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Inherited Wealth over the Path of Development: Sweden, 1810–2010

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Abstract

Inherited wealth has attracted much attention recently, much due to the research by Thomas Piketty (Piketty, 2011; 2014). The discussion has mainly revolved around a long-run contrast between Europe and the U.S., even though data on explicit historical inheritance flows are only really available for France and to some extent for the U.K. We study the long-run evolution of inherited wealth in Sweden over the past two hundred years. The trends in Sweden are similar to those in France and the U.K: beginning at a high level in the nineteenth century, falling sharply in the interwar era and staying low thereafter, but tending to increase in recent years. The levels, however, differ greatly. The Swedish flows were only half of those in France and the U.K. before 1900 and also much lower after 1980. The main reason for the low levels in the nineteenth century is that the capital-income ratio is much lower than in "Old Europe". In fact, the Swedish capital-income ratio was similar to that in the U.S., but the savings and growth rates were much lower in Sweden than in the U.S. Rapid income growth following industrialization and increasing savings rates were also important factors behind the development of the capital-income ratio and the inheritance flow during the twentieth century. The recent differences in inheritance flows have several potential explanations related to the Swedish welfare state and pension system. Sweden was "un-European" during the nineteenth century because the country was so poor, Sweden is "un-European" today because so much wealth formation has taken place within the welfare state and the occupational pension systems.

JEL: D30, J10, N10

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1. Introduction

Thomas Piketty's book "Capital in the Twenty-First Century" has received enormous attention since it's publication. A fundamental question raised – surely not the only one – has to do with the determinants of a person's lifetime income being either a result of 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 U.K. by Atkinson (2013), and the work by Piketty and Zucman (2014) on long-run aggregate private wealth-income ratios (an important component in determining inheritance flows) 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 the capital-income ratio, where a lack of historical accumulation in the U.S. explains why past wealth did not dominate new incomes in the U.S. in the same way as it did in Europe. 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, capital-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 and is likely to reach levels comparable to those observed in nineteenth century by 2050.

In this paper we present annual estimates of inheritance flows and the share of inherited wealth in total wealth in Sweden during the period 1810–2010, showing that the "Old Europe vs. America" dichotomy may not be so straight forward, and also that the recent increase in the capital-income ratio does not automatically translate into increasing private inheritance flows. Over the period we study Sweden moves from being a poor agricultural country, over a relatively late but rapid industrialization in the end of the nineteenth century, to becoming one of the world's richest nations by 1970. In the twentieth century Sweden also gradually created the world's most extensive welfare state in which the government provides many of the things that individuals in most other countries save for privately.

Comparing our results for Sweden 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 overall importance of inheritance flows in relation to income in the nineteenth century. Whereas the inheritance flow in relation to national income was above 20 percent in France until around 1900 (and at that time also about 20 percent in the U.K.) the corresponding figure in our main series for Sweden is only half of that, around 11 percent, throughout the nineteenth century. The biggest contributor to this fact comes from the wealth-income ratio, which in France and the U.K. was 600–700 percent, while it in Sweden moved between 300 and 500 percent up until the early twentieth century. This makes the Swedish wealth-income ratio look much more like the American one at the time. The underlying reasons are a little different though. Sweden was not a frontier country with a short history of accumulation in the same sense as the U.S., but rather a country with a long history of having a landed elite and high wealth concentration (even though privately owned small farms were also relatively common). But, more importantly it seems, Sweden was a poor country where the savings rate according to our estimates was very low in the nineteenth century (and, even though it increased, continued to be so in the beginning of the twentieth century). As a consequence Sweden simply did not accumulate the same levels of wealth as in France and the U.K. before industrialization. This relative lack of domestic wealth meant that when Swedish industrialization took off in the second half of the nineteenth century it was largely financed by borrowing abroad. Comparing ratios of net foreign assets to total wealth, we see that these figures for France and the UK are in the order of magnitude 15–30 percent in the late 1800s, while the corresponding Swedish figure is minus 10 percent by 1900. In other words, Sweden was already in the nineteenth century the textbook case of a small open economy. The net foreign assets to wealth ratios converge to being slightly positive for the three countries around 1950 as French and British foreign assets plummet and Swedish foreign debt is paid off over the first half of the twentieth century.

Starting in the beginning of the twentieth century rapid Swedish economic growth and relatively low savings rates lowered the wealth-income ratio to about 250 percent in 1950 continuing to a historical low of below 200 percent in the 1970s. In recent decades, however, the capital-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. Partly this is due to the retirement savings pattern which shows that Swedes above the age of 65 have lower private wealth and also 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 although available estimates suggest that the order of magnitude of offshore wealth is fairly limited.[1]

We also estimate the share of inherited wealth in the aggregate stock of 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 (2014). The results for Sweden shows 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. This pattern resembles that found for France over the same period by Piketty and Zucman (2014) 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, Sweden falls roughly in between the low level found by Modigliani and the high level found by Kotlokoff and Summers.

Taken together our estimates of inheritance in Sweden since the early nineteenth century show a *pattern that is similar* to that in France and the U.K.: Starting from historically high levels around 1900, the role of inherited wealth falls in the first half of the twentieth century, reaches a historical low point around the middle of the twentieth century (slightly later in Sweden), and in the case of inheritance-income ratio has since increased. The major difference is that aggregate inheritance flows in Sweden are *very different in size*: In the nineteenth century Swedish inheritance flows are much lower than in France and the U.K., and in the recent increase which has also been smaller in Sweden than in France and the U.K. In the nineteenth century the difference comes from aggregate private wealth-income ratio being much smaller than in France and the U.K., which in turn relates to a relatively low

[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.

Swedish savings rate. In recent decades the difference has several sources, a number of which are likely to be related to various aspects of the extensive Swedish welfare state.

The rest of the paper is structured as follows. In Section 2 we explain 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 long-standing 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 differences 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 6 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.

There are two ways in which we can estimate the inheritance-income ratio b_Y (Piketty,

[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. Using national income or disposable income is of some quantitative importance given the rise of government involvement over the twentieth century (we show this in more detail in the appendix), 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.

2011). One is based on using estate tax data to measure directly how much is passed on as inheritance. Unfortunately, the Swedish inheritance taxation largely prevents the use of this measurement approach and in section 2.6 below we present a handful of relatively coarse observations made by ourselves or collected from previous special investigations.

Our main estimation procedure will instead rely on computing b_Y from the structural macroeconomic relationship between the ratio of the aggregate stock of private wealth W to national income Y, a ratio often called 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 as measured by 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 will 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:

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

In the following, we will go through in some detail how each of these three components are constructed and how they have developed in Sweden over the past two centuries. Note, however, that 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 and Zucman (2014) show that it is possible to express the steady-state level β through the classical Harrod-Domar-Solow model as the relationship between net private savings s^n and income growth rate g:

$$\beta = \frac{s^n}{g} \ .^{3} \qquad (2)$$

Data on the aggregate wealth-income ratio β for Sweden comes from a newly constructed annual database in Waldenström (2014), which covers 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 dwellings 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 1 depicts the development of the wealth-income ratio β in Sweden during the two hundred year-period 1810–2010. The period from 1870 onwards is often described as the beginning of the industrial revolution in Sweden. The ratio in the pre-industrialization period before 1970 hovers around 300–400 percent. Private savings in this period was low, only little over two percent per year. Even if economic growth was also slow, just over one percent, the s^n/g-ratio is about two, i.e., even below the recorded wealth-income ratio (see further section 4). After 1870, the capital stock expands 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 500 percent in the beginning of the twentieth century. This development reflects a number of groundbreaking processes in the Swedish economy such as the expansion of industrial production and the infrastructure associated with it and the emergence of a financial system (financial assets as share of national income increased from one half in 1870 to almost three only forty years later).

The wealth-income ratio during the twentieth century follows a steadily decreasing trend, reaching a historical low at 200 percent in the early 1980s. There are many potential explanations to this dramatic decline of private wealth. First, income growth accelerated in this

[3] Piketty (2011) and Piketty and Zucman (2013, 2014) show how this expression holds for a number of models using different savings motives. In a recent note, Krusell and Smith (2014) question the use of net savings and net income growth as opposed to gross savings and growth, and argue that depending on which of these one uses has implications for the long-term path of the wealth-income ratio.

period, averaging at 2.9 and 3.5 percent per year. At the same time the average savings rate did increase slightly but remained relatively low.[4] During this period there was a marked expansion of educational attainment, and the high growth rates thereby reflect the impact of the growth in human capital. Second, the expansion of the welfare state most certainly had a profound impact on the growth rate of private capital. One aspect of this is regulation and taxation of private wealth and capital income, which expanded during the century and possibly hampered wealth accumulation incentives.[5] Another aspect of the emergence of the welfare state is of course the expansion of universal social security systems offering welfare services such as healthcare and public pensions. The total effect on aggregate private wealth accumulation of this development has not been fully examined, but several researchers have found evidence of a notable crowding out of private savings.[6] In section 2.6, we will discuss the potential impact of different ways of treating public pension assets and their impact on private wealth stocks.

[Figure 1 about here]

2.3 Average wealth of the deceased over average wealth of the living (μ^*)

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 arguably the most difficult parameter to attain in equation (2). Unlike the case of France where 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:

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

Key in equation (3) is that we can compute the trickiest parameter, $\overline{W}_d$, by combining ob-

[4] The savings rate in the first half of the twentieth century was about 5–6 percent. With an average growth rate of around 2–3 percent this would imply convergence toward a long-run steady state β of about 200–300 percent, which is in line with the movements we observe.
[5] For an overview of twentieth century capital income taxation, see Du Rietz, Johansson and Stenkula (2014) and Du Rietz and Henrekson (2014) on the evolution of Swedish wealth taxation.
[6] See, e.g., Feldstein (1974) and Gale (1998) for the case of the U.S. and Berg (1983) for Sweden.

served information about the average wealth of living individuals at age a, $\bar{W}_{l,a}$, and information about death rates at specific ages, M_a, and for the whole population, M. Taken together we can compute an age-specific average wealth of the deceased equal to $\bar{W}_{d,a} = (M_a \cdot \bar{W}_{l,a})/M$. When summed over a this yields μ for the whole population. We call this approach the *inverse mortality multiplier method* (IMMM) with explicit 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.

Since the wealthy live longer than the poor, we need to adjust the observed death rates for the different mortality rates across social classes. If we do not do this adjustment, we will ascribe too high death rates to the wealthy individuals and this would generate too large inheritances. 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. Data on historical social mortality differentials in Sweden are scarce, but some evidence does exist. Among the earliest reports are those for the early 1900's presented in Finansdepartementet (1910) whereas Bengtsson and Dribe (2011) present evidence covering almost the full time span of our analysis (for details about our methodology, sources and references, see Appendix C).

Historical evidence on actual age-wealth distributions in Sweden is scarce. We assemble all information know 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 in administrative tax records.[7] These observations are described in detail in Appendix A.[8] Our aim is to compute regular, and ideally yearly, observations of μ^* over the period

[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 market-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 nine-

1810–2010, as opposed to the few points in time for which we observe the age-wealth profiles. Recall that the historical demographical data gives us annual observations of M_a/M, and from equation (3) we thus only require a yearly $\overline{W}_{l,a}/\overline{W}$ to get a yearly series of μ. Our solution is to simulate the historical age-wealth profiles by using fitted values from linear regressions where the ratio $\overline{W}_{l,a}/\overline{W}$ is regressed on a set of age and year polynomials:

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

The fitted values from the regressions of equation (4) are inserted into equation (3), yielding the parameter of interest, $\hat{\mu} = \sum_a \left[(M_a/M)/(\widehat{\overline{W}_{l,a}/\overline{W}_l})\right]$. In addition to this main approach, we also present a robustness calculation of μ^* for the dozen of 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 ratio calculated for the specific year. The result of this calculation is shown in the sensitivity analysis in section 4 below.

Gift correction, finally, allows us to go from μ to the parameter of interest, μ^*. This is important since we wish to include the flow of *inter vivos* gifts from the deceased to their heirs made before the time of death. This is done by scaling up the estimated inheritance flow by a gift correction-factor. This factor computed using data of Ohlsson (2011), which reports about annual tax revenue from inheritances and estates 1884–2004, and about annual gift tax revenues 1915–2004. The relationship between gift tax revenue and inheritance/estate tax revenue tells us something about the order of magnitude of gifts in relation to other inheritances. We observe fiscal inheritance flows in a number of 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 Appendix B).[9] This figure is supported by survey evi-

teenth century which is based on a rich estate sample of deceased in a Southern parish (Perlinge, 2003). See the appendix for a detailed description of all historical age-wealth distributions.

[9] 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 dur-

dence reported in Nordblom and Ohlsson (2011). The 1998 wave of the "Household market and nonmarket activities" survey (HUS) has answers from close to 3,000 individuals about *inter vivos* gifts and inheritances received. These suggest that gifts are about 20 percent of the inheritance amount. 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. Taxable insurance benefits to heirs motivate a correction in the order of 2 percent for these years.

Figure 2 shows the evolution of μ^* in Sweden. 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.[10] 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 until the late 1960s when profiles become hump-shaped.

[Figure 2 about here]

The decline in the early 1900s, up until the 1930s, is consistent with what Roine and Waldenström (2009) have found in previous research on Swedish wealth concentration. This is a period when tabulations of wealth by income class allow us to differentiate between those with high incomes based on high wealth and high earnings, and to look at the development of their wealth shares over time.[11] The basic pattern that emerges is that the wealth share of high-income individuals increases over this period, in particular in the 1910s and 1930s.[12] In terms of wealth over age profiles relatively younger cohorts are accumulating new wealth while the share of older "rentiers" is declining. Note that in terms of aggregate

ing 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.

[10] 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.

[11] These tabulations are due to income taxes being raised on earned income plus a fraction of wealth held be a household, together forming what was called "taxable income", see Roine and Waldenström (2008).

[12] A pattern that is also in line with Glete (1994) who describes the rise of new corporate owners in the 1910s and the successes of corporate executives in the 1930s.

wealth-income ratios this is a period of decline as growth of new wealth is dominated by income growth.

The upward trend that we observe from the 1930s until the 1980s suggests a break with the earlier period in terms of the relative wealth held by those who pass away compared to the living population. As the aggregate wealth-income ratio continues to decline this suggests that Sweden in this period was an environment where incentives to accumulate private wealth were weak. This was most likely a consequence of anti-capitalist policies (like in France), high taxes on wealth and inheritance, but also due to the build-up of a system where private wealth accumulation for precautionary reasons became seen as less and less important as welfare state programs and the public pension system expanded.

The sharp up-turn around 1980 in Figure 2 indicates yet another break in the trend. Over the past 30 years the wealth of the living population has grown faster than the wealth of those who pass away (i.e., μ^* is decreasing) at the same time as the wealth-income ratio has increased.[13] This is in line with asset values increasing more rapidly than income and these increases largely being captured by relatively younger generations (see Roine and Waldenström, 2012). In terms of the impact this has on inheritance flows it seems likely that there is a lagged impact in the sense that values in the living population are still to be passed on to the next generation.

2.4 Mortality (m)

Data on population mortality m are available for all years during 1810–2010 in the Human Mortality Database (see Appendix B for details about data and calculations).[14] Specifically, for each age a we observe the number of adult deaths M_a and the number of living adults N_a.[15] Age-specific mortality rates is then computed as $m_a = M_a/N_a$ and the population mortality rate equals $m = \sum_a M_a/N_a$.

The conventional view of a demographic transition when a country goes from being agrari-

[13] 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).
[14] The HMD database (www.mortality.com) is constructed by demography researchers from different countries and made freely available to other researchers.
[15] Throughout we are for obvious reasons concerned only with the adult population.

an 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. The mortality spike around 1920 reflects the impact of the Spanish Flu. One notable feature is how the annual variability in mortality has decreased during the twentieth century.

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]

2.5 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).[16] That is, the value of all inheritance (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 yearly 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 11 percent of national income throughout the nineteenth century until around 1910. It then falls sharply until around 1950 when the fall levels out but continues to a historical

[16] Note, again, that we do not observe everything on a yearly. In particular, μ^*, is estimated as explained in section 2.3. above.

low of about 5 percent around 1970. After the 1980s there is be a clear upward trend but the average increase is relatively small, up to about 6 percent of national income.

Now the question is of course how can we understand what drives these movements? A first step in answering this question is to decompose the changes according to the relative contribution of the three components that make up the annual inheritance flow. Table 1 shows the average annual percent change in the inheritance flow over different time periods with 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.

The decomposition clearly shows that in the nineteenth century a slightly increasing wealth-income ratio is balanced by 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 equally sharp decline in the wealth-income ratio. This, together with a continuing fall in mortality until 1950, is what drives the decline in inheritance.[17]

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 has a clear positive impact on 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.

[Table 1 about here]

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

In addition to our above-mentioned findings we can also try to deem the size of inheritance flows when measuring them directly from estate data. Unfortunately, Swedish data on direct estates are of lower quality and more scattered than those used to calculate the econom-

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

ic flow estimates above. We therefore view the estate-based series mainly as a robustness-check of the previous findings. Appendix C contains more details about Swedish estate tax data and 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.[18] In our search for previous aggregations of the estate and inheritance we have found the following: In an early publication by 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 (*Finansstatistiska utredningar*) 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, *Statsskatteberedningen*, contains aggregate data on estate inventory reports for the years 1943–1944; the official government commission on inheritance tax, SOU 1957:48, *Arvsskattesakkunniga*, published similar data for the year 1954/55, and yet another official government commission on capital taxes, SOU 1969:54, *Kapitalskatteberedningen*, did a very ambitious study of estate inventory reports registered in 1967; and finally there is the recent Belinda database 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.

Like for the economic flow it is important to add gifts to the direct inheritance to capture the full intergenerational transfer of real and financial assets. We use the same gift correction procedure as explained above, increasing the total by between 4 and 20 percent.

Figure 5 shows the resulting result for our measure of the fiscal flow. 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.

[18] 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.

[Figure 5 about here]

What can explain the large discrepancy between the two from the 1940s onwards? A primary candidate is the effects of 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 Appendix "Fiscal Flow" 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 candidate is 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 pension wealth. There are increasing amounts of private pension 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.

There are also increasing amounts of public pension wealth accumulated public pension systems (public pension reserve funds) assigning individual pension wealth to each citizen. The (dotted) line shows our economic flow calculation of the inheritance flow when we add this pension wealth to private wealth. When someone passes away this individual 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.[19]

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

One of the most long-standing issues in the analysis of intergenerational transmission concerns how important accumulated past inheritances W_B are in relation to the existing stock of private wealth W. In a famous debate, Modigliani (1986, 1988) and Kotlikoff and Summers (1981, 1988) presented different, and 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, Postel-Vinay and Rosenthal (2013) proposed an alternative theoretical model which allows past inheritances to either grow over time along, if invested, with some rate of return but it 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 (2014) show that it is possible to estimate a simplified version of φ using from some aggregate statistical parameters, assuming that the economy is in steady-

[19] OECD (2013) reports that the sum of pension wealth (pension funds, pension insurance contracts, and public pension reserve fund) 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.

state.[20] In brief, in steady state the share of inherited wealth in total wealth equals the share of the flow of inherited wealth b_Y of the total wealth flows: those that stem from inheritances (b_Y) and those that emanate from people's savings of their non-capital income $(1-\tilde{\alpha})s^n$ (for $\tilde{\alpha}$ being the capital share in national income and s being the net saving rate, or

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

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).[21] The Swedish net private savings rate s^n is calculated as the sum of net investments, the current account (difference between exported and imported goods and services) and net foreign income.[22] 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. There is an annual series, which is volatile and only shown for reference, and a smoothed series 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

[20] Piketty and Zucman emphasize 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, Postel-Vinay and Rosenthal (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.

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

[22] 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, 2014, for further details on net and gross private and national saving rates in Sweden).

it stays for the rest of the period up until present day.[23] 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.

[Figure 7 about here]

4. 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. The inheritance flow in Sweden was clearly lower than those in France and the U.K. during 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. Note that we don't have an estimate of the inheritance flow in the U.S.

[Figure 8 about here]

If we look at the three components of the inheritance flow measure (1) starting with β it becomes clear that Sweden has had similar development as the U.S. during the nineteenth century with a β around 400 percent, below during the first half of the century and above during the second half. France and the U.K. had β's almost at 800 percent. The β's in all countries decrease during the first half of the twentieth century. From the mid 1900's the β's in France, the U.K., and the U.S. start to increase. There is an increase in Sweden too, but it starts later and is not as pronounced as in the other countries.

Turning to the μ^*'s it is clear that Sweden has had a similar development as France except for the last decades.[24] The μ^* in the U.K. has evolved differently than those in the other two countries. Finally there are no major differences in how mortality has decreased.

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

[24] 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.

The differences between Sweden and France are, therefore, mainly due to differences in β's. Differences in μ^*'s have played some role during the last decades. If we compare Sweden and the U.K. differences in β's is also a main determinant of the differences in inheritance flows.

So what is behind the differences in the wealth-income ratios (the β's) and their paths? Let's 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 9 shows the net savings rates for the four countries. There is a continuous increase in the Swedish savings rate from a very low level in the beginning of the nineteenth century whereas the savings rate in the U.S. decreases over time from a high level. The savings rates in France and the U.K. vary around 10 percent. During the last decades, the savings rates in all four countries have converged. One way of phrasing it is that the savings rate in Sweden catches up with the savings rates of the other countries.

There has been a continuous increase in the growth rate for Sweden except during last period. At the same time there has been almost continuous decrease in growth for the U.S. The savings rates in all four countries have converged during the last decades.

[Figure 9 about here]

The paths of the wealth-income ratios in Sweden and the U.S. are similar but there explanations are not the same. Sweden started out from low savings and low growth and has gone to high savings and high growth (except the last decades). 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 those in the other two countries.

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

Figure 10 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 (3) we know that a higher wealth share α tends to increase φ, and α has increased in both countries. We also know that a higher b_Y tends to increase 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.

[Figure 10 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 11 percent throughout the nineteenth century, inheritance flows dropped sharply to a lowest level of about 5 percent around 1970. Starting around 1980 there is a clear upward change in the 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 seems to be the fluctuations in the wealth-income ratio, which in turn is affected by a number of factors. Most important seems to be changes in the aggregate savings rate and fluctuations in the growth rate. One interpretation could be that Swedes were so poor that they simply needed to eat almost all their income in the pre-1900 era. And even though growth picked up during the country's industrialization in the latter half of the nineteenth century it was not enough to build up large savings; in fact, the Swedes were so poor that one sixth of the population migrated to 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 in the housing and 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 fortunes to coming generations. In addition, 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 *private* 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 of course interesting in its own right but, perhaps more importantly, it also sheds new light on some more general questions. First, it adds to our understanding of the often-made distinction between an American, as opposed to a European experience, in which Sweden is often taken to be the "most European" of countries in terms of redistribution and the size of government.[25] 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.[26]

Our results, however, suggest that historically Sweden was rather "un-European" in this sense. 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. 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.[27]

[25] 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.
[26] See also the overview by Piketty and Saez (2014) where, again, the Europe vs. U.S. case is emphasized.
[27] 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

With respect to the more recent twentieth century growth of government the European versus American division has of course often been modified into a distinction between an Anglo-Saxon, a Continental European, and a Scandinavian model of society.[28] With respect to this type of grouping 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 provided by the government for free, or at a very low cost and the public pension system is also to a large extent 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 in Sweden (and in the other Scandinavian countries) than in France, the U.K. and the U.S.[29] This, of course, also influences private inheritance flows. However, it does not necessarily mean that no wealth passes between generations, it just means that some of it passes through the public system.

Our attempts to adjust for the "crowding out" of private savings show that the development of aggregate wealth in relation to income in the past decades is not very different from that in France and the U.K. but it does not automatically translate into larger inheritance flows due to the organization of the pension system and treatment of some estate inventories. Finally, there is the real possibility of relatively large amounts not being accounted for due, in part to low valuations, and in part to assets being "hidden", so as to avoid what have historically been high taxes on both wealth and inheritance. Since the abolishment of both of these taxes capital flows and developments of private wealth suggest that tax avoidance and evasion may have been substantial in the past.[30]

Overall, our analysis of inheritance flows in Sweden since the early nineteenth century point out two major lessons with respect to the development of capital and its impact on inheritance. Historically, Sweden does not fit the picture of a country where, despite a long history of aristocracy, accumulated capital was large in relation to income (even though

democracy arrived in Sweden without resistance, another possibility is that perhaps tensions were actually smaller in Sweden.

[28] For example, Titmuss (1974) and Esping-Andersen (1990).

[29] See, for example, Nakajima and Telyukova (2013).

[30] The estimates of evaded offshore capital by Roine and Waldenström (2009) suggest that about one billion SEK are currently place abroad, which is about one third of national income.

inequality and capital concentration might have been high). In more recent times, Sweden stands out as a country where the return of capital 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.

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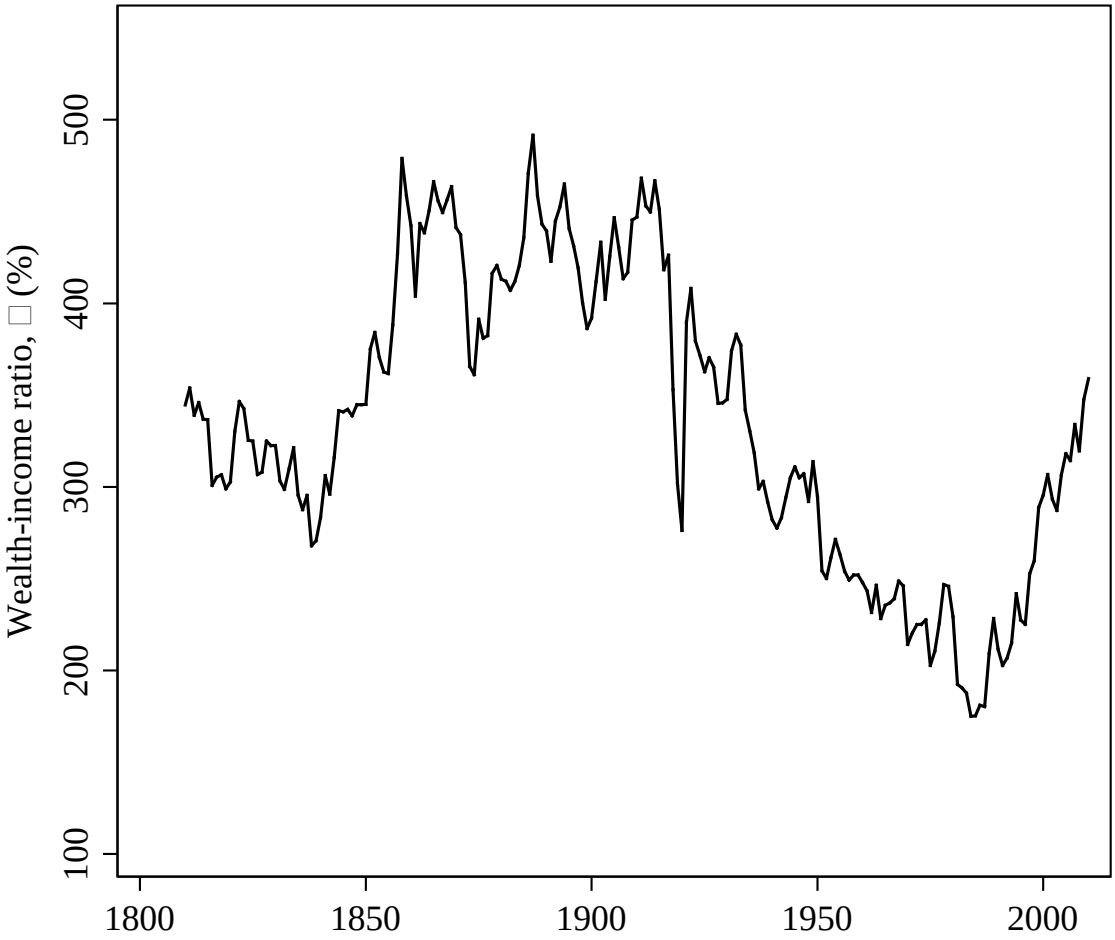
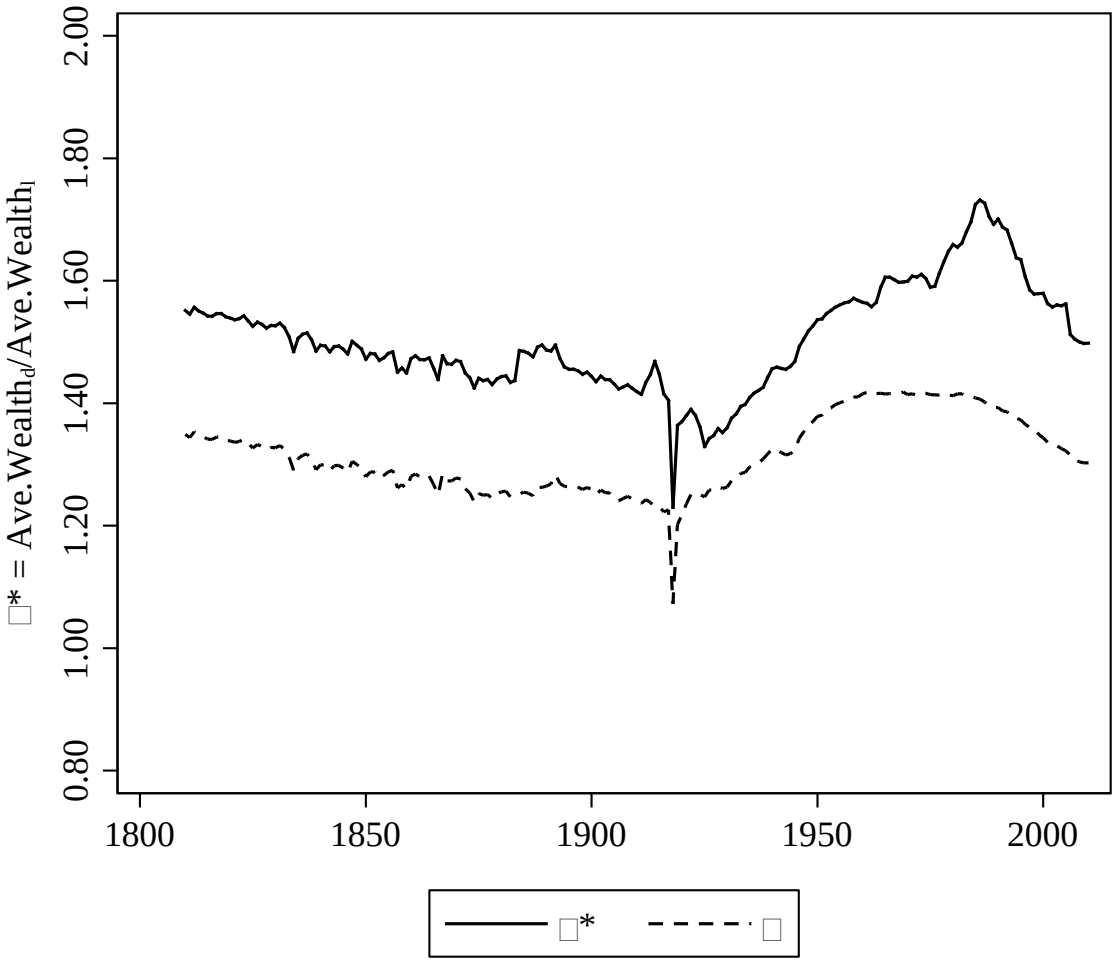
Figure 1: Private wealth-national income ratio in Sweden, β, 1810–2010.



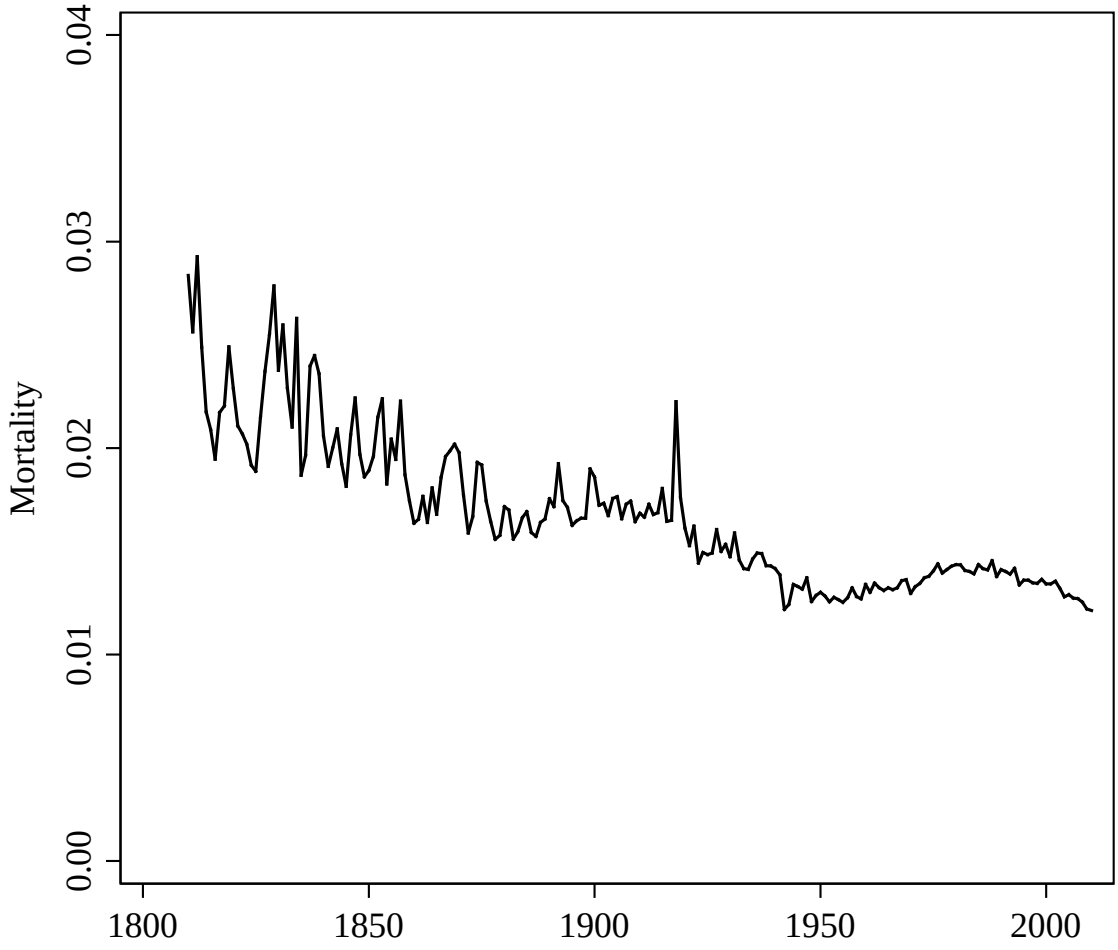
Source: Waldenström (2014).

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).



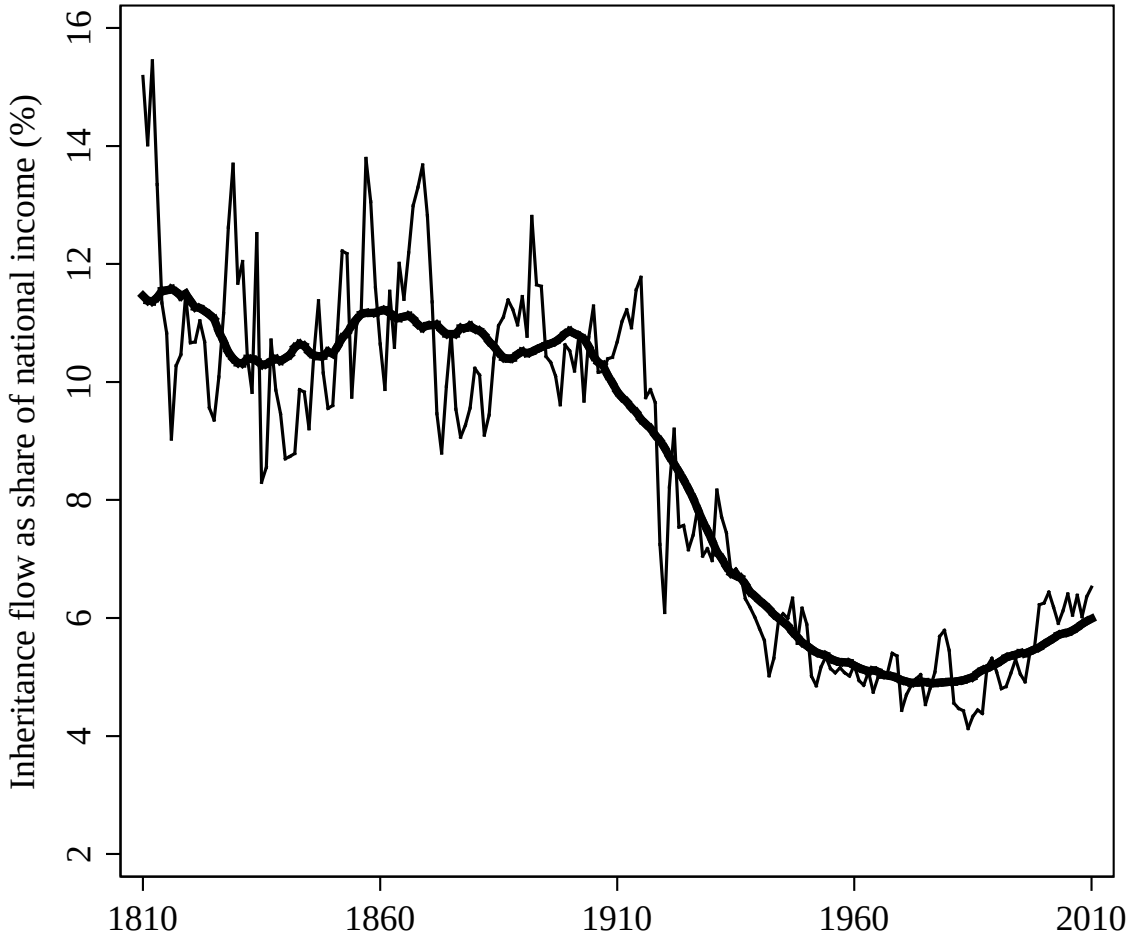
Source: Own calculations (see text).

Figure 3: Mortality among adults in Sweden, m, 1810–2010



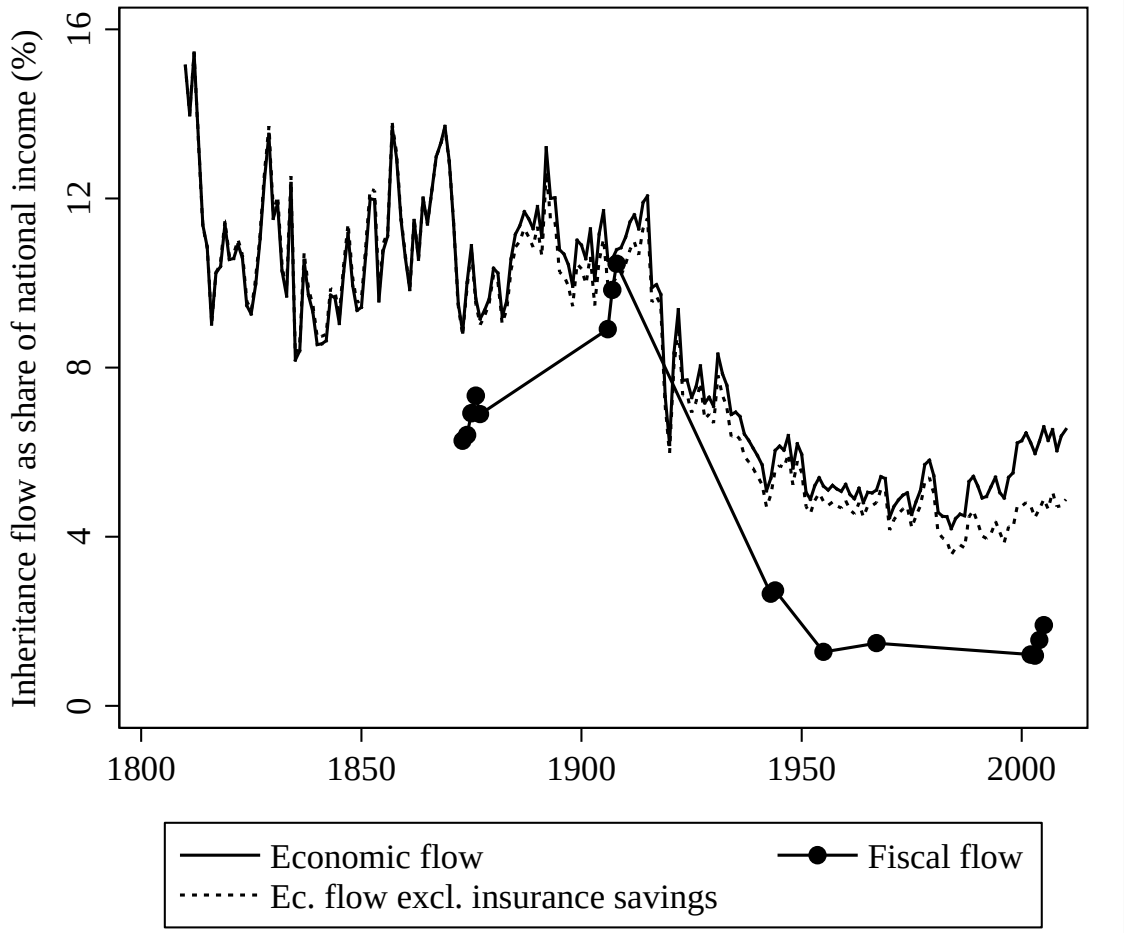
Note: Mortality is measured among people aged 18 years or more as the number of deaths as a share of the living population. Source is Human Mortality Database.

Figure 4: Inheritance flow over national income in Sweden, b_Y, 1810–2010



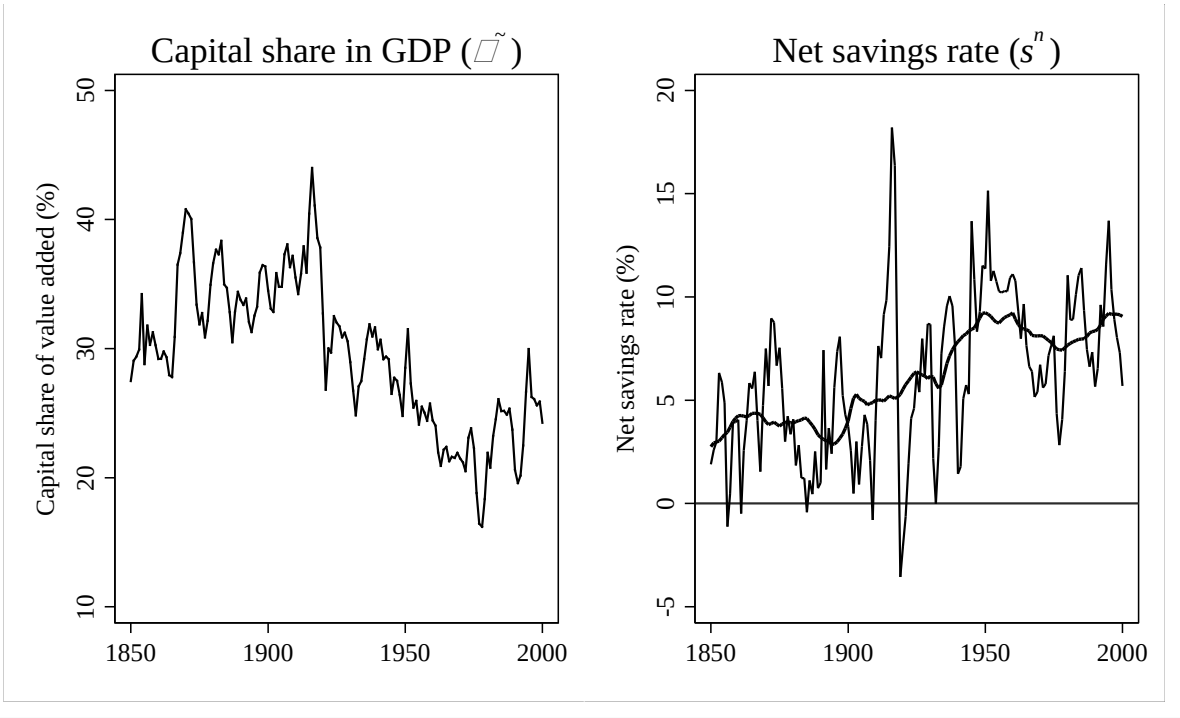
Source: Own calculations (see text).

Figure 5: Comparing “fiscal flow” and “economic flow” estimates.



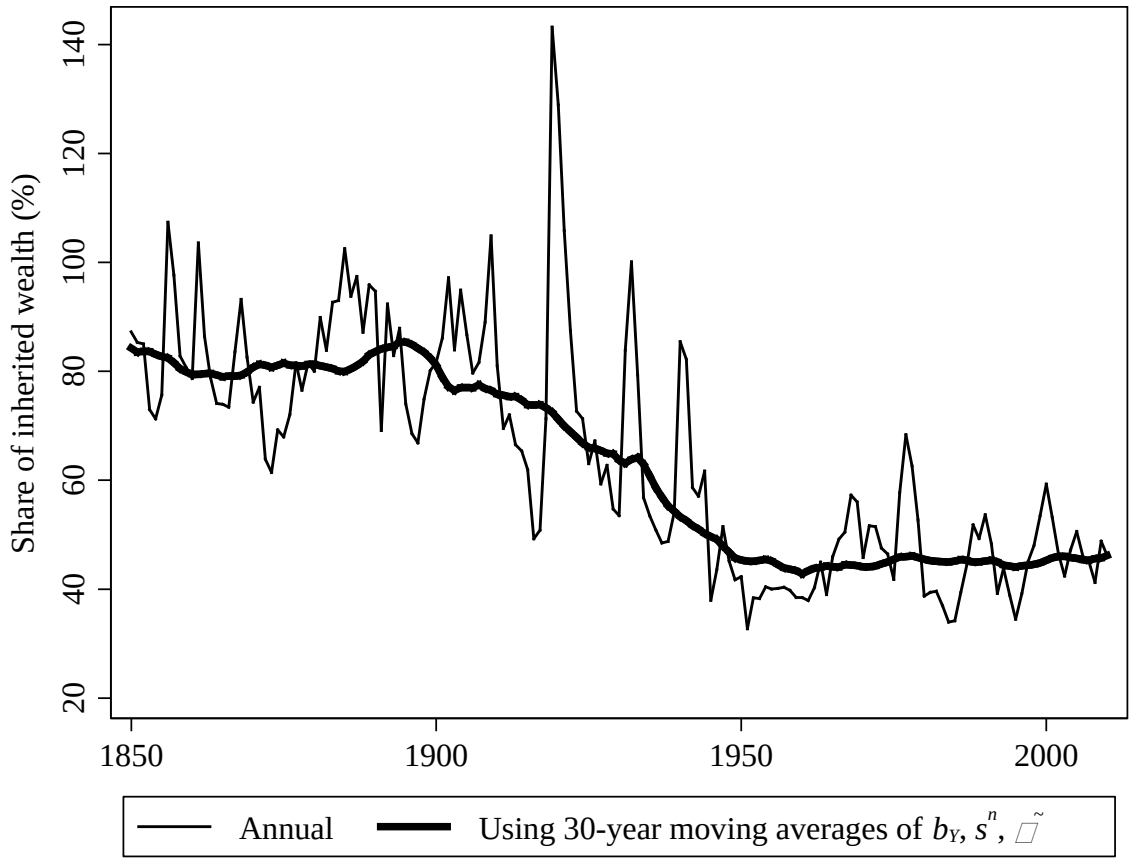
Source: Own calculations (see text).

Figure 6: Capital share of value added and private net savings rate for Sweden, 1850–2010.



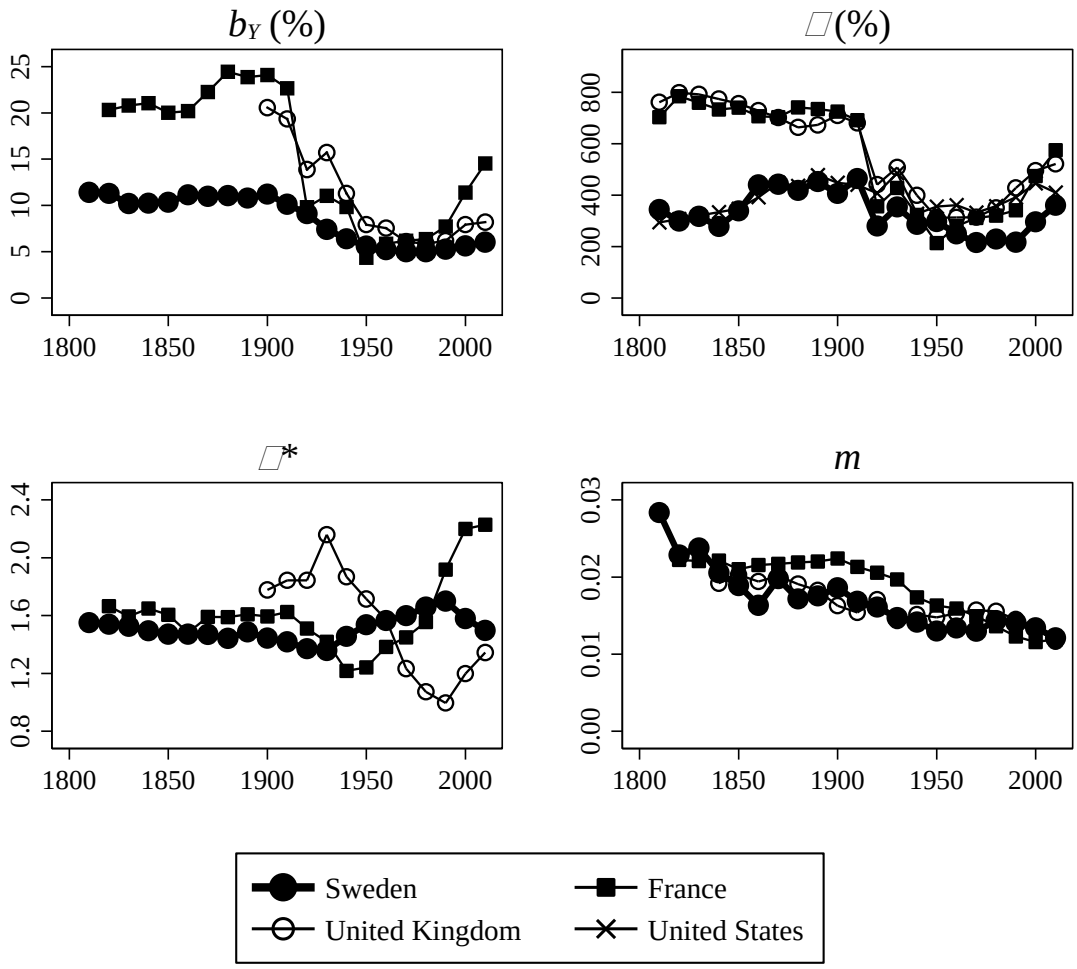
Source: Own calculations (see text).

Figure 7: Inherited wealth as share of aggregate wealth, φ.



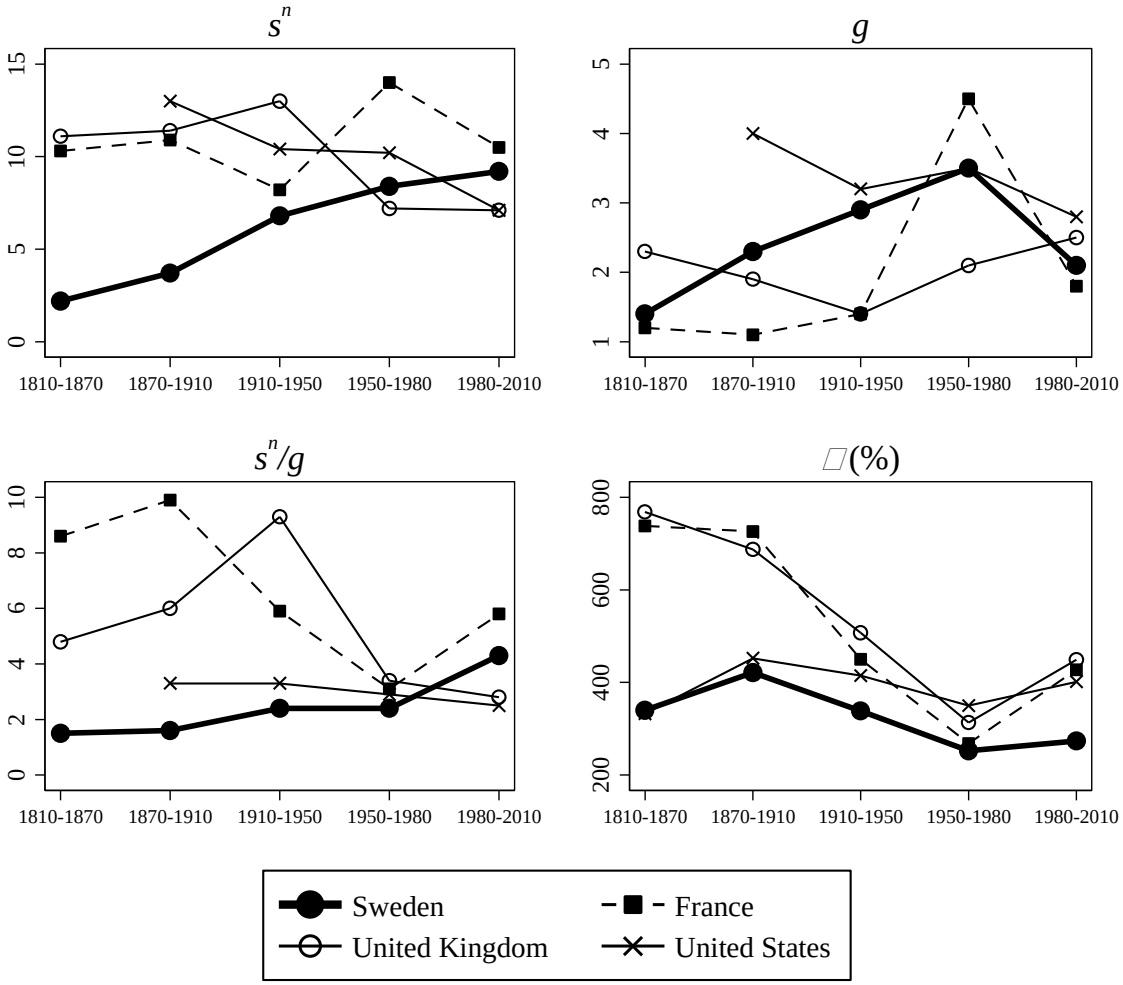
Source: Our calculations (see text).

Figure 8: International comparison of the determinants of b_Y.



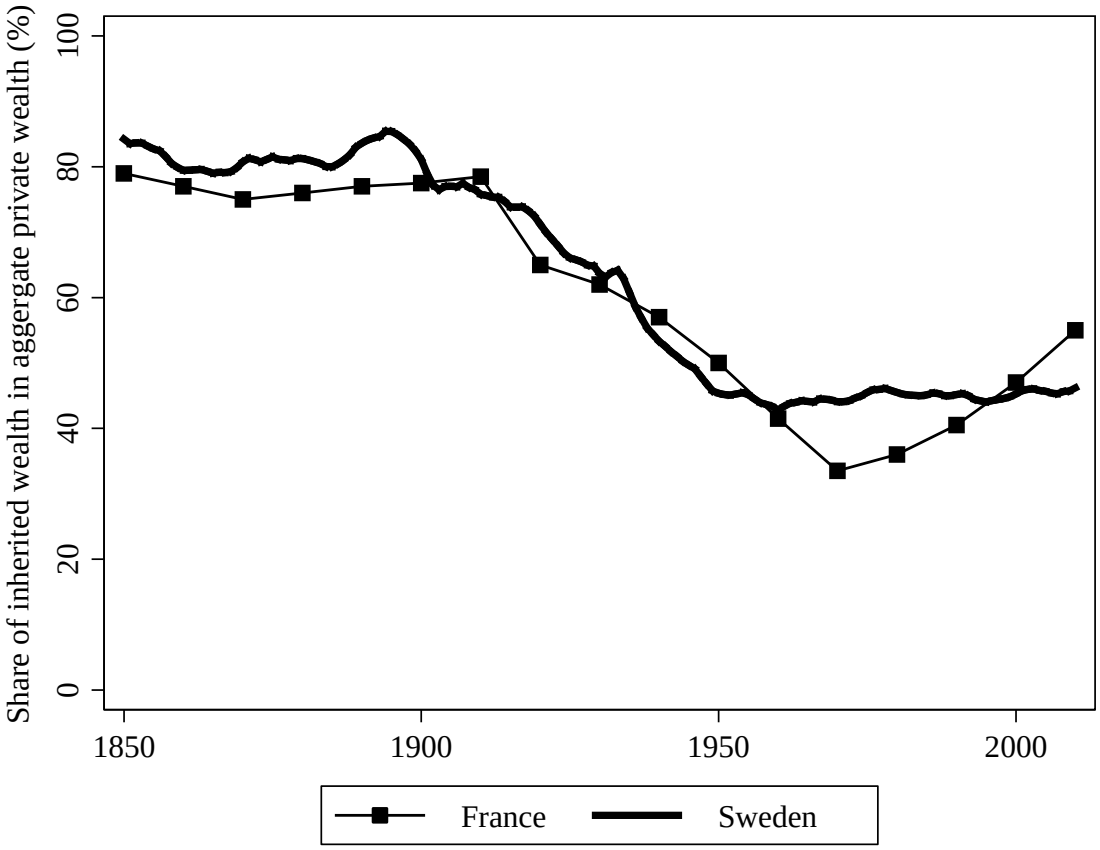
Notes and sources: Data on β from Waldenström (2014) for Sweden and Piketty and Zucman (2013) for the other countries. Mortality for France comes from Piketty (2011), for Sweden and the U.K. from the Human Mortality Database. Data on μ^* come from this study for Sweden and from Piketty (2011) for France, 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: 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 (2013) and for Sweden from Waldenström (2014) and this study.

Figure 10: Share of inherited wealth in France and Sweden, 1850–2010



Source: For France, see Piketty and Zucman (2014) and for Sweden, our own calculations.

Table 1: 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 deceased and living ($\Delta\mu^*$)	Mortality (Δm)
1810s–1870s	–0.1	0.4	–0.1	–0.6
1870s–1910s	–0.2	0.1	–0.1	–0.4
1910s–1950s	–1.4	–1.1	0.2	–0.6
1950s–1980s	–0.4	–0.9	0.3	0.3
1980s–2010s	0.7	1.5	–0.3	–0.6

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

Table 2: Comparative b_Y-decomposition: Sweden vs. France and the U.K.

	Difference from Sweden in the inheritance flow b_Y (%)	with contribution from (%):		
		Wealth-income ratio (β)	Ratio of average wealth of deceased and living (μ^*)	Mortality (m)
France				
1820s–1870s	103	87	7	9
1870s–1910s	109	69	13	27
1910s–1950s	63	27	4	32
1950s–1980s	10	8	–9	11
1980s–2010s	67	51	25	–9
United Kingdom				
1910s–1950s	103	57	46	0
1950s–1980s	30	28	–10	12
1980s–2010s	19	32	–14	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.

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 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 point 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 the 19th century observation 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, 2014).

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 are 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.[31] 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.[32] 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. 114ff).

[Figure A4 and Table A4 about here]

1.5 The 1945 age-wealth profile

[31] 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.

[32] We use all the data from 1906–1908 when estimating the fiscal inheritance flow, shown in the paper's sections 2 and 3.

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 observations 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.[33]

[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 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),

[33] 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.

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:

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

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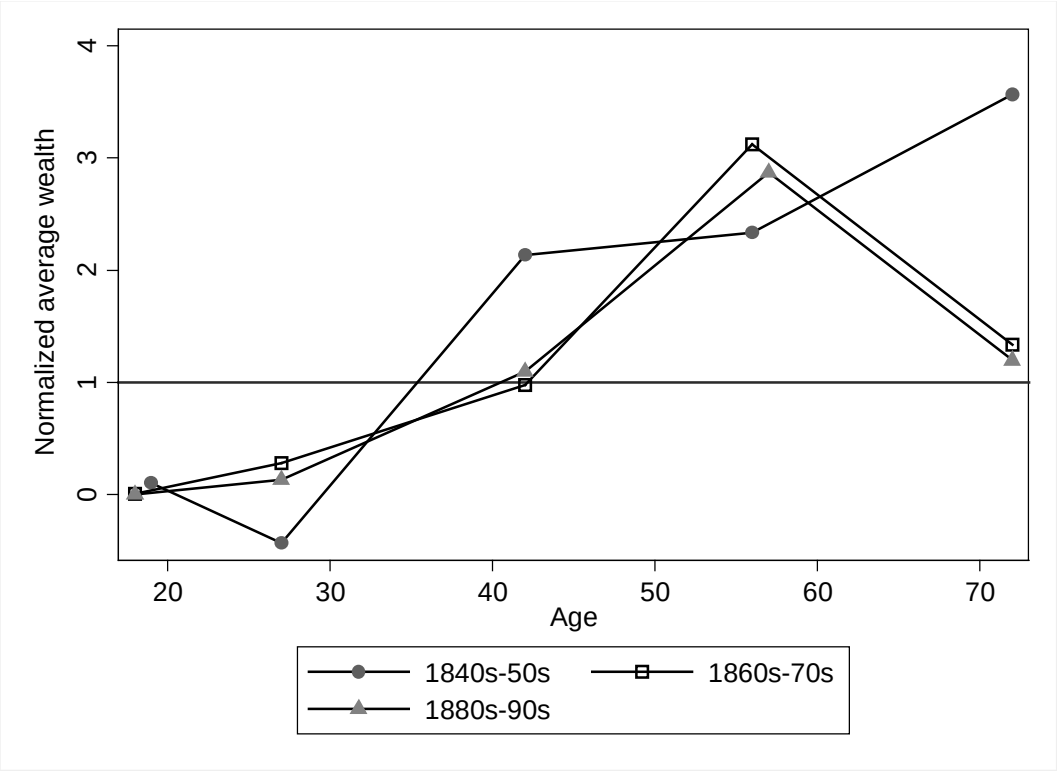
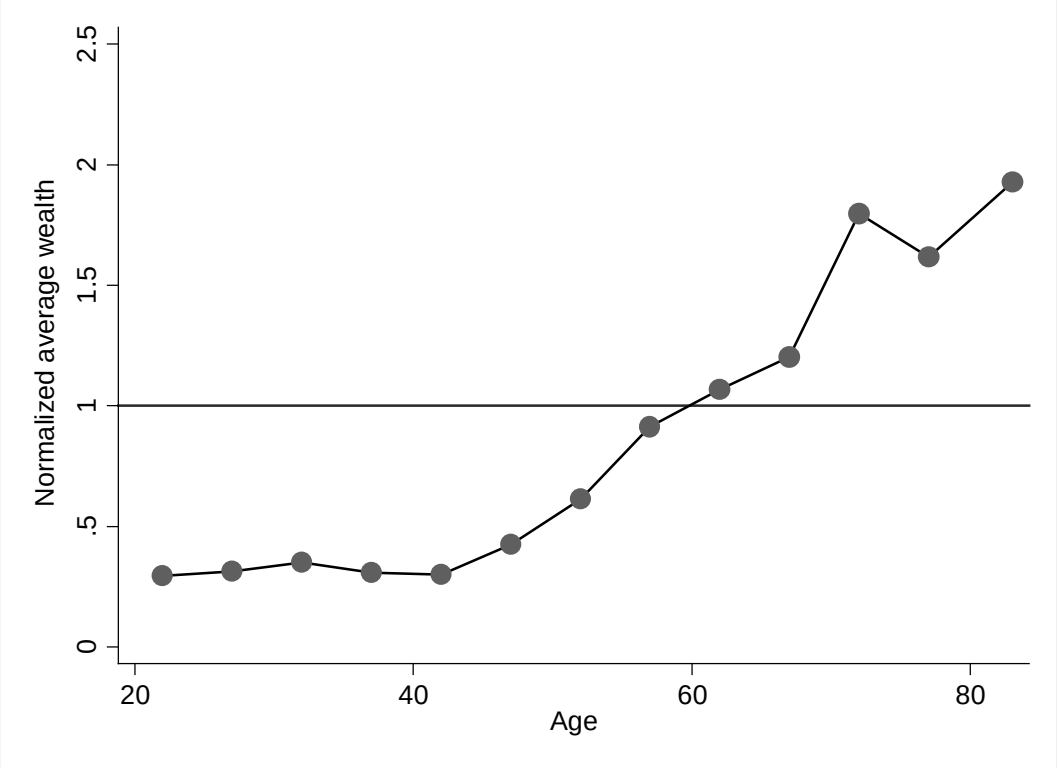
Figure A1: Age-wealth profiles between 1840s and 1890s.



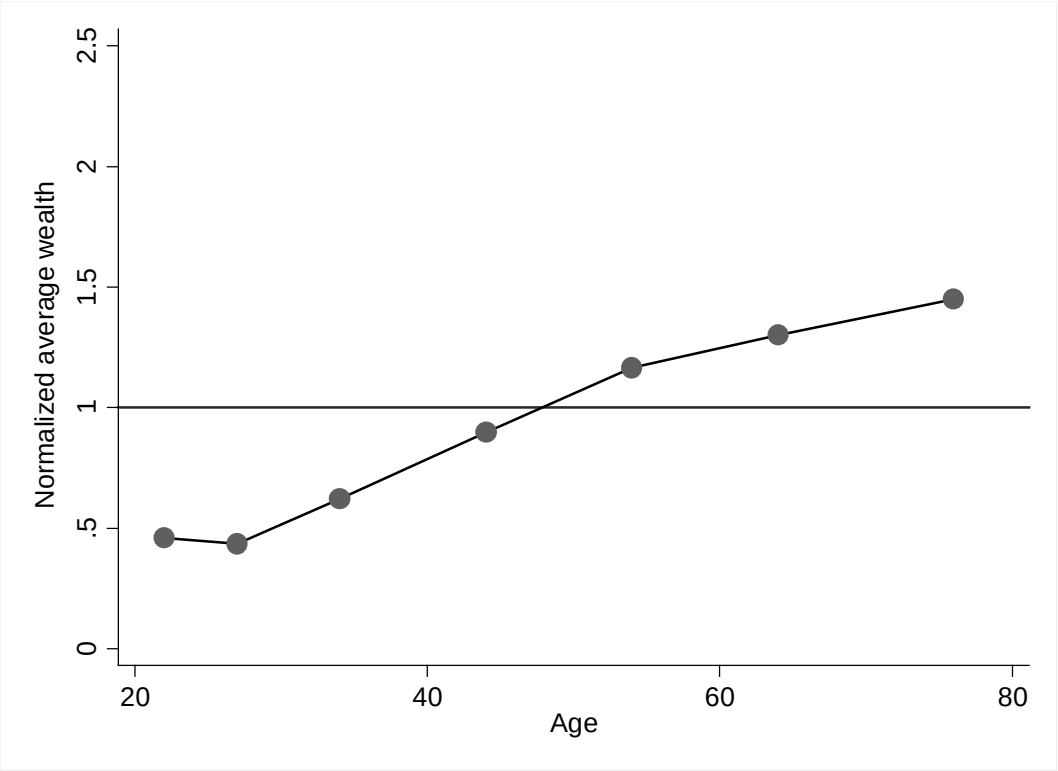
Note: Normalized average wealth is defined as $\bar{W}_{l,i}/\bar{W}_{l}$. Data come from Table A3.

Figure A2: Age-wealth profile in 1908.



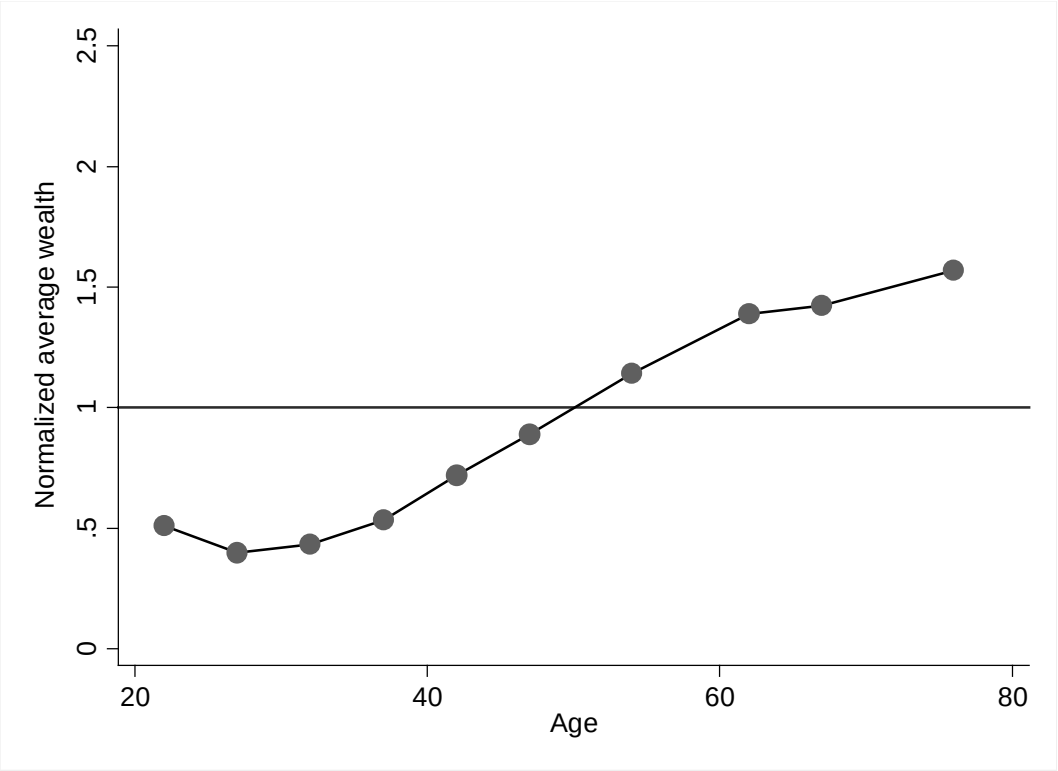
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A2.

Figure A3: Age-wealth profile in 1920.



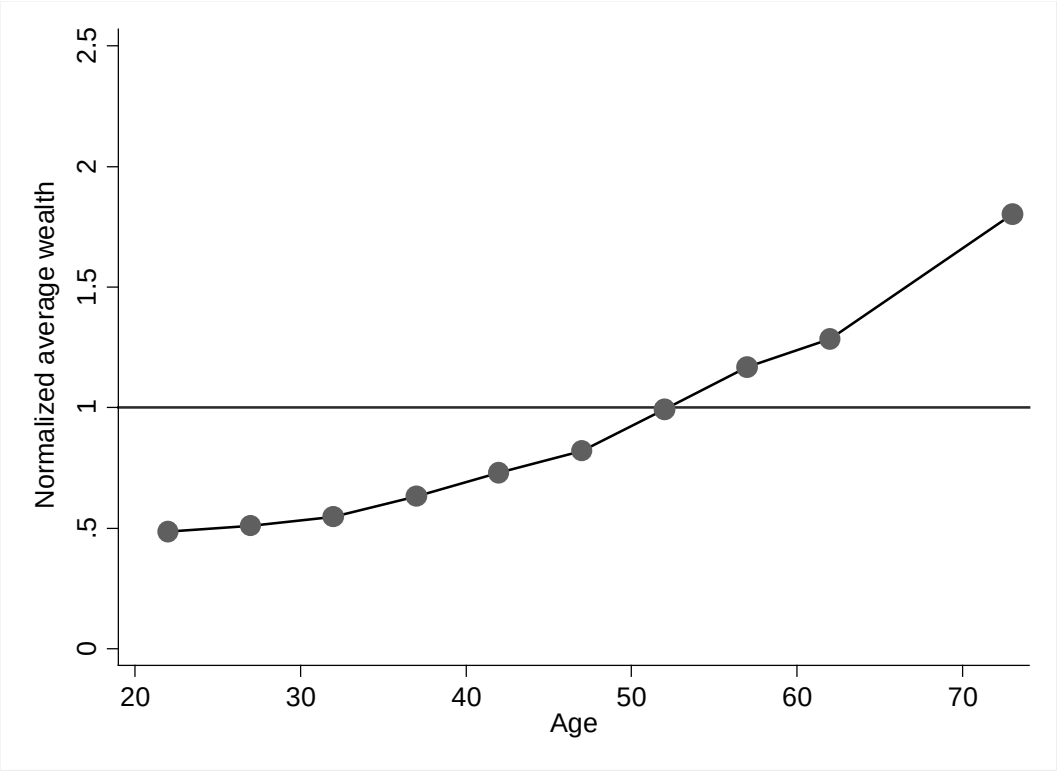
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A3.

Figure A4: Age-wealth profile in 1930.



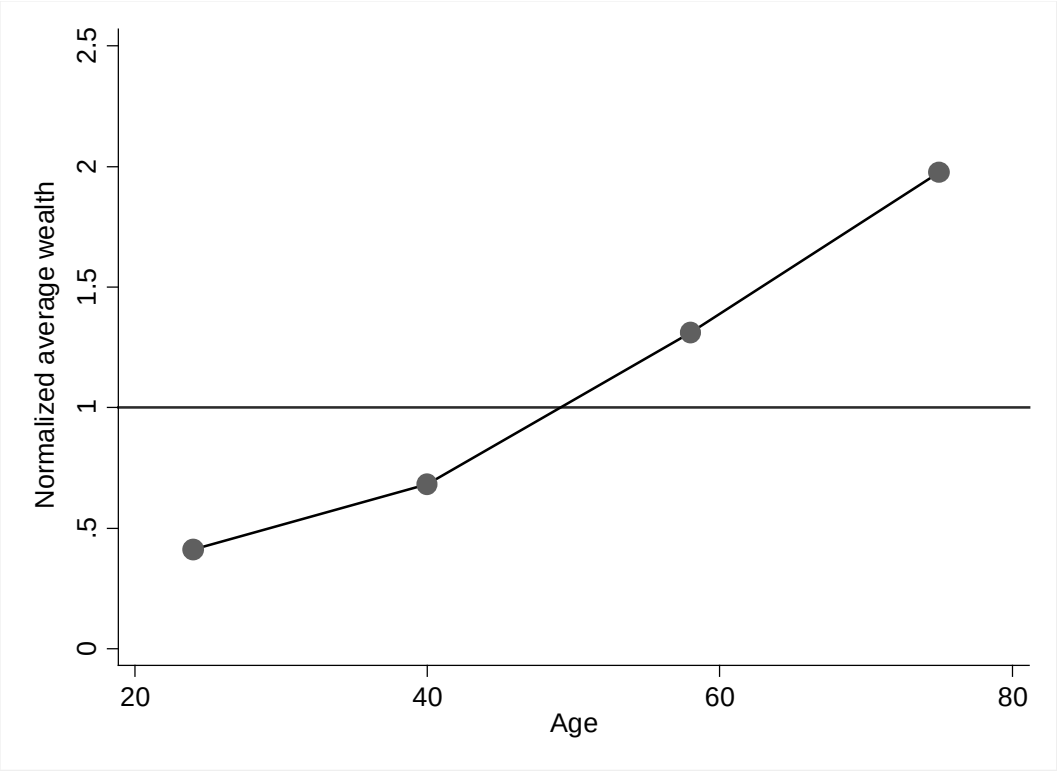
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A4.

Figure A5: Age-wealth profile in 1945.



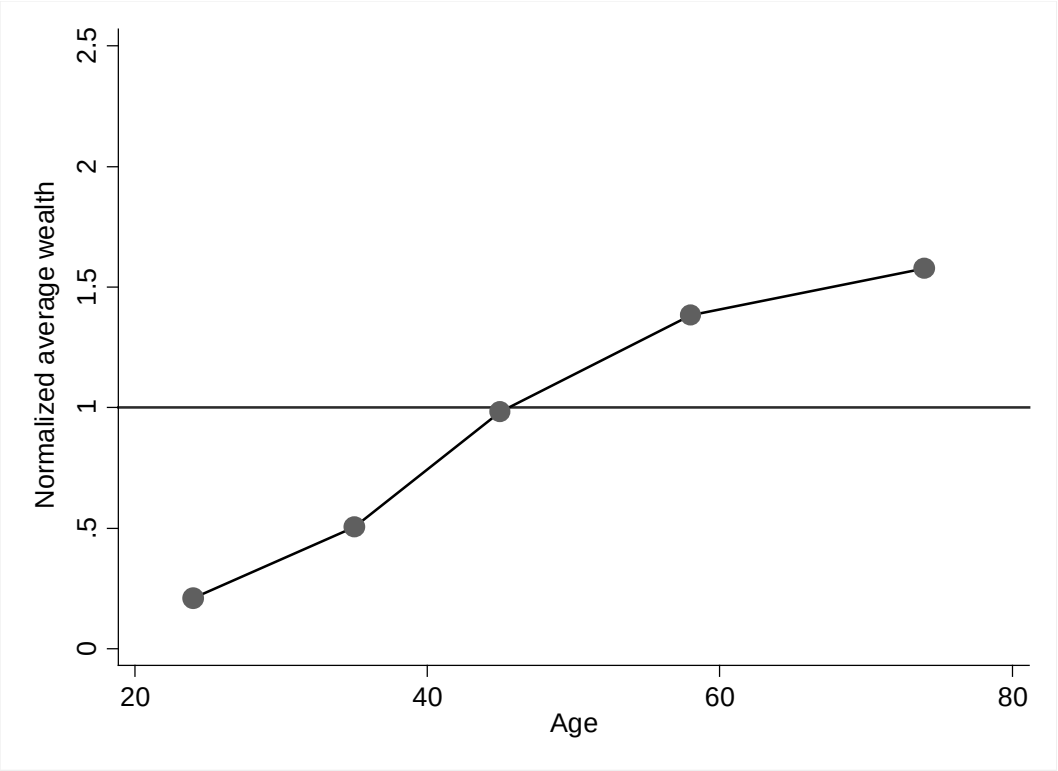
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A5.

Figure A6: Age-wealth profile in 1951.



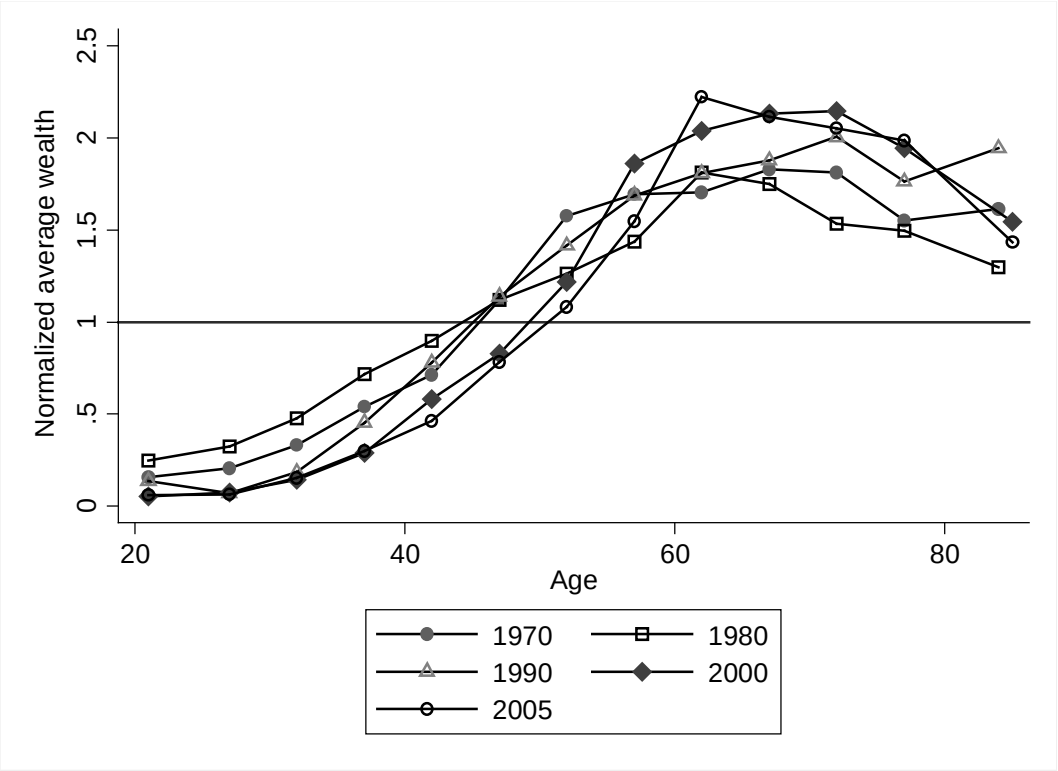
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$, come from Table A6.

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.

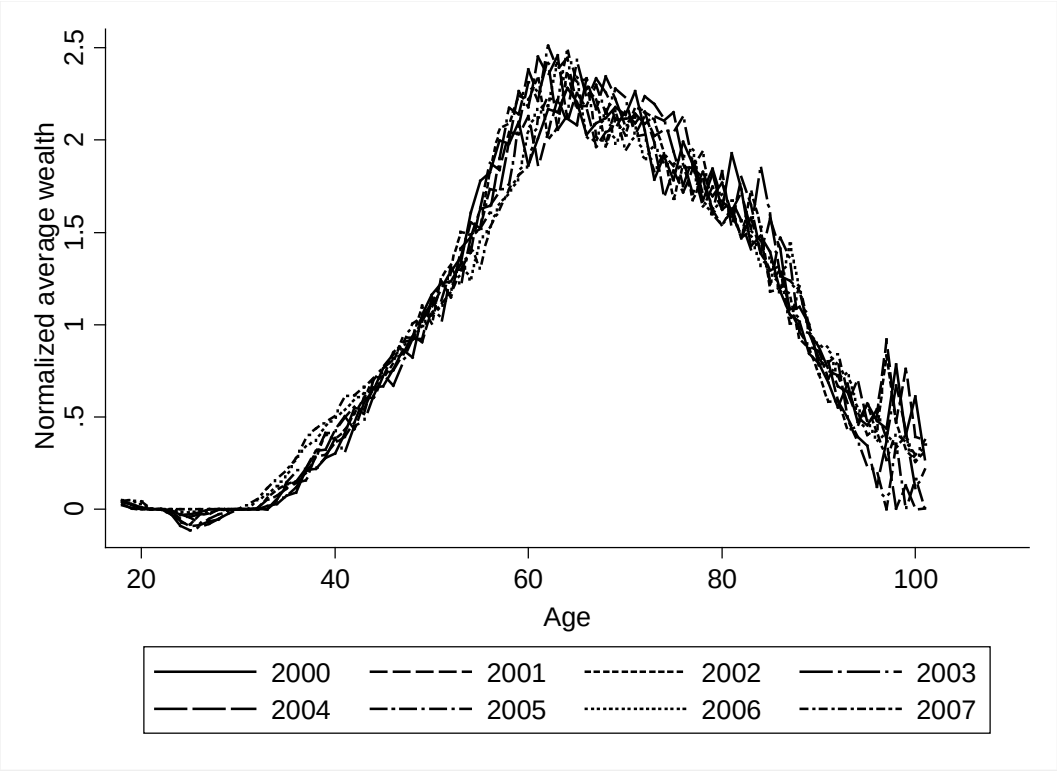


Note: Normalized average wealth is defined as $\bar{W}_{l,i}/\bar{W}_l$, (see, e.g., Table A1). Observations are three-year averages, with the denoted years as midpoint.

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

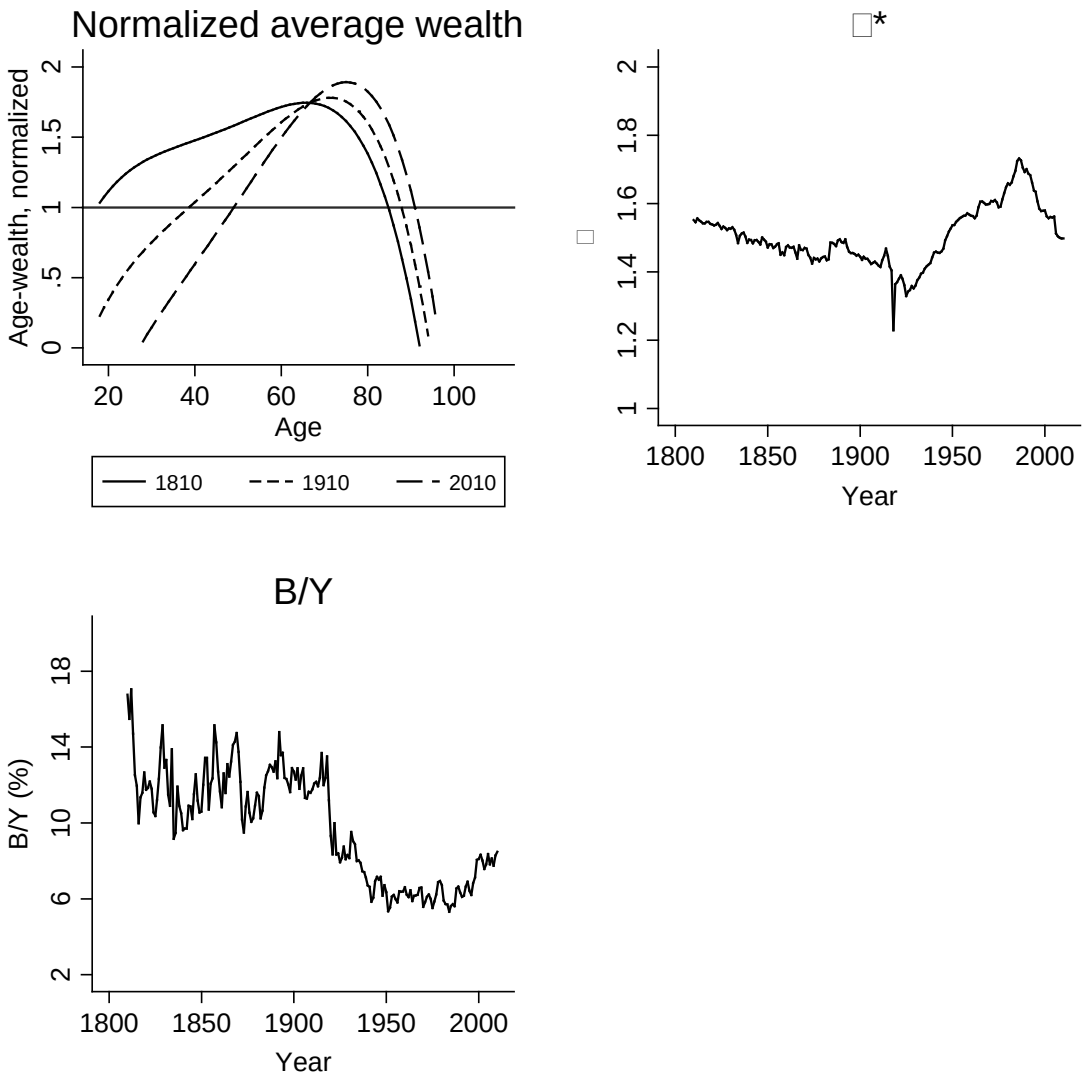
Note: Normalized average wealth, $\bar{W}_{l,a}/\bar{W}_l$, annual values corresponding to values in Tables A8b and A9. Observations are three-year averages, with the denoted year as midpoint.

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



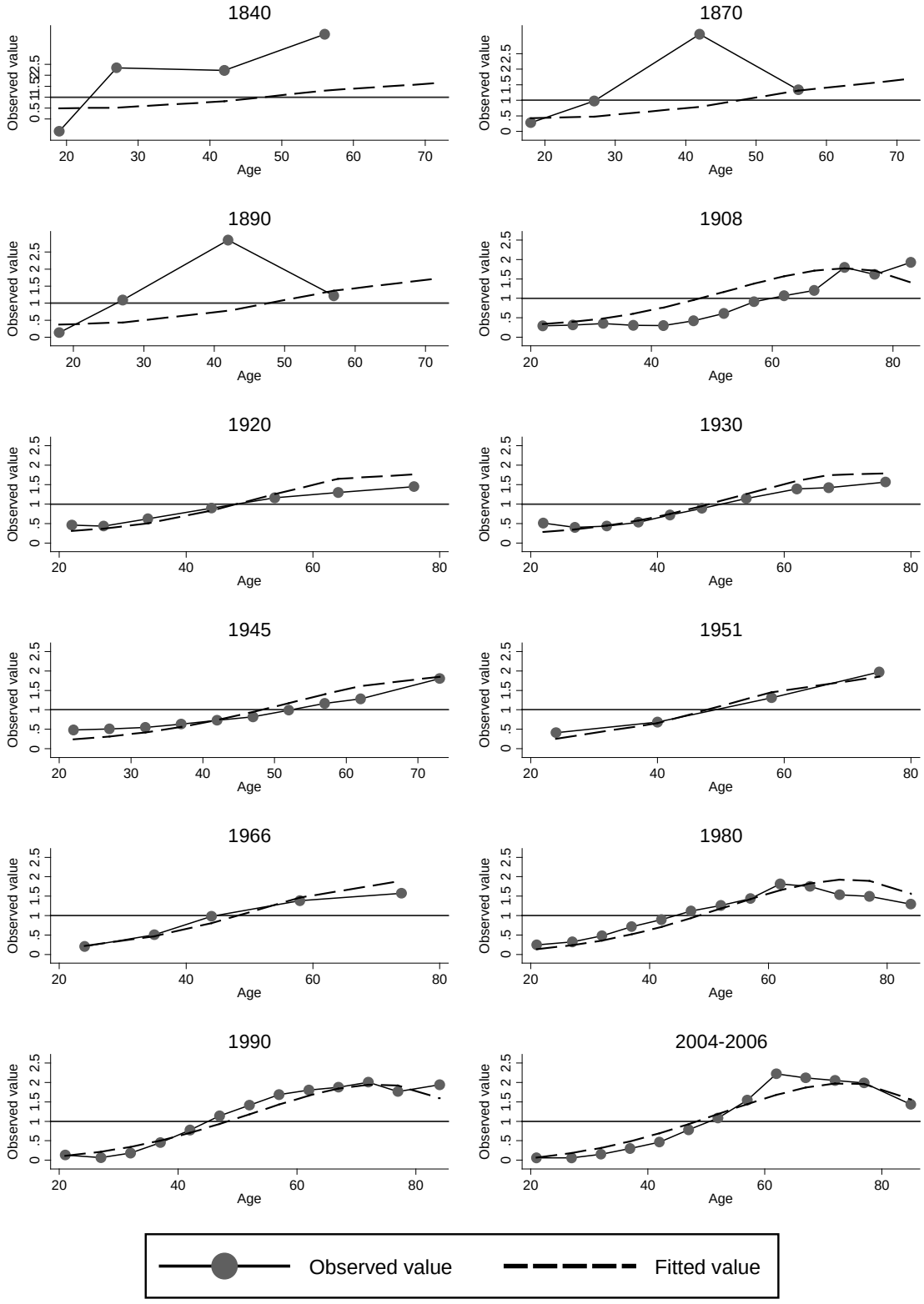
Note: Normalized average wealth, $\bar{W}_{l,i}/\bar{W}_l$. Data come from Statistics Sweden's Wealth Register and LINDA. The variable names in Register database for net wealth are "fnettw" and "cfnetto".

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, $\overline{W}_{l,a}/\overline{W}_{l}$, 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.

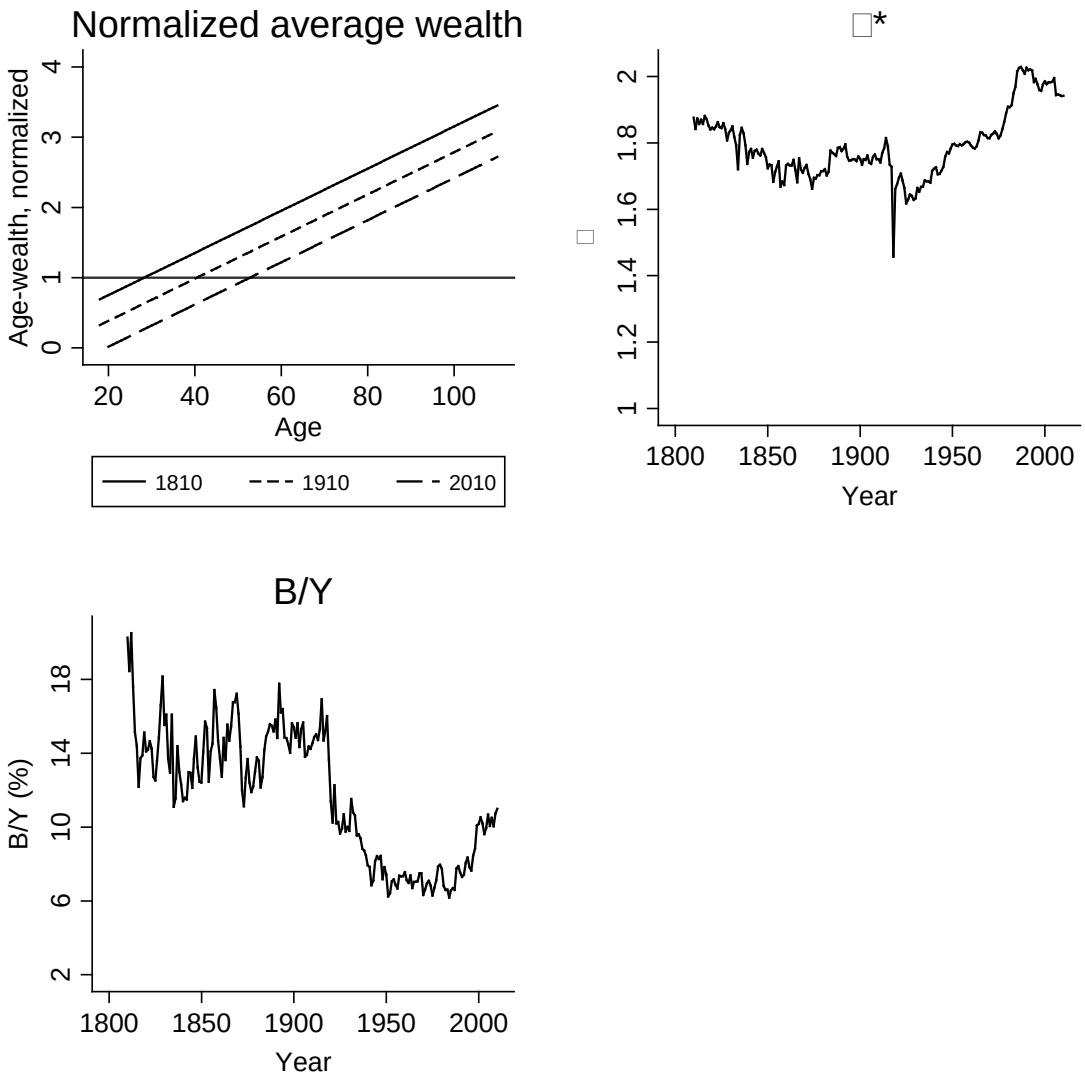


Figure A14: Age-wealth profiles, implied μ^* and inheritance flow (B/Y): No time trend.

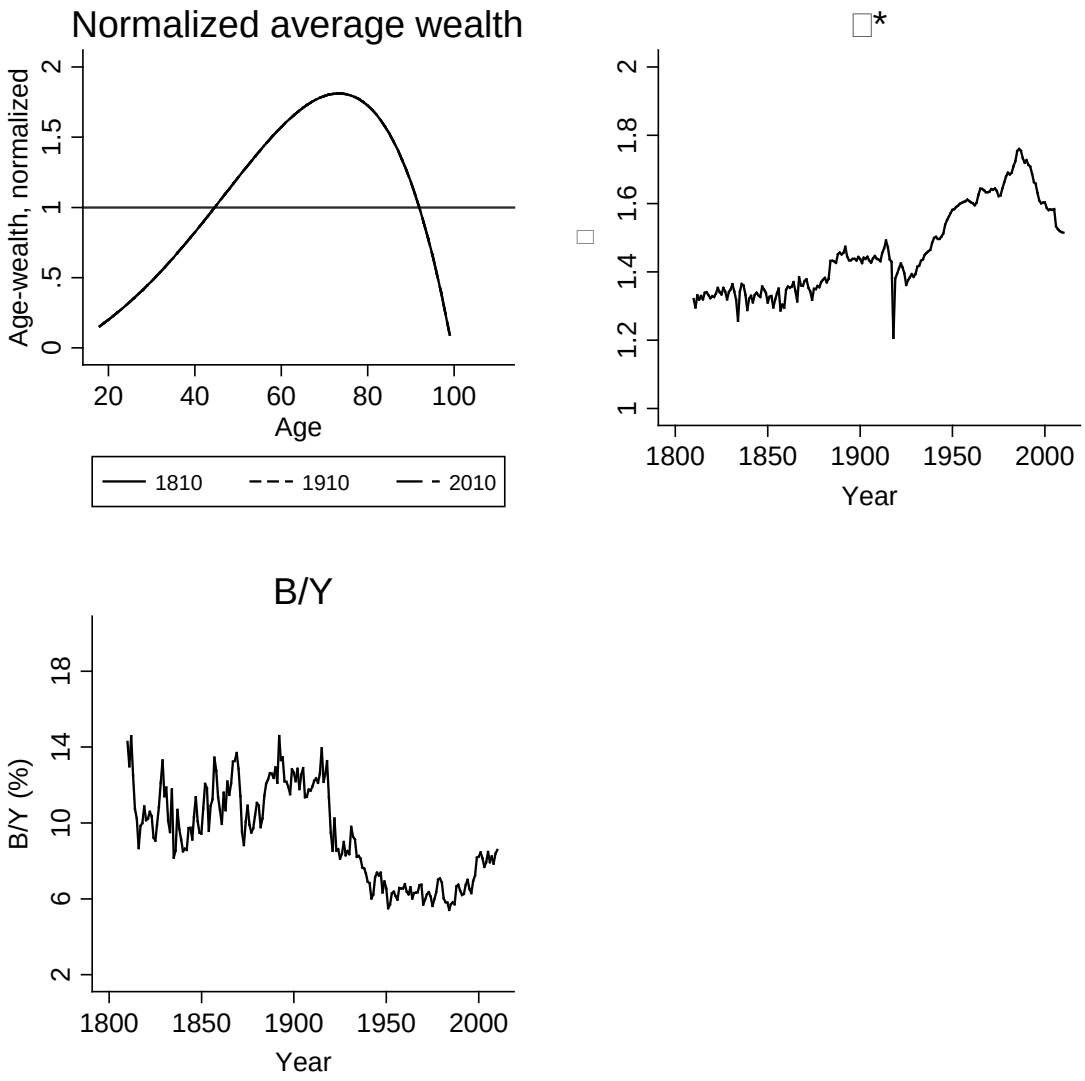


Table A1a: Age-wealth profiles between 1840s and 1890s: Kalmar city

Age class (a)	Average age, weighted (a)	Number of wealth holders (N_a)	Sum of wealth ($W_{l,a}$)	Average wealth ($\overline{W}_{l,a}$)	Normalized average wealth ($\overline{W}_{l,a}/\overline{W}_l$)
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

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.[34] 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.[35] 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 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.

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

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.[36] Similar evidence has been found by several other postwar studies for different countries.[37] 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 class.[38] A main message from the table is that there was indeed a clear

[36] See Attanasio and Hoynes (2000), table 4, p. 9.
[37] See further the discussion of Kopczuk and Saez (2004), Appendix B pp. 37–39.
[38] We have merged these two groups into one common group, "Urban Sweden", which is a 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 centre 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".

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).[39] 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 mortality differentials for urban men in the table for our purposes.[40] 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

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

[40] "Urban Sweden" is a 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 centre 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".

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).[41] 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 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]

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

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Figure B1: Impact of mortality differentials on μ^*

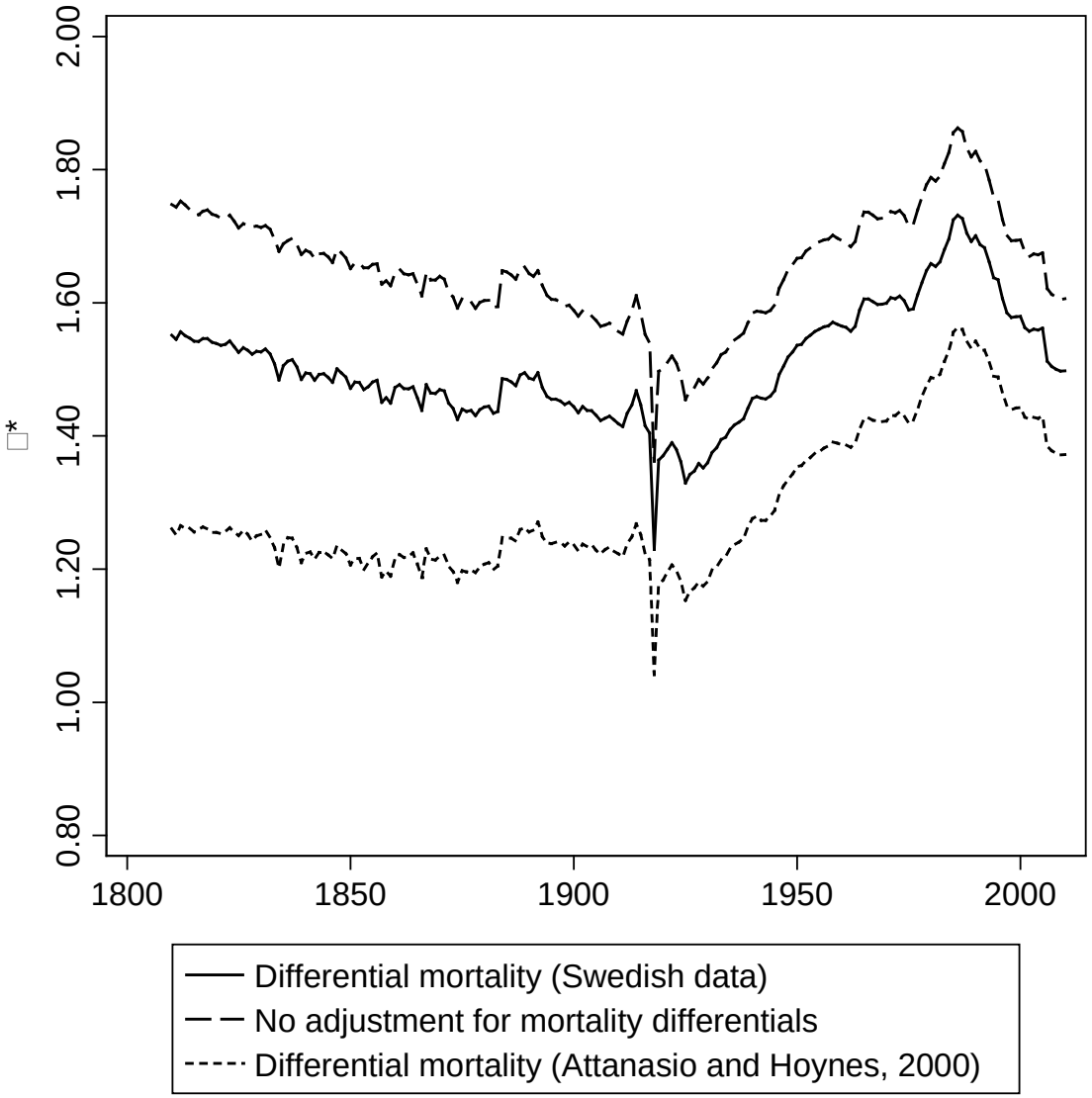

Table B1: Differential mortality rates across age and social class, Sweden 1908.

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 a 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 centre 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).

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.[42]

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:[43]

• 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 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

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

[43] 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.

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 organise 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 organised 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

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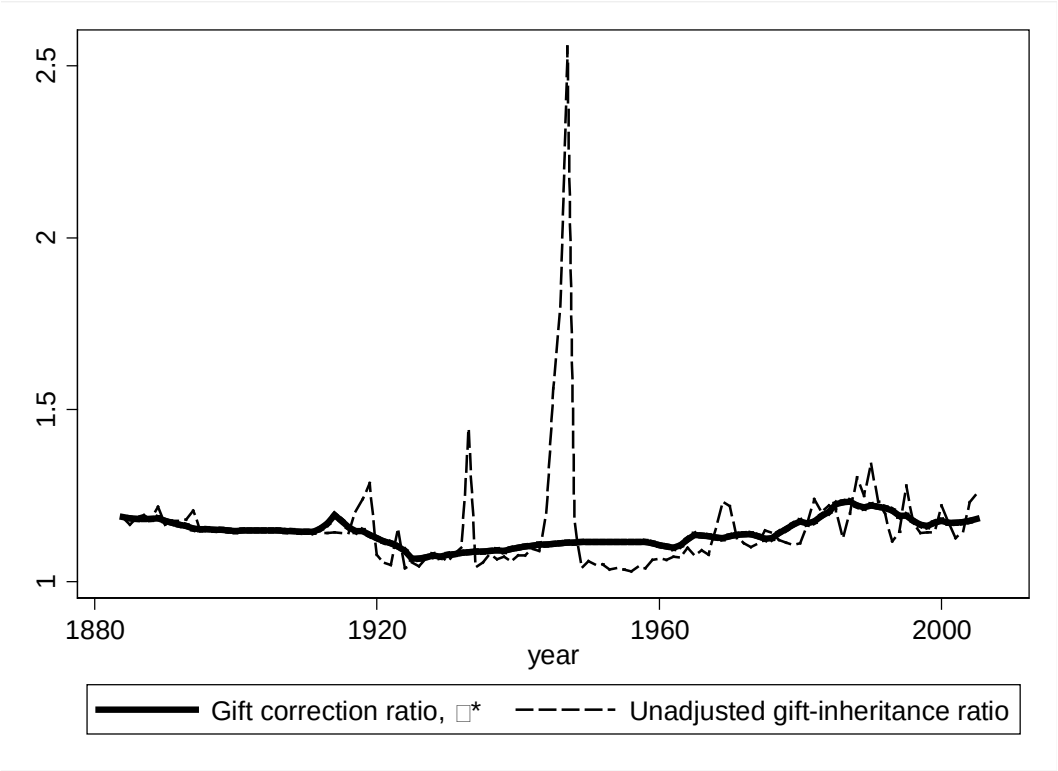
Figure C1: Correcting for *inter vivos* gifts in Sweden, annual and smoothed series



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.