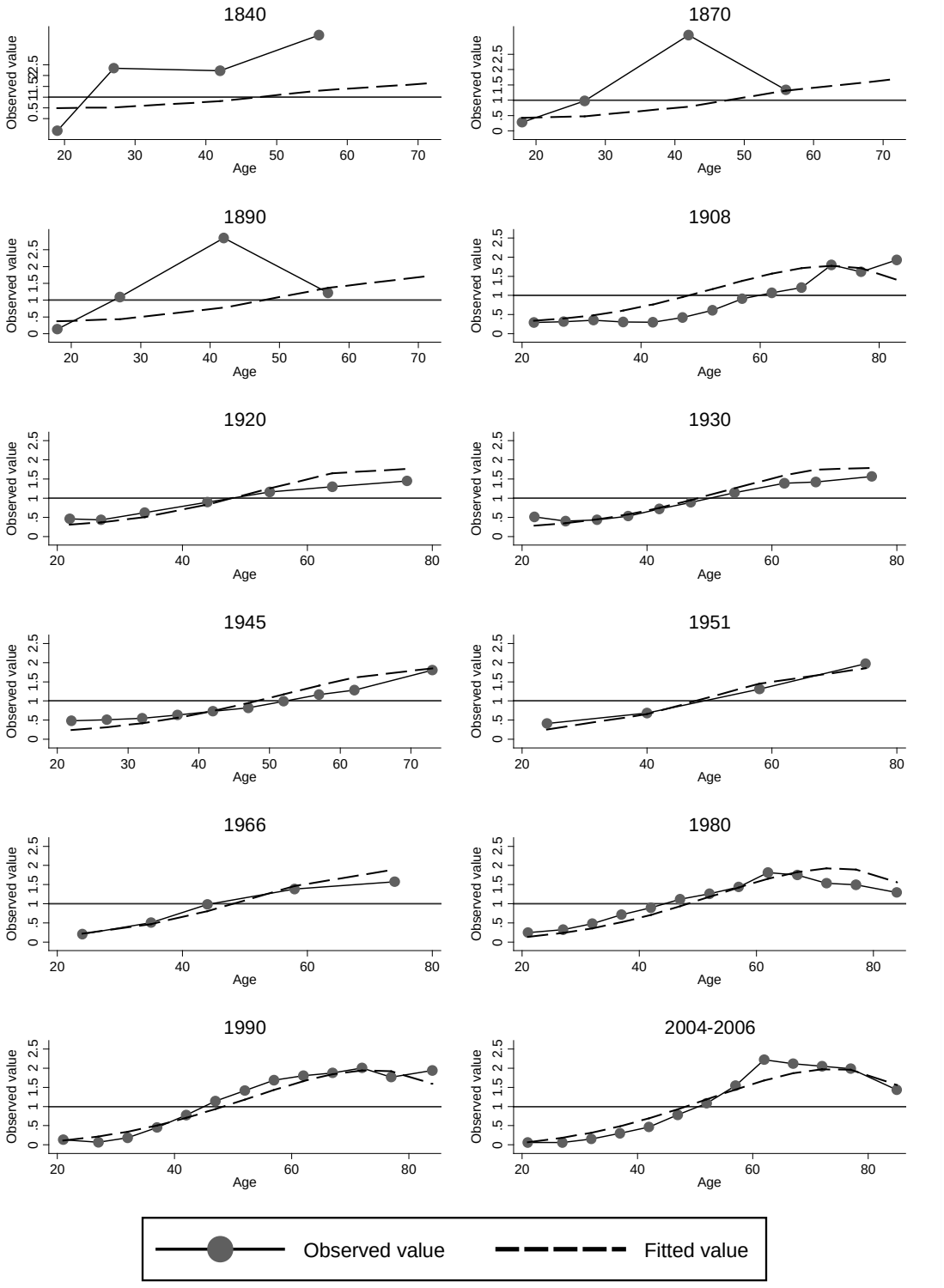
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$. Data come from Statistics Sweden's Wealth Register and LINDA. The variable names in Register database for net wealth are "fnettw" and "cfnetto".

Figure A11: Age-wealth profiles, implied μ^* and inheritance flow (B/Y): Main model.



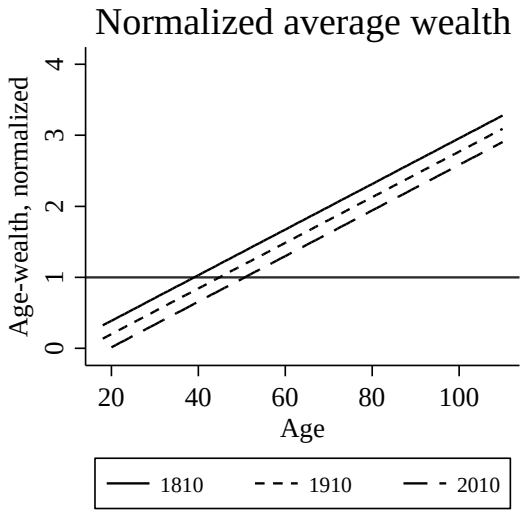
Note: The normalized average wealth, $\bar{W}_{l,a}/\bar{W}_l$, the ratio of average wealth of the living in each age class to the average wealth of the living in the whole population.

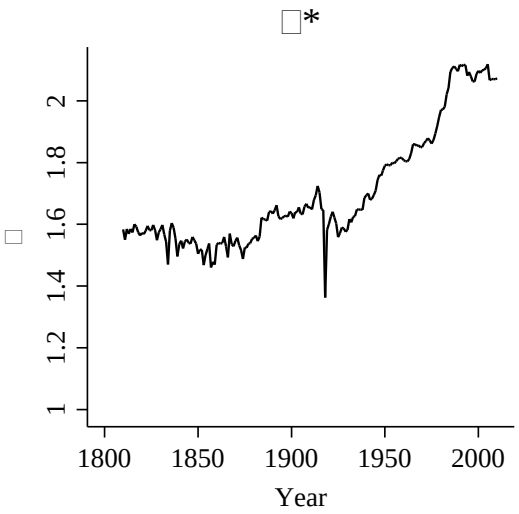
Figure A12: Goodness of fit: simulated and actual age-wealth profiles (main model).



Note:
The figures show observed and simulated values of the normalized average wealth, $\bar{W}_{l,a}/\bar{W}_l$, the ratio of average wealth of the living in each age class to the average wealth of the living in the whole population.

Figure A13: Age-wealth profiles, implied μ^* and inheritance flow (B/Y): Linear model.





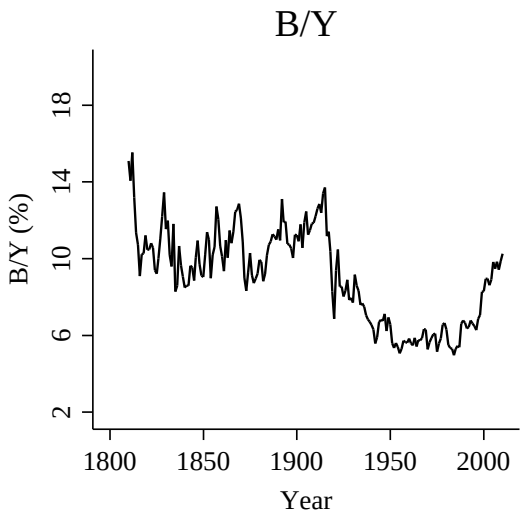


Figure A14: Age-wealth profiles, implied μ^* and inheritance flow (B/Y): No time trend.

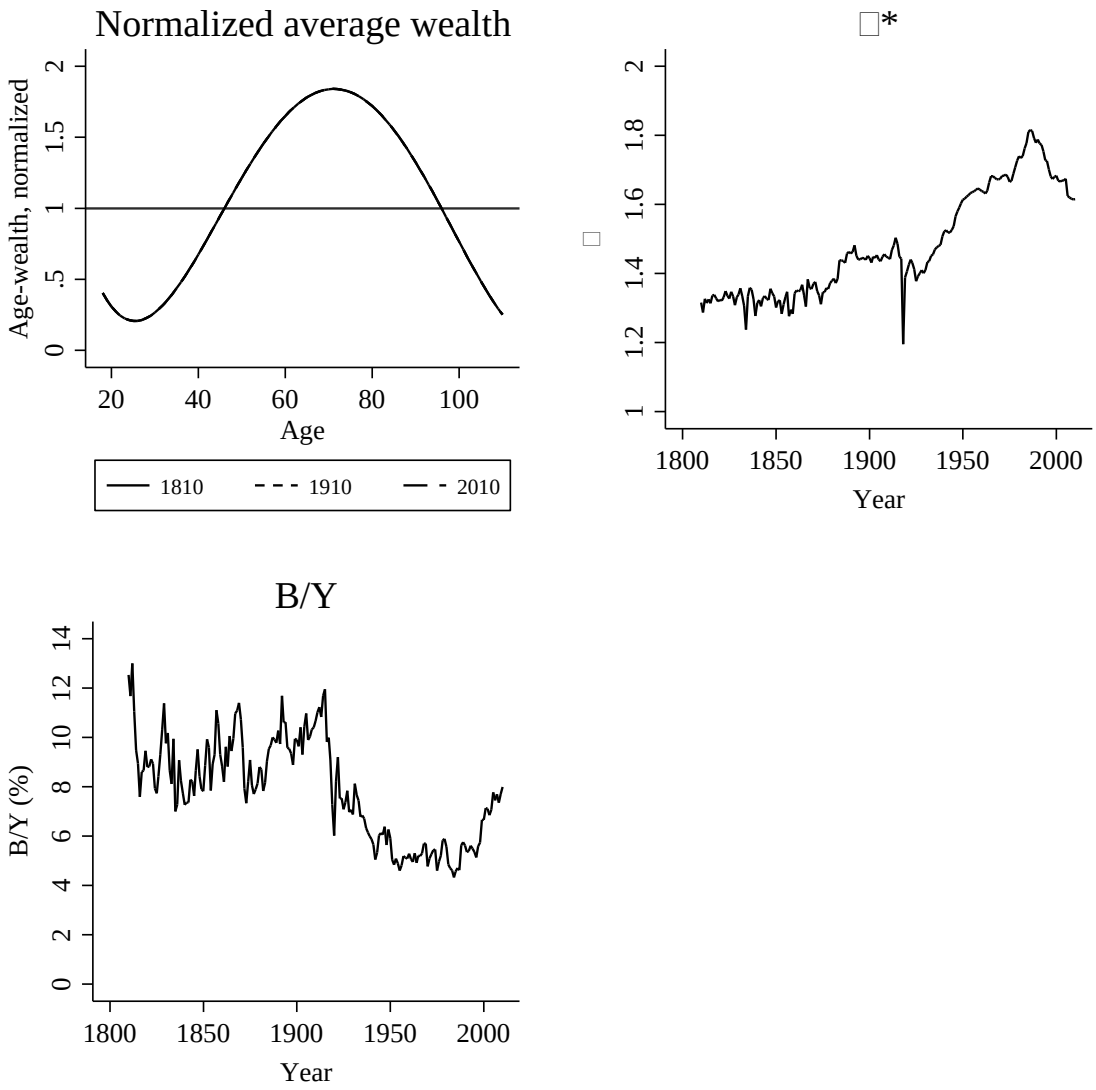


Table A1a: Age-wealth profiles between 1840s and 1890s: Kalmar city

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
1841–1845					
15–19	27	630			
20–34	42	1,652	–1,014,758	–614	–0.71
35–49	56	1,103	2,461,423	2,232	2.58
50–40	72	598	1,162,130	1,943	2.24
65–	19	245	1,054,587	4,304	4.97
All	39	4,228	3,663,382	866	1.00
1871–1875					
15–19	18	924			
20–34	27	2,359	3,693,793	1,566	0.27
35–49	42	2,053	11,721,115	5,709	0.98
50–40	56	1,264	22,269,970	17,619	3.01
65–	72	477	3,672,043	7,698	1.32
All	40	7,077	41,356,921	5,844	1.00
1901–1905					
15–19	18	1,211			
20–34	27	3,104	5,234,230	1,687	0.12
35–49	42	2,388	37,166,680	15,567	1.10
50–40	57	1,707	73,000,918	42,778	3.03
65–	72	1,172	19,756,758	16,857	1.19
All	42	9,581	135,158,586	14,108	1.00

Note: For age group 15–19 years we only have information about the number of individuals. "Average age, weighted" represents the actual average age within each age classes, calculated as the number of adults times their respective age (in yearly age classes) divided by the number of adults using population data from Statistics Sweden. "Normalized average wealth" is the ratio of average wealth of the living in each age class to the average wealth of the living in the whole population. Data come from adjusted data from Lindgren (2002), kindly provided by Håkan Lindgren.

Table A1b: Age-wealth profiles between 1840s and 1890s: Vånga parish

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\overline{W}_{l,a}$)	Normalized average wealth ($\overline{W}_{l,a}/\overline{W}_l$)
1840–1859					
15–19	27	1,133	212,986	188	0.49
20–34	42	807	236,678	293	0.76
35–49	56	518	561,920	1,085	2.82
50–40	72	255	125,527	492	1.28
65–	19	427	72,029	169	0.44
All	39	3,140	1,209,140	385	1.00
1860–1879					
15–19	18	462	21,630	47	0.16
20–34	27	1,079	335,671	311	1.08
35–49	42	891	230,701	259	0.90
50–40	56	471	197,353	419	1.45
65–	72	205	111,157	542	1.88
All	40	3,108	896,512	288	1.00
1880–1899					
15–19	18	446	0	0	0.00
20–34	27	822	237,269	289	0.73
35–49	42	794	206,271	260	0.66
50–40	57	673	269,439	400	1.01
65–	72	410	528,364	1,289	3.27
All	42	3,145	1,241,343	395	1.00

Note: See Table A1a for description of variables. Data come from adjusted data from Perlinge (2005), kindly provided by Anders Perlinge.

Table A1c: Age-wealth profiles between 1840s and 1890s: Kalmar city and Vånga parish

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
1840–1859		1,057	72,029	68	0.10
15–19	27	2,785	–801,772	–288	–0.44
20–34	42	1,910	2,698,101	1,413	2.14
35–49	56	1,116	1,724,050	1,545	2.34
50–40	72	500	1,180,114	2,360	3.57
65–	19	7,368	4,872,522	661	1.00
All	39				
1860–1879		1,386	21,630	16	0.00
15–19	18	3,438	4,029,464	1,172	0.28
20–34	27	2,944	11,951,816	4,060	0.98
35–49	42	1,735	22,467,323	12,949	3.12
50–40	56	682	3,783,200	5,547	1.34
65–	72	10,185	42,253,433	4,149	1.00
All	40				
1880–1905		1,657	0	0	0.00
15–19	18	3,926	5,471,499	1,394	0.13
20–34	27	3,182	37,372,951	11,747	1.10
35–49	42	2,380	73,270,357	30,792	2.87
50–40	57	1,582	20,285,122	12,822	1.20
65–	72	12,726	136,399,928	10,719	1.00
All	42	1,057	72,029	68	0.10

Note: These data are sums of the values for Kalmar city (Table A1a) and the Vånga parish (Table A1b). See further the notes under these tables.

Table A2: Age-wealth profile in 1908

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
20–25	22	2,217	3,670	1,656	0.30
25–30	27	19,500	34,406	1,764	0.31
30–35	32	24,333	47,697	1,960	0.35
35–40	37	48,651	84,110	1,729	0.31
40–45	42	92,686	155,551	1,678	0.30
45–50	47	115,237	275,009	2,386	0.43
50–55	52	130,129	447,122	3,436	0.61
55–60	57	111,116	570,291	5,132	0.91
60–65	62	113,618	680,638	5,991	1.07
65–70	67	118,104	797,013	6,748	1.20
70–75	72	106,644	1,076,455	10,094	1.80
75–80	77	97,414	884,023	9,075	1.62
80–	83	84,839	918,178	10,823	1.93
All	42	1,064,488	5,974,168	5,612	1.00

Note: Data from Flodström (1910, Table K).

Table A3: Age-wealth profile in 1920

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
20–25	22	13,511	140,489	10,398	0.46
25–30	27	29,877	295,449	9,889	0.44
30–40	34	115,335	1,623,130	14,073	0.62
40–50	44	150,211	3,055,765	20,343	0.90
50–60	54	143,099	3,778,595	26,405	1.16
60–70	64	109,791	3,237,024	29,484	1.30
70–	76	60,206	1,978,308	32,859	1.45
All	42	622,030	14,108,760	22,682	1.00

Note: Data from Statistics Sweden (1927), p. 124.

Table A4: Age-wealth profile in 1930

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
20–25	22	21,092	193,332	9,166	0.51
25–30	27	40,907	292,687	7,155	0.40
30–35	32	63,579	493,105	7,756	0.43
35–40	37	81,083	776,190	9,573	0.53
40–45	42	93,689	1,210,785	12,923	0.72
45–50	47	99,087	1,584,295	15,989	0.89
50–60	54	193,389	3,967,681	20,517	1.14
60–65	62	79,322	1,976,612	24,919	1.39
65–70	67	71,227	1,819,991	25,552	1.42
70–	76	101,694	2,865,782	28,180	1.57
All	43	845,069	15,180,460	17,964	1.00

Note: Data from Statistical Yearbook of Statistics Sweden, 1945 (table 254, p. 302-303).

Table A5: Age-wealth profile in 1945

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
20–25	22	37,591	376,970	10,028	0.49
25–30	27	66,145	695,818	10,520	0.51
30–35	32	97,999	1,110,111	11,328	0.55
35–40	37	131,944	1,725,186	13,075	0.63
40–45	42	145,358	2,193,481	15,090	0.73
45–50	47	147,896	2,504,670	16,935	0.82
50–55	52	141,332	2,900,492	20,523	0.99
55–60	57	131,205	3,168,052	24,146	1.17
60–65	62	111,512	2,965,116	26,590	1.29
65–	73	196,709	7,327,399	37,250	1.80
All	43	1,207,691	24,967,295	20,674	1.00

Note: Data come from Statistics Sweden, Statistical Yearbook of 1950, table 303, p. 320–321.

Table A6: Age-wealth profile in 1951

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
16–30	24	293,000	1,743	5,949	0.41
31–50	40	913,000	8,976	9,831	0.68
51–67	58	675,000	12,750	18,889	1.31
68–	75	259,000	7,378	28,486	1.98
All	44	2,140,000	30,847	14,414	1.00

Note: Data come from Statistics Sweden, Statistical Yearbook of 1957, table 388, p. 316.

Table A7: Age-wealth profile in 1966

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
20–29	24	587,511	3,685	6,272	0.21
30–39	35	535,844	8,105	15,126	0.50
40–49	45	589,281	17,402	29,531	0.98
50–66	58	1,080,967	44,890	41,528	1.38
67–	74	567,246	26,863	47,357	1.58
All	46	3,360,849	100,945	30,036	1.00

Note: Data from SOU 1969:54, tables 17 and 18, pp. 217–218.

Table A8a: Age-wealth profile in 1980

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
18–25	21	26,423	277,789	10,714	0.23
25–30	27	19,878	290,353	14,792	0.32
30–35	32	22,064	476,299	21,879	0.48
35–40	37	21,066	709,929	32,893	0.72
40–45	42	16,328	665,902	41,158	0.90
45–50	47	14,557	751,501	51,385	1.12
50–55	52	15,254	878,254	57,839	1.26
55–60	57	16,801	1,101,146	65,827	1.44
60–65	62	16,176	1,371,559	83,188	1.81
65–70	67	15,153	1,200,803	80,209	1.75
70–75	72	12,909	906,172	70,386	1.53
75–80	77	9,159	629,605	68,524	1.49
80–	84	9,756	623,511	61,381	1.34
All	47	215,524	9,882,823	45,855	1.00

Note: Data from Statistics Sweden, LINDA. The register variable on net taxable wealth is called formskp in 1979–1981. The equivalent variables are sfo in 1969–1971 and formskp in 1989–1991.

Table A8b: Age-wealth profile in 2005 (2004–2006)

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
18–25	21	25,267	134,724	4,493	0.04
25–30	27	18,649	105,616	5,751	0.06
30–35	32	20,964	286,154	14,017	0.14
35–40	37	22,103	583,707	26,892	0.26
40–45	42	20,631	1,044,556	51,554	0.50
45–50	47	19,837	1,697,403	84,418	0.82
50–55	52	19,689	2,242,371	115,362	1.12
55–60	57	21,592	3,692,950	172,161	1.68
60–65	62	18,349	4,296,455	228,976	2.23
65–70	67	13,920	3,017,726	217,788	2.12
70–75	72	11,816	2,502,822	212,296	2.07
75–80	77	10,858	2,146,673	196,702	1.92
80–	85	17,939	3,044,973	146,278	1.43
All	49	241,620	24,794,941	102,627	1.00

Note: Data from Statistics Sweden, LINDA. The register variable on net taxable wealth is called fsp.

Table A9: Age-wealth profile in 2004–2006, market-valued wealth (SEK).

Age (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\bar{W}_{l,a}$)	Normalized average wealth ($\bar{W}_{l,a}/\bar{W}_l$)
20	3,691	258,706	63	0.11
30	3,981	578,937	101	0.18
40	4,568	1,711,256	335	0.59
50	3,968	2,775,591	628	1.10
60	4,379	4,397,395	924	1.62
70	2,484	2,479,160	1,016	1.78
80	2,026	1,735,173	892	1.56
90	688	461,297	775	1.36
100	31	11,337	449	0.79
All	243.366	139,027,796	412	1.00

Note: Data from Statistics Sweden's Wealth Register and LINDA. The register variable on wealth is fnettw.

Table A10: Polynomial regressions underlying simulated age-wealth profiles

	Main model	Linear model	No trend-model
Age	–0.116	0.030***	0.021
	(0.201)	(0.002)	(0.200)
Age^2	–0.006		–0.000
	(0.006)		(0.007)
Age^3	0.000		0.000
	(0.000)		(0.000)
Age^4	–0.000		–0.000
	(0.000)		(0.000)
$Year$	–0.011***	–0.004***	
	(0.003)	(0.001)	
$Age * Year$	0.000***		
	(0.000)		
$Constant$	9.110***	6.426*	0.900
	(3.263)	(3.628)	(1.317)
Observations	126	126	126
R-squared	0.631	0.567	0.566

Note: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Online Appendix B: Adult mortality in Sweden

1. Estimating mortality, population-wide and across age groups

Data on demographic variables for Sweden are available annually since 1751 in the Human Mortality Database.[39] We use the year tables specifying the number of living individuals ("Population size") and the number of deaths ("Deaths") for each age between 0 and 110+. Details on the data series is reported by Glei, Lindström and Wilmoth (2012). The data series reflect residents of Sweden, the *de jure* population. The main data source for the period from 1860 onwards is the population Censuses, launched each decade up to the mid- 20th century. For the period before 1860 data are based on exposure rates reported in five-year intervals.

Data quality is high throughout the time period, but highest from 1860 onwards. Prior to 1860 the accuracy is somewhat lower. For example, for Stockholm the *de facto* population is used. The age-specific numbers are also less reliable due to errors in the reporting routines. Specifically, there is evidence of age-heaping, with death counts being consistently higher in the younger five-year groups within each 10-multiple of age (e.g., 20–24, 30–34 etc.) than in the older five-year groups (e.g., 25–29, 35–39 etc.).

Our analysis of inheritance flows focuses on transfers from deceased adults to their relatives (mainly children). Therefore we only study the adult population and remove all individuals below 18 years of age in the calculations.

We define population mortality m as the relation between the number of deceased individuals during each year, M, and the number of living adult individuals, N, i.e., as:

$$m = \frac{M}{N} \ . \qquad \text{(A1)}$$

We also divide the mortality into age-specific intervals. For each age a the number of adult deaths is M_a and the number of living adults N_a. Age-specific mortality rates is then computed as $m_a = M_a/N_a$ with the population mortality rate thus equaling $m = \sum_a M_a/N_a$.

2. Correcting for differential mortality across wealth classes

When estimating inheritance flows using mortality rates among people with different age and personal wealth, there may be a need to account for potential mortality differentials existing across groups with different wealth or, more generally, in different social classes.[40] In our particular case, the estimation of the parameter μ^* consists of calculating the average wealth of the deceased and the living populations, and these are numbers based on combining information about age-wealth profiles (either from estate tax returns as in France, see Piketty, 2011, or from

[39] The HMD database (www.mortality.com) s constructed by demography researchers from different countries and made freely available to other researchers.
[40] See, e.g., the discussion of Atkinson and Harrison (1978), chapter 3, pp. 53ff.

wealth tax returns as in the case of Sweden, see this study) and information about age-specific mortality rates. As explained by Piketty (2010, section B2, pp. 77ff), poor people die off more often than rich people do, therefore the raw aggregate mortality numbers across age cohorts found in the demographical databases need to be adjusted for the mortality differentials across social class. The wealthy are less likely to die at any age, and therefore the expected flow of inherited capital from that age needs to account for this lower wealth-adjusted mortality to avoid getting too high inheritance flows.

There is a large previous literature studying mortality differences across economic status, especially concerning recent decades. Looking specifically at personal wealth as a measure of status, Attanasio and Hoynes (2000) compute mortality differentials across different age-wealth cohorts in the United States during the 1980s. They find that the mortality among the relatively poor is consistently higher than the mortality among middle- and high-wealth groups. According to their estimates of individuals aged 50 years of higher, the mortality rate in the lowest wealth quartile was between two and three times higher than the mortality in the top three quartiles.[41] Similar evidence has been found by several other postwar studies for different countries.[42] In his study of inheritance in France, Piketty (2011) uses the social mortality differentials found by Attanasio and Hoynes (2000) when adjusting for the recorded mortalities for socioeconomic status over his entire study period 1820–2010. Piketty thereby assumes that these differences are both constant over time and regions.

However, can we be sure that the social gradient in mortality was the same a century ago or even before the industrial expansion? There is a specific literature looking at historical mortality differentials across socioeconomic groups. In a recent review, Bengtsson and van Hopper (2011) find that while such differentials have existed for a long time, the available evidence does not suggest that they were consistently larger in either pre-industrial or industrializing societies than today. Nor was there any seeming impact from industrialization on socioeconomic mortality differentials.

In the case of Sweden across historical eras, one recent analysis of mortality differentials across social classes in Southern Sweden during 1815–1968 fail to find any evidence of a gradient prior to World War II and only some evidence of such a gradient in the postwar era (Bengtsson and Dribe, 2011). Similar results are found by Edvinsson and Lindkvist (2011) in their study of 19th century mortality in a Swedish Northern town. Based on these results and earlier studies of Swedish mortality trends, these authors conclude that mortality differences between socioeconomic classes are a very recent phenomenon.

An older Swedish historical investigation of the link between mortality and wealth is Flodström's (1910) study of estates and wealth in the Swedish population in the years 1906–1908. Flodström discusses the mortality differentials and their importance for the computation of mortality multipliers for the Swedish wealth distribution. He refers to an earlier Danish investigation of mortality across three broader social classes in the 1870's and then he adjusts the findings from that study to match the Swedish situation. In Table B1 his mortality rates for Swedish towns around 1908 are presented for men and women across age cohorts and social

[41] See Attanasio and Hoynes (2000), table 4, p. 9.
[42] See further the discussion of Kopczuk and Saez (2004), Appendix B pp. 37–39.

class.[43] A main message from the table is that there was indeed a clear differential in mortality across classes; the highest class had a lower mortality than the population as a whole, with the differential being smaller in Stockholm than in other towns and smaller the older people get.

For women, the differential across social groups is much smaller than it is for men. In fact, it is almost insignificant, with the highest class having only a few percent smaller mortality rates than the population as a whole. The social mortality gradient for the whole Swedish urban population is therefore less pronounced than it is for men only. If one also would to include the rural population to achieve a gradient for the entire population, would that be steeper or flatter than the urban one? This is an empirical question for which we have no conclusive evidence, but some evidence is cited by Flodström (1910) from another Danish study of rural mortalities. The main conclusion from these data is that the mortality differentials across social groups are less pronounced in the countryside than in cities. Amending the numbers for Swedish urban males with numbers for women and for the rural population, it seems as the social mortality differentials in Sweden around 1900 were quite modest.

[Table B1 about here]

In comparison with the mortality differentials of Attanasio and Hoynes (2000), which are also used for 19th and 20th century France by Piketty (2011), these Swedish historical findings of small differentials are challenging. Mortality among the richest quartile of 50-year old U.S. household heads (mainly men) was about a fourth of the mortality among the whole population (0.2 percent vs. 0.9 percent).[44] According to Table 1, the mortality among the richest third among Stockholm males was two thirds of the population mortality (1.6 percent vs. 2.4 percent). For the oldest, aged 75 and above, mortality of the richest U.S. quartile was about half the population mortality but one twentieth among Stockholm males (and a fifth among males in other provincial towns).

We conclude from the Flodström (1910) investigation of urban males and females, from the Danish evidence of a smaller mortality differential in the rural regions than in cities, and also the analysis of Swedish historical demographers Bengtsson and Dribe (2011), that the mortality differentials in Sweden in historical time up to at least World War II *were substantially smaller* than those that Attanasio and Hoynes (2000) find for the U.S. of the 1980's.

Now to estimate Swedish wealth-adjusted mortalities by age, we use the numbers from Flodström (1910) in Table B1 to calculate the differential mortality for the rich. Specifically, we acknowledge the fact that the upper-class males of "Urban Sweden" were the owners of the bulk of the wealth in Sweden around the turn of the century, and this means that we can use the

[43] We have merged these two groups into one common group, "Urban Sweden", which is an aggregate wealth-weighted average between Stockholm (0.5) and provincial towns (0.5). The basis for regional wealth weights is property tax assessments, which show that Stockholm had 42 percent of the value of all urban non-agricultural property (SOS Statistisk Årsbok 1910, table 104, p. 138). Adding to this the fact that Stockholm was Sweden's financial center and net financial assets were surely skewed towards Stockholm, and overall 50 percent-share of all the country's wealth is a plausible "educated guess".

[44] See Attanasio and Hoynes (2000), table 4, p. 9.

mortality differentials for urban men in the table for our purposes.[45] One may object by saying that also the non-elite urban men, against whom the mortality differential is geared, were wealthier than the rest of the non-wealthy or even poor population. If true the calculated mortality differential in Table B1 would be too small and probably also too flat over the age distribution. However, this is not necessarily the case. First, there were plenty of poor male industrial workers, close to the archetypical "proletariat" class, living in Swedish towns around the turn of the century 1900. Second, some women were surely among the wealthiest, and if we would weight them into the picture we would incorporate some of the even smaller and flatter mortality differential that is apparent among the urban females. Third, it is not obvious that the urban population was all that poorer than the city population; Sweden had a relatively high share of self-owning farmers and including them into the lower classes would not necessarily increase differentials, perhaps quite the contrary.

We therefore feel confident that the Swedish mortality differentials across social classes, and thus also across wealth levels, are appropriately represented by the numbers for urban males shown in Table B1. In our estimations, we adjust these differentials so as to match the methodology set out by Piketty (2011) where the differentials for practical purposes are characterized in terms of two social groups: the poor and the rich. The mortality rate at age a for the poor part of the population is denoted m_a^{Poor}, the mortality rate at age a for the rich population m_a^{Rich}, the mortality rate at age a for the whole population is denoted m_a. The poor, for which mortality rates are relatively high, are assumed to own one tenth of all private net wealth, which is historically is the share of wealth of the bottom half (and even bottom nine deciles) of the Swedish wealth distribution (Roine and Waldenström, 2009).[46] We need to translate the differentials between rich and poor (the rest) in Table B1, which only suggested how to scale down the mortality of the rich, such that the overall mortality rate is the same. This means that the poor have somewhat higher mortality rates than the population average such that the difference between rich and poor (according to Table B1) is sustained. The resulting differential mortality rates are shown in Table B2.

[Table B2 about here]

Our preferred social mortality multipliers are presented in Table B2, and they are used in all the analyses of the paper. However, since the mortality differentials found by the careful analysis of Attanasio and Hoynes (2000) for the U.S. in the 1980s were deemed as quite general, and thus also used for France over the entire 19th and 20th centuries, it would be interesting to see how different the Swedish mortality differentials are. Moreover, it would also be interesting to contrast the Swedish differentials with the "raw" situation without any differential mortality across wealth classes.

As robustness checks, Figure B1 shows three versions of the ratio of the average wealth of the

[45] "Urban Sweden" is an aggregate wealth-weighted average between Stockholm (0.5) and provincial towns (0.5). Basis for regional wealth weights is property tax assessments showing that Stockholm had 42 percent of the value of all urban non-agricultural property (SOS Statistisk Årsbok 1910, table 104, p. 138). Adding to this the fact that Stockholm was Sweden's financial center and net financial assets were surely skewed towards Stockholm, and overall 50 percent-share of all the country's wealth is a plausible "educated guess".

[46] This wealth share is also assumed by Piketty (2011) in the case of France.

deceased to the average wealth of the living (the μ^*-ratio), one where we adjust the mortality rates by the Swedish social class differences ("Differential mortality"), one where we use the Attanasio and Hoynes differentials ("Attanasio and Hoynes (2000)") and one where we make no adjustment at all ("raw"). The comparison shows that

[Figure B1 about here]

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Figure B1: Impact of mortality differentials on μ^*

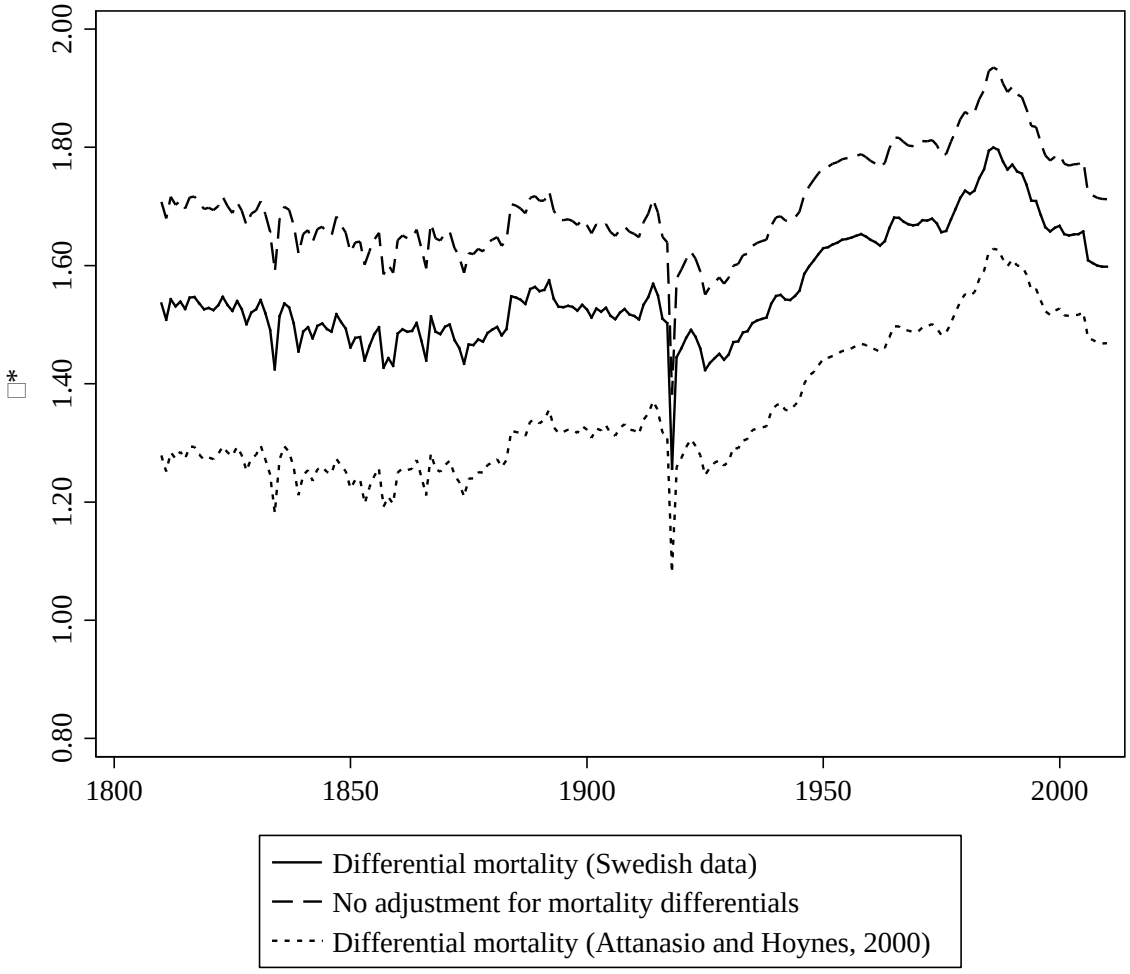

Table B1: Differential mortality rates across age and social class, Sweden 1908.

Age, years	Male mortality rate (%):			Female mortality rate (%):		
	All classes	The highest class	Share of the highest class in all	All classes	The highest class	Share of the highest class in all
			Stockholm:			
45 – 55	2.4	1.6	67%	1.2	1.0	88%
55 – 65	3.9	3.1	80%	2.0	1.7	87%
65 – 75	7.2	5.7	78%	4.4	4.3	98%
75 and older	14.7	13.9	95%	12.7	12.0	95%
			Swedish provincial towns:			
45 – 55	1.8	1.2	68%	1.0	0.9	83%
55 – 65	3.0	2.5	84%	1.8	1.8	95%
65 – 75	6.1	5.3	86%	4.3	3.5	81%
75 and older	13.9	11.3	81%	12.1	10.6	87%
			Urban Sweden (Stockholm + Swedish provincial towns):			
45 – 55	2.1	1.4	67%	1.1	1.0	86%
55 – 65	3.5	2.8	81%	1.9	1.8	92%
65 – 75	6.7	5.5	83%	4.4	3.9	90%
75 and older	14.3	12.6	88%	12.4	11.3	91%

Source: Table from Flodström (1910). "Urban Sweden" is an aggregate wealth-weighted average between Stockholm (0.5) and provincial towns (0.5). The basis for regional wealth weights is property tax assessments, which show that Stockholm had 42 percent of the value of all urban non-agricultural property (SOS Statistisk Årsbok 1910, table 104, p. 138). Adding to this the fact that Stockholm was Sweden's financial center and net financial assets were surely skewed towards Stockholm, and overall 50 percent-share of all the country's wealth is a plausible "educated guess".

Table B2: Differential mortality rates across wealth classes in Sweden

	Age group (a)			
	18–54	55–64	65–74	75+
m_a^{Poor}/m_a^{Rich}	150%	124%	121%	114%
m_a^{Poor}/m_a	120%	110%	109%	106%
m_a^{Rich}/m_a	80%	89%	90%	93%
Wealth share of the poor	10%	10%	10%	10%
m_a^{Poor}/m_a^{Rich} in France	200%	180%	150%	130%

Note: The mortality differential for France comes from Piketty (2010), table B4, which is based on evidence in Attanasio and Hoynes (2000).

Online Appendix C: Measuring "fiscal flows" of inheritance in Sweden

1. Swedish estate data

This appendix gives details on Swedish estate data, both in the form of estate inventory reports and estate tax data. It also explains what is available to capture gifts (*inter vivos*).

It has been compulsory in Sweden to file estate inventory reports (or probate records) since 1734. Estate inventory reports have been carefully kept in Sweden for centuries and have also been easily accessible at the local courts and the regional archives. After a period of time estate reports have then been moved to the regional archives. Soltow (1985) uses estates reports as one of his sources for studying wealth in Sweden in the beginning of the 1800s. Some researchers have based their studies on data sampled from specific geographic areas.[47]

However, the responsibility for registering estate inventory reports was moved from the district courts to the Swedish Tax Agency 1 July 2001. All estate reports are now registered in the Inheritance Tax Register. There are two main parts of this register: First, there is an electronic database where the basic information from the estate report is registered. Since the repeal of the inheritance tax in 2005, this database is, unfortunately, incomplete with respect to economic variables whereas the demographic information still is complete. Second, all documents in each report are scanned and attached to the database entry. This part of the register is still complete.

We use estate data from the BELINDA databases for the years 2002–2005. Statistics Sweden was commissioned to organize data on intergenerational transfers (estates, inheritances, taxable gifts during the previous ten years, and insurance payments) using the Inheritance Tax Register of the Swedish Tax Agency as a starting point. Three data sets have been produced:[48]

• All bequests. The inheritance tax data base provides economic information for all estates 2002-2004. This gives a schematic view of the different aspects of intergenerational transfers. The information is, however, not detailed. The items of the estate are valued at tax values and not at market values. There are about 90,000 observations per year and more than 80 variables in this data set.

• All taxable gifts. The register covers all taxable gifts during the period 2002-2004. From 2005 and on, there are no data because of the repeal of the gift tax. There are about 30,000 observations per year and about 10 variables in this data set.

• Bequests of a representative sample. The scanned estate reports provide much richer information. It is possible to construct detailed balance sheets with several different items of financial assets, real assets, and debts. It is also possible to have data both at tax values and market

[47] Lindgren (2002), for example, uses estate reports from the town of Kalmar 1840–1905 to study the use of promissory notes to provide credit.

[48] The Swedish Research Council has funded the data base project. Data are available, subject to the usual standard secrecy examination, for researchers through Statistics Sweden's remote access system MONA.

values. There is also information on who receives the inheritances and how much they receive. It, however, requires considerable resources to collect and transform these data to become electronically accessible. Our basic approach is to focus on the estate reports of deceased people who were included in Statistics Sweden's LINDA data base. The LINDA sample is 3 percent of the Swedish population; consequently the sample size is approximately 3,000 estate reports annually. Data for 2004 and 2005 are available for research. There are more than 100 variables in this data set.

Over the years there have been previous attempts to collect and organize data on estates and inheritances. The official government committee on capital taxes (*Kapitalskatteberedningen*) did a very ambitious study of estate inventory reports registered in 1967. This is reported in Chapter 9 of SOU 1969:54. A decade before the official government on inheritance taxes (*Arvsskattesakkunniga*) published a similar study in SOU 1957:48. Similar data can also be found in SOU 1946:79 (*Statsskatteberedningen*).

In the beginning of the 1900s, Isidor Flodström organized a series of empirical studies of economic variables (*Finansstatistiska utredningar*). There is a very detailed account of estate reports 1906–1908 in Finansdepartementet (1910b), corresponding information on inheritances can be found in Finansdepartementet (1910a). Statistics based on estate reports from as early as 1873–1877 can be found in Finansdepartementet (1879).

All these historic studies are ambitious and produce interesting results but we still lack continuous time series for the aggregate estate amounts in Sweden over longer time series. What we do have is the aggregate values of the estates of the deceased in:

- 1873 – 1877
- 1906 – 1908
- 1943 – 1944
- 1954/55
- 1967
- 2002 – 2005

The reported estate wealth data are in tax-assessed values and in one our main fiscal flow series we adjust make a coarse adjustment of postwar observations so as to reflect market valued inheritances (before the 1940s tax-assessed values were statutorily set at market values). Specifically, assume that half of the estate wealth comprises dwellings of the deceased and we multiply this wealth by the sale price ratio (ratio of recorded actual sales with tax values) recorded by Statistics Sweden and reported by Waldenström (2015c). The difference in inheritance flows when using raw tax-assessed estate wealth is not large (about one half percent of the national income in the 2000s).

2. Gift correction

We need to add the annual flow of gifts to estate wealth that is transferred from the deceased to the heirs. Ohlsson (2011) reports the annual tax revenue from inheritance and estates during the period 1884–2004. He also reports the annual tax revenue during the period 1915–2004 when

there also was a gift tax. The ratio of the sum of gift tax and inheritance (and estate) tax revenues to the inheritance (and estate) tax revenues is a correction coefficient which can be used to scale up either estate values 1873–1967 or the μ ratio to get the μ^* ratio. Figure C1 shows this correction coefficient over the period 1884–2004 being in the order of 5–18 percent. Note that there are two prominent spikes in the annual series. These spikes reflect behavioral effects of two tax reforms, both leading to increases in inheritance taxation relative to gift taxation. In 1934, the inheritance tax rate was sharply increased and in 1948, it was not only increased but also combined with an estate tax. For this reason, people started giving away larger shares of their wealth in order to minimize future inheritance taxation for their heirs, and our final series uses a version where we smooth out the gift amounts over a ten-year period after the 1934 reform and a 20-year period after the 1948 reform.

The BELINDA database provides information on the total taxable gift amounts in 2002–2004. The aggregate taxable gift amounts are close to 20 percent of the aggregate estate values. We, therefore, correct the aggregate estate using a factor of 20 percent.

[Figure C1 about here]

2.1 Survey evidence on gifts

The 1998 wave of the "Household market and nonmarket activities" survey (HUS) has answers from almost 3,000 individuals about *inter vivos* gifts and inheritances received. The dataset is rich in terms of property transfers. All adult members of the interviewed households were asked: "Have you or anyone else in your household received a gift/an inheritance worth at least SEK 1,000 or an equivalent value?"

These transfer questions were retrospective and concerned all previous transfers although the questions were only asked in one wave of the survey. The respondents could report up to five gifts and five inheritances received. Nordblom and Ohlsson (2011) deflate all amounts to 1998 values using the consumer price index and a zero percent real interest rate.

Among the respondents 17.7 percent had received gifts, the unconditional average amount was SEK 13,000, while 29.3 percent of the respondents had received inheritances with an unconditional average amount of SEK 63,900. The gift amount is slightly above 20 percent of the inheritance amount. This supports a gift correction in the order of 20 percent.

3. Insurance correction

There are considerable amounts transferred from decedents to heirs via different insurance arrangements. Most of this wealth does not show up in the estate inventory reports. This is particularly true for insurance policies with premia that have been paid for with money that already has been taxed. Some insurance policies are, however, tax-deferred. When an heir receives the benefits from such a policy, the benefit amount was added to the inheritance amount when the inheritance tax amount was calculated.

The BELINDA database provides us with a lower bound for how important insurance was for wealth transfers from decedents to heirs in 2002 – 2005. Taxable insurance benefits to heirs motivate a correction in the order of 2 percent for these years.

4. Fiscal flow in Sweden

Figure Y shows the resulting result for our measure of the fiscal flow. We have divided our corrected estate values with national income. It is clear from the figure that the fiscal flow was close to the economic flow during the 1870s and the 1900s. The fiscal flow became considerably smaller than the economic flow during the 1940s, the 1950s, and the 1960s. Our latest observations suggest that the fiscal flow has increased the last decades. The fiscal flow is, however, still much smaller than the economic flow.

What can explain the large discrepancy between the two flows? We suspect that non-taxable gifts and non-taxable insurance benefits may explain a considerable part of the difference between the two flows. Tax non-compliance might also be an important explanation. It should be stressed though that our last data point concerns 2005 when there no longer were any taxes on inheritances and gifts.

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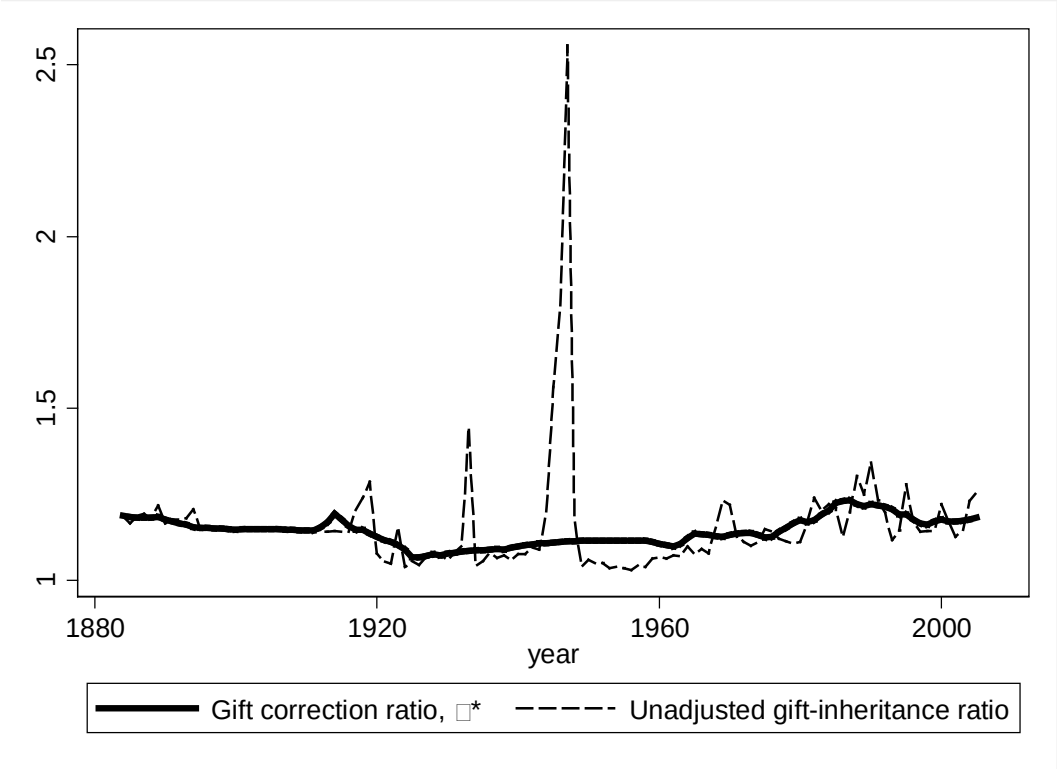
Figure C1: Correcting for *inter vivos* gifts in Sweden, annual and smoothed series



Note: The unadjusted ratio (thin, dashed line) shows the sum of gifts and inheritances over the sum of inheritances. The gift correction ratio, μ^* (bold, solid line), shows the same ratio but when account is taken for gift tax increases in 1934 and 1948, leading to spikes in gift flows just preceding these tax increases (see further Ohlsson, 2011; Henrekson and Waldenström, 2014). Gifts in 1933 are smoothed out during the following ten-year period and gifts in 1947 are smoothed out over the succeeding twenty-year period.