DISCUSSION PAPER SERIES

DP13199
(v. 2)

HOW DO INHERITANCES SHAPE WEALTH INEQUALITY? THEORY AND EVIDENCE FROM SWEDEN

Arash Nekoei and David Seim

LABOUR ECONOMICS AND PUBLIC ECONOMICS

ISSN 0265-8003

HOW DO INHERITANCES SHAPE WEALTH INEQUALITY? THEORY AND EVIDENCE FROM SWEDEN

Arash Nekoei and David Seim

Discussion Paper DP13199
First Published 24 September 2018
This Revision 29 March 2019

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

HOW DO INHERITANCES SHAPE WEALTH INEQUALITY? THEORY AND EVIDENCE FROM SWEDEN

Abstract

Inheritances reduce relative measures of wealth inequality according to recent evidence from several countries. Using a theoretical model and Swedish administrative data, we first show that this counter-intuitive finding can be explained by high intergenerational wealth mobility and low inheritance inequality relative to wealth inequality. We then exploit two quasi-experiments: randomness in the timing of death and an inheritance tax repeal. We find that the equalizing effect of inheritances is short-lasting and reverted within a decade since less wealthy heirs deplete their inherited wealth rapidly in contrast to more affluent heirs. This depletion represents a constant reduction in annual savings equivalent in size to 10% of the average inheritances amount. 70% of this additional annual non-labor income are allocated to consumption (half of it is car purchases) in the first years, compared to 90% in later years. The remaining 30% (or 10%) reflect a considerable albeit declining labor supply elasticity with respect to inheritances. Taken together, our findings suggest that inheritance taxation can reduce long-run wealth inequality solely through the taxation of very large inheritances.

JEL Classification: D31

Keywords: Inheritance, inequality, Wealth, Consumption, Labor Supply

Arash Nekoei - arash.nekoei@iies.su.se
IIES, Stockholm University and CEPR

David Seim - david.seim@ne.su.se
Stockholm University and CEPR

How do inheritances shape wealth inequality? Theory and evidence from Sweden*

Arash Nekoei David Seim

March 28, 2019

Abstract

Inheritances reduce relative measures of wealth inequality according to recent evidence from several countries. Using a theoretical model and Swedish administrative data, we first show that this counter-intuitive finding can be explained by high intergenerational wealth mobility and low inheritance inequality relative to wealth inequality. We then exploit two quasi-experiments: randomness in the timing of death and an inheritance tax repeal. We find that the equalizing effect of inheritances is short-lasting and reverted within a decade since less wealthy heirs deplete their inherited wealth rapidly in contrast to more affluent heirs. This depletion represents a constant reduction in annual savings equivalent in size to 10% of the average inheritances amount. 70% of this additional annual non-labor income are allocated to consumption (half of it is car purchases) in the first years, compared to 90% in later years. The remaining 30% (or 10%) reflect a considerable albeit declining labor supply elasticity with respect to inheritances. Taken together, our findings suggest that inheritance taxation can reduce long-run wealth inequality solely through the taxation of very large inheritances.

*This paper has been presented and circulated under the title "On the Accumulation of Wealth: The Role of Inheritances" from November 2015 to July 2018. We thank Konrad Burchardi, David Cesarini, Raj Chetty, Anna Döös, Itzik Fadlon, Henrik Kleven, Wojciech Kopczuk, Per Krusell, Erik Lindquist, Kurt Mitman, Robert Östling, Torsten Persson, Dina Pomeranz, Emmanuel Saez, Anna Seim, David Strömberg, Gabriel Zucman, Clara Zverina, as well as numerous seminar and conference participants (in particular the AEA-ASSA 2016 and NBER-Summer institute 2016) for helpful discussions and comments. Jonas Cederlof and Elin Molin provided excellent research assistance. We acknowledge financial support from Jan Wallander and Tom Hedelius Foundation, grant P2015-0095:1 and the Torsten Söderberg foundation, grant E18/15. Arash Nekoei: Institute for International Economic Studies (IIES) at Stockholm University and CEPR, arash.nekoei@iies.su.se; David Seim: Department of Economics, Stockholm University; CEPR and Uppsala University, david.seim@ne.su.se.

1 Introduction

The fat-tailed distribution of wealth is one of the most salient aspects of economic inequality. In all countries with reliable data, the top 1% share of wealth is larger than the corresponding top-share of income (Alvaredo et al., 2016). The high wealth inequality stems either from heterogeneity in inherited or self-made wealth. The relative contribution of these two factors determines the potential of different taxes in changing the shape of the wealth distribution. Moreover, taxing inherited wealth more than self-made wealth is debated among policy makers and supported by citizens (Harbury et al., 1977 and Fisman et al., 2017).

Starting with Wedgwood (1928), an extensive literature has attempted to gauge how much of wealth inequality that is inherited. The focus has been on the immediate impact of inheritances on the wealth distribution, which depends on the difference between bequests received by wealthy and less affluent heirs. Over time, however, the short-run mechanical effect would be exacerbated if inheritances are well invested, but attenuated if inheritances increase the consumption of goods and leisure. We argue that the long-run effect of inheritances thus depends on the marginal propensity to consume and earn out of inheritances.

This paper provides a comprehensive analysis of the short- and long-run effects of inheritances on wealth inequality. To this end, we exploit eleven administrative datasets, matched at the individual level, that cover the entire population of Sweden. These sources include third-party reported asset-by-asset information on individuals' wealth as well as the car registry, allowing us to measure the marginal propensity to consume cars out of inheritances. In particular, the matched wealth and inheritance data provide us with the wealth of both heirs and donors, which are individually matched to inheritances and inter-vivo transfers.

Our first contribution is to show theoretically that inheritances can be wealth-inequality increasing or decreasing in the short run, depending on three well-studied moments: intergenerational wealth mobility, initial wealth inequality, and inheritance inequality.[1] Intuitively, the share of wealth held by the wealthiest heirs after inheritances increases in the share of wealthy heirs with wealthy parents (intergenerational mobility) and in the share of total estates held by the wealthiest parents (inheritance inequality).[2]

We connect the theoretical framework to the data using estimates of the three *aggregate* moments for the U.S. and Sweden. The model predicts that inheritances reduce the wealth inequality in both countries. Moreover, this is due to a low inheritance inequality relative to the wealth inequality. The predictive power of the model is particularly useful where the lack of microdata prevents a direct estimation, as in the U.S. For Sweden, however, we test the prediction directly. While the whole wealth distribution of heirs shifts to the right upon receiving inheritances and the distance between percentiles of the wealth distribution increases, the ratios of those percentiles are reduced.[3] This

[1] For empirical measurements of these moments, see Charles and Hurst (2003), Kopczuk and Saez (2004), Saez and Zucman (2016), and Piketty et al. (2006), respectively.

[2] Following the literature (see Piketty and Zucman, 2015 and references therein), our empirical analysis focuses on relative measures of inequality, namely top percentiles' shares and Kuznets (percentile) ratios. This choice is due to empirical availability and to the ability of these measures to capture the skewness of the wealth distribution.

[3] Using data on taxable inter-vivo transfers (gifts), we show that gifts are inequality-decreasing – just like inheritances, but to a much smaller extent – implying that inheritances reduce short-run inequality more when inter-vivo transfers are

confirms previous empirical findings.[4]

Moreover, based on the intuition of the model but without its help, we construct counterfactual cases where one of the two drivers of the inheritance effect – intergenerational mobility and inheritance inequality – reaches its extremes. This results in four counterfactual inheritance flows, corresponding to no intergenerational mobility, full intergenerational mobility, inheritance equality and extreme inheritance inequality. Supporting the prediction of the model, inheritances always reduce the wealth of the top shares, irrespective of the degree of intergenerational mobility.

Our second contribution is to provide quasi-experimental evidence on the dynamic behavioral responses to inheritances and their implications for long-run wealth inequality. Our identification strategy exploits randomness in the timing of bequests by comparing individuals of the *same* birth cohort who happened to lose a parent at different ages. This research design allows us to study intergenerational wealth transfers occurring at the time of death and the behavioral responses they induce.

Importantly, the equalizing short-run effect of inheritances on wealth inequality is reverted within ten years. For instance, while we estimate a 2.5 percentage-point decline in the share of wealth held by the top 5% upon receiving inheritances, the effect is zero seven years later. Percentile ratio effects exhibit a similar pattern. For instance, the 99th percentile over the median declines on impact but reverts and becomes positive after ten years. We also document that the whole wealth distribution of heirs shifts to the right in the short run, increasing the likelihood of heirs being at the top of the population wealth distribution. For example, the probability of being in the top 10% (1%) goes up by 17% (26%). However, over time, the distribution shifts back relative to the control group with the exception of the very top. In fact, inheritances only increase the likelihood of being in the top 2% of the wealth distribution after ten years. Taken together, inheritances increase the wealth inequality in the long run.

The inheritance effects on wealth inequality differ in the short- and long-run because the rate of wealth depletion varies with the heirs' initial wealth level. We find that heirs among the bottom 99% of the wealth distribution before inheritances deplete almost all of their inherited wealth within a decade. In contrast, for the top 1%, the inherited wealth remains practically intact over time.

These reduced-form findings should be the result of heterogeneity in heirs' responses to inheritances, either due to heterogeneity in the propensity to consume or earn out of inheritances or in the rates of return on inherited wealth. We investigate the reasons for the wealth depletion in two steps, in what we term a *Mincerian dynamic approach*. Under this approach, we first measure the allocation of extra wealth across time by estimating the effect of inheritances on annual unearned (non-labor) income, i.e. the wedge between annual labor income and consumption. Then, we attribute this additional unearned income in each period either to an increase in consumption or to a reduction in labor supply.[5]

We implement the first step of the Mincerian dynamic approach by estimating the increase in

taken into account.

[4]See Boserup et al. (2016), Elinder et al. (2018), Karagiannaki (2017) and Wolff (2002), discussed in detail in Section 2.

[5]A similar idea was proposed by Jacob Mincer (Holtz-Eakin et al., 1993, page 432). Due to the lack of microdata on savings, he suggested to convert inheritances into an equivalent annuity. Here, we are able to directly estimate the *actual* extra resources (unearned income) brought to each period.

annual unearned income induced by inheritances. More precisely, with asset-level data for each individual, we decompose wealth changes into changes in prices and quantities, i.e. capital gains and savings decisions. This decomposition shows that inheritances generate a roughly constant increase in annual unearned income, suggesting an unearned-income smoothing pattern.[6] More relevant for our purpose here is that the depletion of wealth is indeed due to differential savings decisions and not due to differences in the rates of return.

In the second step of the Mincerian dynamic approach, we estimate the inheritance effects on heirs' labor income and consumption. To measure the marginal propensity to consume (MPC), we construct a measure of consumption as the residual of total income and savings following Koijen et al. (2014). We estimate that almost 70% of the additional unearned income obtained during the first three years post-inheritance are spent on consumption, implying an intra-temporal MPC of 0.7. However, the intra-temporal MPC increases over time and approaches 0.9 after seven years. The car registry reveals that at least 40% of the consumption responses in the first two years consist of durable goods consumption.

We find that inheritances reduce labor supply along both the extensive and the intensive margins. The likelihood of working decreases by 0.6% and labor earnings drop by one percent, conditional on working. Moreover, estimating labor supply effects among children not receiving inheritances, we find that at most one third of the estimated labor supply responses are due to direct effects of losing a parent, such as grief or care-giving, rather than due to inheritances.[7]

Taken together, we find that inheritances reduce relative measures of wealth inequality in the short run but increase them in the long run. This reversal is due to behavioral responses, not bequests being quantitatively unimportant or heterogeneity in rates of return. In fact, we show that heirs deplete their inheritances by a constant increase in annual non-labor income which is equivalent in size to 10% of the average inheritances amount. During the first years, about 30% of these additional resources are spent on cars; 40% on other commodities, and the remaining 30% on working less. In latter years, spending on commodities increases to 90%, and the remaining 10% is used to reduce labor supply.

The rather rapid depletion of inherited wealth and the heirs' responses are at odds with the permanent income hypothesis or decisions based on an intergenerational budget constraint. However, they can be rationalized by individuals being credit constrained, for instance by being over-saved at the time of the inheritance receipt due to the extensive mandatory pension system in Sweden. The fact that wealthier heirs do not deplete their inheritance supports this interpretation. Another potential explanation is that inheritances are unexpected. Applying a sample-split strategy, we find the same evidence of depletion following inheritances due to unexpected deaths. All in all, our evidence suggests that the average heir in Sweden behaves like a credit-constrained agent with a high discount factor.

How does inheritance taxation affect wealth inequality? In the short run, a flat, *unexpected* in-

[6] With time-separable utility, the agent's inter-temporal decision leads to a smoothing of the marginal utility of unearned income across time. Assuming further that the intra-temporal utility is separable in consumption and leisure generates a smoothing of the marginal utility of consumption. Unearned-income smoothing is thus a general form of consumption smoothing.

[7] These empirical findings support a version of the Carnegie conjecture, namely that labor supply drops upon receiving inheritances, which was first assessed empirically in Holtz-Eakin et al. (1993) (for more details, see Section 2). Carnegie (1899) proposes that (potential) inheritances distort heirs' working incentives, which is a more general conjecture.

heritance tax will increase relative measures of wealth inequality since inheritances reduce wealth inequality in the absence of a tax. Our counterfactual analysis shows that the effect of inheritances on the share of wealth of the top 1% is attenuated from a -1.65 percentage-point effect to a -1.51, -0.9 or -0.2 percentage-point effect in the presence of a flat, unexpected tax of 10, 50 and 90 %, respectively.[8] Perhaps even more surprising, a progressive unexpected tax increases inequality in the short run, unless it is extremely progressive. This can be explained by the fact that the *share* of post-inheritance heir wealth bequeathed by, say, the top 1%-parents is the same for the top 1% heirs as for the average heir. Two countervailing forces are at play, namely that the top 1% has a higher share of inheritances stemming from top 1% parents, but they have a lower share of inherited wealth .[9]

In the long run, however, an unexpected tax reduces the wealth inequality – no matter the degree of progressivity – to the extent that it taxes large inheritances. This is due to our finding that only large inheritances persist over time. We provide a second research design that sheds some direct light on this issue. It leverages the quasi-experimental variation induced by the unexpected repeal of the Swedish inheritance tax to investigate what heirs do with the windfall gains implied by such a tax repeal. We document that the extra inheritances received by heirs whose parents die after the tax repeal are preserved over time. This means that an unexpected progressive inheritance tax will reduce inequality in the long run by reducing large inheritances which are otherwise sustained over time.

An *expected* inheritance tax affects wealth inequality through three mechanisms. The first is the mechanical effect of the tax itself, which is similar to that of an unexpected tax. An expected tax also triggers behavioral responses prior to death: parents who were planning on leaving inheritances in the absence of the tax will consider alternatives to bequests, such as investments in children's human capital (Stantcheva, 2015). As a result, we would expect greater pre-inheritance wealth inequality among heirs and lower inheritance inequality (second and third mechanisms). However, any behavioral responses will generate effects on wealth inequality that are of second-order and dominated by the mechanical effect of the tax itself, which is wealth-inequality increasing.

The long-run effect of an expected inheritance tax on wealth inequality depends on the persistence of the short-run effect. Conditional on having the same short-run effect, an expected and an unexpected tax have the same long-run effect. We therefore conclude that in the short run, both an unexpected and an expected tax would dampen the equalizing effect of inheritances, which thus makes them wealth-inequality increasing. However, they both reduce wealth inequality in the long run solely through the taxation of very large inheritances.

These insights can be used to compare different tax systems. For example, currently around 0.2% of the estates are taxed in the U.S., whereas in Sweden the abolished inheritance tax was levied from 34% of the estates. While the two systems differ substantially leading to very different short-run inheritance effects on wealth distribution, our results suggest that both tax regimes reduce the wealth inequality in the long run.

[8] The finding that an unexpected inheritance tax would increase wealth inequality might seem contradictory in light of our theoretical results that a lower inheritance inequality should increase the equalizing effect of inheritance. We show that this is indeed the case for a revenue-neutral inheritance tax.

[9] This finding can explain the small effect of Swedish inheritance tax on the short-run wealth inequality found in Elinder et al. (2018).

The outline of the paper is as follows. Section 2 summarizes the prior literature. Section 3 presents the institutional settings and data. Section 4 focuses on the role of inheritances in shaping short-run wealth inequality. Section 5 introduces the empirical strategy that Section 6 uses to estimate long-run effects on wealth inequality. Connecting the short- and long-run effects, Section 7 uncovers the role of behavioral responses. Section 8 studies inheritance taxation. Section 9 discusses the robustness of our results while Section 10 concludes the paper. Theoretical derivations, proofs of propositions, validity tests, and further robustness checks are collected in an online Appendix.

2 Prior literature

There has always been and there is still a considerable amount of controversy both in the public debate and among economists about the role played by inherited wealth in shaping wealth inequality: "Put the question to any miscellaneous gathering of well-to-do people and you are likely to get as many different opinions as there are different personal experiences".[10] Wedgwood (1928, 1929) offers the first attempts to estimate the role of inheritances in shaping wealth inequality. A second wave of interest in this question has followed a structural approach, specifying and simulating models of savings and consumption choices with and without bequests.[11]

The recent years have seen a new wave of research on this question. As mentioned in the introduction, evidence from four countries indicates similar short-term effects of inheritances to those we find: Boserup et al. (2016) for Denmark, Elinder et al. (2018) for Sweden, Karagiannaki (2017) for the U.K. and Wolff (2002) for the U.S. The first two are most relevant for us as they use administrative data. Boserup et al. (2016) find that inheritances cause a stable decline in the share of wealth of the top 1% over a three-year horizon. In work simultaneous to ours, Elinder et al. (2018) find a reduction of the share of wealth of the top 10% in the year after receiving the inheritance.[12] They also show that the Swedish inheritance tax increased wealth inequality in the short run.

We provide five contributions relative to those papers: i) Our theoretical model identifies drivers of the short-run effect of inheritances on wealth inequality. The model predicts how inheritances affect the wealth distribution in settings where microdata are not available, e.g. in the U.S., and also allows us to assess the quantitative importance of each of the factors. Moreover, the model sheds some light on the existing empirical work and clarifies why inheritances reduce wealth inequality.[13] ii) We show that the latter finding – inheritances decrease inequality – is short-lasting and in fact reverted within a decade. iii) We show that the long-run inheritance effects can be understood by the responses of consumption of goods and leisure induced by inheritance receipts. iv) We exploit a research design

[10] See e.g. Cannan (1905) and Seager (1904) for two opposing arguments. Quotation from Wedgwood (1928).

[11] See Davies and Shorrocks (2000) for a summary.

[12] Elinder et al. (2018) compare the inequality series of those who inherit in 2002 and 2004 and thus identify the short-run effects in 2003 before the control group gets their bequests. They do not focus on the right tail of the wealth distribution, such as the top 5% or higher.

[13] Two examples: Elinder et al. (2018) write: "The equalizing effect can be explained solely by the distribution of wealth among the decedents being more equal than the distribution of wealth among the heirs." Our model shows that the distribution of wealth among the decedents is not a sufficient statistic for the wealth-inequality effects of inheritances. In fact, one also needs to take intergenerational mobility into account. Horioka (2009) finds that wealthier donors leave less bequests, concluding that inheritances reduce wealth inequality. Our model highlights that this conclusion also depends how wealthy the heirs of those donors are.

that uses both future heirs as control and reweighting techniques.[14] This dynamic analysis is crucial because the short-term effect can differ substantially from the long-run effect because of heterogeneous propensities to consume out of inheritances across the wealth distribution, which is precisely what we find. v) We reveal the impacts of expected and unexpected changes in the inheritance tax both in a short- and long-run perspective.

The role of inheritances shaping the wealth distribution is also closely related to the debate in the 1980s between Kotlikoff and Summers (1981) and Modigliani (1988), which addressed the share of *aggregate* wealth due to inheritances. The debate has been revisited in Piketty (2011) and in Ohlsson et al. (2017), focusing on the evolution of inheritance flows as a share of GDP. Our focus on the distinction between the short- and long-run role is similar to that of Blinder (1988) who points out the role of behavioral responses for the Kotlikoff-Summers versus Modigliani debate.[15]

Our work is also related to the literature studying the "wealth effect", estimating the short-run MPC out of tax rebates (Johnson et al., 2006 and Parker et al., 2013), the MPE out of inheritance (Holtz-Eakin et al., 1993, Joulfaian and Wilhelm, 1994, Brown et al., 2010 and Elinder et al., 2012), or the MPE or MPC out of lottery wins (Imbens et al., 2001, Cesarini et al., 2017, and Fagereng et al., 2016).[16] Relative to this work, we estimate both the MPEs *and* MPCs in one and the same setting. We also argue that these MPEs and MPCs are a mixture of inter-temporal saving decisions and intra-temporal MPCs/MPEs. Our *Mincerian dynamic approach* decomposes the intra- and inter-temporal responses. In this way, we connect the MPE/MPC literature with the strand of papers estimating the static income effect (see Chetty, 2006 and references therein) and the literature that investigates the wealth effect on saving decisions (Joulfaian, 2006, Karagiannaki, 2017 and Druedahl and Martinello, 2018). Finally, we investigate how the heterogeneity in these responses shapes wealth inequality, thereby providing macro-implications of these behavioral responses.

The labor supply responses that we find are larger than most of those in the previous literature. Section 7 performs a meta-analysis, where we compare our results to earlier estimates of the MPEs induced by both inheritances and lottery wins.

3 Institutional setting and data

3.1 Institutional setting

According to the Swedish inheritance division law, the default succession rule prescribes that the surviving spouse receives the entire estate. Only in his or her absence does the estate get divided

[14] Our empirical strategy builds on and extends the work of Fadlon and Nielsen (2015) and is related to Ruhm (1991), Grogger (1995) and Hilger (2016). In comparison, Boserup et al. (2016) compare heirs who receive inheritances to those who do not receive any bequests (a design used in prior literature on the inheritance effect on labor supply, see the discussion below). The reweighting technique we use is based on DiNardo et al. (1996). In comparison, Boserup et al. (2016) focus only on a sample of heirs aged 45-50 at the time of the inheritance receipt in order to have treatment and control groups who are at the same stage in their life-cycle profiles of wealth. This is not a relevant issue for Elinder et al. (2018), who only focus on the short-run effect and thus compare close cohorts with similar age distributions.

[15] The importance of inherited wealth across time has also been studied using alternative, indirect measures. Edlund and Kopczuk (2009) use the share of the wealthiest Americans that are female as a proxy for inherited wealth and find that self-made wealth has become more important since the 1970s.

[16] See also Maggio et al. (2018) who estimate the MPC out of unexpected returns on assets, uncovering heterogenous MPCs by asset type.

among direct descendants and in the absence of direct descendants, more distant relatives inherit.[17] By law, at least half of the estate is transferred according to the aforementioned default succession rule. Around 18 percent of all estates with surviving children have a will, and among those, 52 percent of the estate go to the children, on average, compared to 55 percent for cases without a will. Around 8 percent of the estates with a will share the estate unequally among the children.

Sweden taxed inheritances progressively according to a four-bracket system until 2004 (see Section 8). The marginal tax rates were 10, 20 and 30 percent. The tax thresholds depended on the relationship with the deceased. For instance, in 2002, the thresholds for children were 70,000, 370,000 and 670,000 Swedish kronor (SEK), corresponding to roughly 8, 42 and 76 thousand USD. 17 percent of the children who lost a parent during 2002-2004 paid positive inheritance taxes, compared to 40 percent for children who received a positive inheritance. We also discuss the taxation of inter-vivo transfers in Section 9.

3.2 Data

Eleven individual-level administrative datasets covering the population of Sweden are matched at the individual level and used in this study: (i) income tax, (ii) wealth tax, (iii) property tax, (iv) Inheritance and Estate Tax Register, (v) Integrated Database for Labour Market Research, (vi) wage and hours survey, (vii) Multigeneration Register, (viii) death dates, (ix) Cause of Death Register, (x) Car Ownership Register and (xi) National Patient Register. We complement these data with prices on financial securities from various sources as well as household balance sheet data from the National Accounts.

Our analysis population is constructed as follows. The register with intergenerational linkages provides connections between parents and biological as well as adopted children who were born in 1932 or later.[18] We start with these data and add the death date of the parents. We focus on individuals who lose any parent during the period 1999-2015 and restrict attention to children who are alive in 2014 in order to get a balanced panel.[19]

Wealth measurement

Our baseline measure of wealth at the individual level is based on detailed third-party-reported data on assets and liabilities, collected for the purpose of wealth taxation in the period of 1999-2007.[20] For bonds, stocks, funds and options, these reports contain the quantity of securities held by each individual *asset-by-asset* along with their corresponding International Securities Identification Num-

[17] Technically, in case the couple has common children, the surviving spouse has the disposal right to the estate, but is not allowed to bequeath it. If the deceased has children from a previous marriage/cohabitation, the deceased's estate goes to those children directly, unless the children postpone their inheritance until after the death of the surviving spouse.

[18] This makes it possible to study effects of inheritances for children in older ages, compared to e.g. the Danish data that cover intergenerational links for children born after 1960 (see Boserup et al., 2016).

[19] A child may thus appear twice in our sample population if she loses both parents during the sample period. Formally, the estate of a parent gets divided in case of a second-parent death or if the parents are divorced at the time of the death. Our results are robust to instead considering that subsample of children . We prefer to include all children because we observe considerable inheritances to children also for deaths of married first parents.

[20] Although less than 10% of the population paid the wealth tax, the third-party reported wealth was collected for the total population (Seim, 2017).

ber.[21] We use these data to construct a measure of wealth that follows the definition of the National Accounts and includes all financial assets, liabilities, and real estate properties subject to a few exceptions described as follows.[22] Financial assets comprise listed and unlisted stocks, funds, bonds, bank accounts, pension wealth, options and other assets. They consist of around 52% of households' total assets according to the National Accounts.

Out of financial assets, our data lack the following four components, comprising 30% of total assets: (i) pension wealth and insurances, amounting to 23 percent of households' total assets; (ii) shares in unlisted companies, 5 percent of total assets; (iii) around 25 percent of total bank accounts, comprising 1 percent of total assets and (iv) cash, less than 1 percent of total assets.[23] Real estate assets, 48 percent of total assets, include residential property (e.g. tenant-owned apartments, owner-occupied houses, vacation homes), rental, industrial and agricultural property as well as land. Our data cover these assets well. The value of total non-financial assets in our microdata amounts to around 94% of the value in the Household Balance sheets. Appendix Table A.1 provides a comprehensive comparison of the total value of households' wealth in our microdata with that of the National Accounts.

While many asset types, like real estate, get transferred at death, this is not the case for some assets with insurance elements such as occupational pensions or pension insurance contracts.[24] This could prove important for our purposes when gauging the amount of wealth that flows across generations.[25] In practice, the main insurance partners in Sweden (Fora and Collectum) report that around 25% of all individuals name beneficiaries, made up by the surviving spouse or, in their absence, by the descendants. In our sample, around 57% of the parents do not have a surviving spouse, implying that out of the 17.3% of household wealth in pension savings and the 6.4% of the insurance savings that our measure do not capture, at most 14% are transferred to children, or, assuming that the composition of national wealth is representative of the wealth of deceased, we miss 3.3% of the wealth that is passed on.[26]

Moreover, Appendix Section A.1 provides three adjustments to increase the coverage of our wealth measure. First, we proxy defined contribution pension savings by contributions to and withdrawals from personal retirement accounts as well as withdrawals from private occupational pension accounts. Second, we capitalize business income to obtain the value of closely held corporations, given

[21] They also contain annual coupon payments, interest and dividends received, as well as interest paid (for liabilities) for each individual and asset. Bank deposits, capital insurance products and liabilities were reported with their end-of-year balance.

[22] Our measure of wealth largely excludes durables and luxury goods. Cars and boats were taxable and required to be reported by tax payers with net wealth (including those assets) exceeding the wealth tax exemption level (around 3-8 % of the population depending on year). However, not reporting these assets was a common way of evading the wealth tax (Seim, 2017). Luxury goods, such as art and jewelry, were not part of the tax base and were thus not reported. This means that i) our estimated inheritance effect on wealth is biased downwards to the extent that these goods are passed on to the next generation and ii) purchases of durable and luxury goods will be captured in consumption in our analysis of the dynamic effects of inheritances.

[23] Similar to cars and boats, cash was taxable and required to be self-reported for around 3-8 % of the population who were eligible to pay wealth tax.

[24] Such savings vehicles can typically be signed with or without a beneficiary. Not naming a beneficiary implies higher returns for older individuals, since they share the pension wealth of the deceased who made that choice.

[25] The repayment can be both lump-sum and in the form of annuities.

[26] However, the wealth portfolio of the deceased is more likely to contain a larger share of pension wealth than that of the total household balance sheets, but since this only concerns heirs who lose a parent with a surviving spouse who name beneficiaries, even a pension share of 50% implies that we only miss around 7% of the wealth that is passed on.

that the taxation of such assets was poorly enforced. Third, in some years, third-parties were obliged to report bank values if the total annual interest exceeded 100 SEK. We provide two solutions that bound the potential bias (see Appendix Section A.2): i) we compare the direct inheritance effect on wealth with the recorded inheritance in the estate data, which always includes bank values; ii) we impute bank values from a subset of individuals whose bank reported their bank value although they were not required to by law. Taken together, our adjustments ensure that we capture 95% of all household wealth in the National Accounts.

Capitalization method

In order to construct longer wealth series and address the problem of missing wealth data on unlisted companies, we capitalize the capital return series which cover a longer period than the wealth data, 1995-2012 as opposed to 1999-2007.

Essentially, we infer an individual's wealth from capital income and expenditures or taxes paid within each asset class using the national average return rate or tax rate in that class. To our knowledge, this is the first application of the capitalization method in a quasi-experiment setting.[27] Fortunately, our wealth records allow for a direct validation test of the method. While the estimated magnitudes differ somewhat across methods, the patterns are remarkably similar.

We briefly discuss the method here while Appendix Section A.3 provides all assumptions and the implementation of our approach. For assets that deliver capital income, we compute the average rate of return within each of five asset classes as the ratio of total capital income to aggregate wealth in the household balance sheets in that class. We then inflate each individual's capital income with the obtained average rate of return. For assets that do not deliver capital income, e.g. properties, we use two different strategies. For real estate, we either observe ownership directly (1999-2011), or capitalize property taxes paid by the individual (1995-1998).

The general assumption behind the capitalization method is that the rate of return is constant across individuals within each asset class. In our research design, explained in Section 5.1, the assumption is weaker, namely that the average rate of return for an asset class is the same in treatment and control groups. When capitalizing property taxes, we assume that average taxes, measured as taxes paid divided by the market value of properties held, are constant across the treatment and control groups within each property type.

Our capitalized wealth concept is slightly different from the baseline definition. It excludes capital insurance vehicles and tenant-owned apartments since the former do not deliver taxable capital income and the latter are not subject to the property tax. However, it includes closely held businesses.

3.3 Empirical setting and our population

With a population of about 10 million, Sweden is characterized by a large middle class, low inequality in both income and wealth by international standards, higher intergenerational income mobility and a larger government relative to most other industrialized countries (Calvet et al., 2007 and Jäntti and

[27] The capitalization method has first been used in Atkinson (1956) to study financial asset ownership, and has been fully developed to provide a comprehensive measure of wealth in Saez and Zucman (2016), where it is used to study wealth inequality.

Jenkins, 2015). Net private wealth has been increasing since the late 1990s, reaching 434 percent of national income in 2014, compared to 470 percent in the US (Alvaredo et al., 2016). Using our individual-level data, Appendix Figure E.1 reveals that this increase i) is due to price changes rather than quantity changes, ii) is primarily occurring within real estate rather than in financial assets, and iii) has accrued proportionally to all parts of the distribution, with no impact on the top quantiles' share of aggregate wealth.

Sweden has experienced an increase in wealth flows across generations over the last forty years (Ohlsson et al., 2017). The share of total intergenerational transfers over national income reached 6 percent in 2000, which is still low as compared to 12 percent in France or 8 percent in the United Kingdom.[28] Ohlsson et al. (2017) speculate that this difference is partly explained by the Swedish welfare state. Even though the wealth-income ratio is quite high by international standards, extensive public and occupational pension systems imply that privately held wealth at the end of life is lower in Sweden as compared to other countries.

Our baseline population covers 1.161 million parental deaths with 2.498 million surviving children. Within this population, the share of all estates allocated to descendants and surviving spouses is 59 percent and 39 percent, respectively. Parents and children are on average 78 and 48 years of age, respectively, at the time of the parent's death. The average inheritance at tax values received by children during the period 2002-2004 amounts to 48 thousand SEK and roughly half of the wealth left behind by the deceased comprises financial assets. Finally, even though inheritances are also very skewed in our analysis population, the size of inheritances relative to baseline heir wealth is declining across the wealth distribution (see Appendix Figure E.3). In other words, wealthier children receive larger inheritances in absolute terms, but not relative to their own wealth. We return to this point in the next section.

We use our individually matched wealth records with inheritance receipts to provide novel descriptive statistics on the joint distribution of wealth and inheritances (see Appendix Section D.3.1 for the full set of descriptives). We start by investigating how individuals are reshuffled across the wealth distribution after receiving an inheritance. Due to the skewness of the inheritance distribution, for all children, even those with negative wealth, there exists an inheritance amount that would move them as high as the top 0.5% of the wealth distribution, even though this likelihood is slim for poor heirs. In fact, the skewness of the wealth distribution creates a persistence at the top, e.g. all individuals who belong in the top 8% of the wealth distribution before the inheritance receipt will remain in the top 10% of the wealth distribution post inheritances, irrespective of how much they receive.

4 Short-run effect of inheritances on wealth inequality

In this section, we lay out the short-run effect of inheritances on wealth inequality. We start with a theoretical framework that connects the short-run effect into three well-known parameters. Thereafter, we estimate the short-run effect directly and investigate counterfactual scenarios.

[28] See Piketty (2011) and Atkinson (2013), respectively.

4.1 A theoretical model

The short-run effect of inheritances on wealth inequality depends on whether wealthier heirs receive larger inheritances. This section presents a model that illustrates the two forces which determine this effect. The first force is intergenerational wealth mobility, or how the likelihood of having a wealthy parent depends on own wealth. The second is inheritance inequality, which is shaped by both wealth inequality in the donor generation in mid-life and how much more inheritances wealthy parents leave behind. The model has sharp predictions about the short-run effect of inheritances on relative measures of wealth inequality and offers a decomposition which we implement empirically.

Consider a dynastic economy where each individual has one child (heir). For simplicity, assume that all agents receive inheritances at the same age and denote each individual by her rank in the within-cohort wealth distribution just before receiving inheritance.

We denote the proportion of children among the top θ of the heir wealth distribution, whose parents are from the top θ of the parent wealth distribution by $\overline{\alpha}$. The corresponding share for the bottom $1-\theta$ share is denoted by $\underline{\alpha}$. Higher alphas mean a lower level of intergenerational wealth mobility.[29]

$\overline{A}$ and $\underline{A}$ denote the average wealth among heirs before receiving an inheritance. $\overline{A_p}$ and $\underline{A}_p$ are the analogous moments within the parent generation. We parameterize parents' wealth trajectory so that the average inheritance is given by $\overline{\gamma}\overline{A_p}$ and $\underline{\gamma}\underline{A}_p$ for each group, respectively. S^W denotes the share of total wealth of the top θ heirs before inheritance and S^I denotes the top-θ parents' share of total inheritances, that is $S^W = \frac{\theta\overline{A}}{\theta\overline{A}+(1-\theta)\underline{A}}$ and $S^I = \frac{\theta\overline{\gamma}\overline{A_p}}{\theta\overline{\gamma}\overline{A_p}+(1-\theta)\underline{\gamma}\underline{A}_p}$.[30]

Proposition 1. *The share of wealth in the hands of the top θ of the wealth distribution upon receiving an inheritance is increasing in inheritance inequality (keeping the average inheritance constant), and decreasing in intergenerational wealth mobility. Moreover, inheritances reduce the wealth share of the top-θ heirs iff*

$$(1-\theta)\underbrace{\left(S^W-\theta\right)}_{\substack{\text{wealth}\\ \text{inequality}}} > \underbrace{(\overline{\alpha}-\theta)}_{\substack{\text{intergener.}\\ \text{immobility}}}\underbrace{\left(S^I-\theta\right)}_{\substack{\text{inheritance}\\ \text{inequality}}} \quad (1)$$

In particular, (1) holds if one of the following is true:

i - intergenerational wealth mobility is high, namely the likelihood of having a parent in the top group for top heirs is lower than their wealth share, $S^W > \overline{\alpha}$,

ii - inheritance inequality is smaller than wealth inequality, $S^I < S^W$, or equivalently $\frac{\overline{\gamma}}{\underline{\gamma}} \times \frac{\overline{A_p}}{\underline{A}_p} < \frac{\overline{A}}{\underline{A}}$.

The proof of the proposition and its generalization are found in Appendix Section D. The intuition of the proof is as follows. The top wealth share is reduced after inheritances if the share of wealth in the hand of the top θ exceeds their share of inheritances, $\frac{\overline{I}}{\underline{I}} < \frac{\overline{A}}{\underline{A}}$. Proposition 1 connects this condition to the basic parameters of the model.

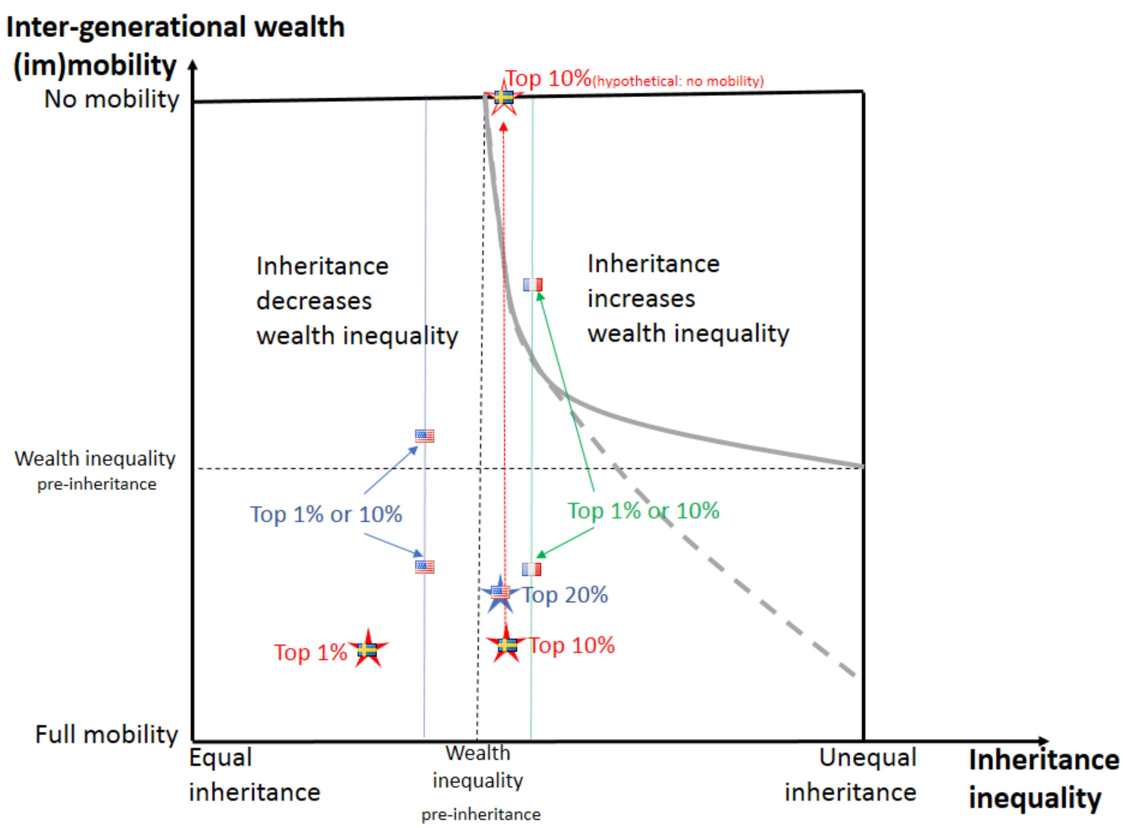
[29] More precisely, $\frac{1-\overline{\alpha}}{1-\underline{\alpha}} = \frac{1-\theta}{\theta}$, $\overline{\alpha} \in [\theta, 1]$ and $\underline{\alpha} \in [1-\theta, 1]$ where the lower bounds are attained if there is perfect wealth mobility.

[30] The latter is not theoretically equal to the top-θ share of inheritances since the rankings and groups are defined by wealth, but they are approximately equal due to persistent wealth ranks over the life cycle (Boserup et al., 2014).

Graph 1 illustrates the findings of Proposition 1. Discussing some extreme cases can provide intuitions for this graph. If there is no inheritance inequality, $S^I = \theta$, inheritances reduce wealth inequality independently of the degree of intergenerational mobility (on the y-axis). If there is full intergenerational wealth mobility, $\overline{\alpha} = \theta$, inheritance flows reduce relative wealth inequality as long as there is some degree of wealth inequality, $S^W > \theta$. If there is no intergenerational mobility, $\overline{\alpha} = 1$, then inheritances are equalizing if and only if the top-wealth individuals have a higher share of wealth than of inheritances.

The higher is wealth inequality, the lower is the level of mobility necessary to make the inheritance an equalizing factor. In fact, when wealth inequality increases, both thresholds move further from the reference, which leads to an increase in the area where inheritances decrease wealth inequality.

If the share of total inheritances of the top θ is smaller than its share of wealth, inheritances reduce the share of wealth in the hands of the top θ before inheritances (condition ii). Inheritance inequality differs from wealth inequality among heirs for two reasons. One reason is the heterogeneity in the life-cycle pattern of wealth across wealth levels. The second reason is simply that the inheritance and wealth distributions reflect wealth distributions for different generations. In the recent periods, these two forces seem to have been countervailing.



Graph 1: The short-run effect of inheritance on wealth inequality among heirs

Note: The gray solid line represents the curve where the inheritance flow does not change the share of wealth in the hands of the wealthiest heirs in the pre-inheritance period (Proposition 1). The dashed gray solid line represents the same curve once we focus on the wealth of the top wealthiest heirs in each period. Inequality in wealth or inheritances is measured in relative terms as the top 1% share.

The x-axis represents S^I in the model, and the y-axis $\overline{\alpha}$. Lower and upper bounds of the x- and y-axes are θ and 1. The points on both axes marked by "Wealth inequality" correspond to the top share measure, S^W. The flags indicate the location of the corresponding countries. For example, for France we know that the top 1% share of inheritance is larger than the wealth counterpart.

Appendix D extends Proposition 1 in three ways. Proposition 1 investigates the inheritance effect on the share of wealth in the hands of the wealthy, defined by their pre-inheritance wealth level. Our first extension allows the composition of the top group to change after inheritances.[31] More precisely, we derive similar conditions to i and ii for inheritances being inequality-increasing in that case. The main difference is that we obtain a larger wealth-inequality increasing region, depicted in Graph 1. The intuition is that the top share's post-inheritance wealth is larger when we rerank individuals after inheritance receipt.[32] Second, we also show that absolute measures of inequality, such as the dispersion of wealth, always increase because of inheritances unless there is perfect intergenerational mobility or no inheritance inequality (see Proposition 4). Third, we show that similar necessary conditions hold for other measures of relative inequality, e.g. the Kuznets ratio and the coefficient of variation.[33]

Predictions of the model from aggregate moments

Proposition 1 predicts whether wealth inequality will decrease or increase due to inheritances in the short run. This prediction depends on three well-known moments: wealth and inheritance top shares, and intergenerational wealth mobility, that is S^W, S^I and $\overline{\alpha}$. Appendix Tables 3 and 4 present empirical estimates of these parameters for the top 1% and 10% in Sweden. We estimate $\overline{\alpha} = 9.87$, $\underline{\alpha} = 99.09$, $S^W = 30\%$ and $S^I = 24\%$ for the top 1%.[34] We also apply our model to two non-Nordic countries with reliable estimates of both wealth inequality and inheritance inequality: France and the U.S.[35] For the U.S. we also have one estimate of intergenerational wealth mobility, which allows us to point identify how inheritances change wealth inequality. Appendix Section D presents the details of these estimates.

The flags in Graph 1 mark the locations of these three countries. For Sweden, inheritances reduce wealth inequality at the top 1% because of low inheritance inequality relative to wealth inequality. However, for the top 10%, the inheritance effect depends on the level of intergenerational mobility. For the U.S., inheritances reduce wealth inequality at the top 20% due to a high level of intergenerational mobility. However, we do not have any estimate of wealth mobility for the top 10 or 1% in the U.S. and for any level in France. This ties our hands in the case of France where inheritances may be wealth-inequality increasing or not depending on the level of intergenerational mobility. In the case

[31] Empirically, this change is small since individuals' wealth ranks are persistent over time (see Appendix Figure D.4 and Boserup et al., 2014) and the effect of inheritances on who is at the top of the wealth distribution is small (see Appendix Figures D.2 and D.4). This is the reason for the proximity of the solid and dashed lines around the reasonable (i.e. observed as opposed to counter-factual) level of inheritance inequality in Graph 1.

[32] Moreover, given a certain initial wealth distribution and degree of intergenerational mobility, a higher inheritance inequality implies a larger gap between the top share's post-inheritance wealth measured with fixed top groups or evolving ones. This explains why the inequality-increasing region extends south.

[33] It is, however, difficult to find necessary and sufficient conditions similar to those in Equation 1 for when inheritances reduce Kuznets ratios. This is fundamentally due to the difficulty in handling the quantile sum of two random variables, see Watson and Gordon (1986) and Hernández et al. (2014).

[34] Appendix Tables 4, 5 and 6 also present parameter estimates for the top 1, 10 and 20%, respectively, using different measures of parental wealth. We use measurements at different points in time: at the time of death; one year before death, in 1991 and the average of wealth during 1991-1993, generating estimates that are stable.

[35] Estimates are from Piketty et al. (2006) and Garbinti et al. (2017) for France and Saez and Zucman (2016), Alvaredo et al. (2017) and Charles and Hurst (2003) for the U.S., see Appendix D.1 for the details.

for the U.S., however, Proposition 1 shows that inheritance inequality is low enough relative to wealth inequality that inheritances reduce the share of wealth in the hands of the top 1 or 10% independently of the level of intergenerational wealth mobility.

4.2 Estimating the short-run effect of inheritance on wealth inequality

We now test the prediction that inheritances decrease wealth inequality in Sweden and estimate the inequality effects directly in our microdata. We then disentangle the forces of intergenerational mobility and inheritance inequality, as pointed out by Proposition 1.

Figure 1, Panel A displays the Lorenz curve of wealth among heirs before and after receiving an inheritance, as well as the Lorenz curve of inheritances (Lorenz, 1905). One fourth of the heirs have negative net wealth, and it takes until slightly above the 60th percentile of heirs to accumulate enough wealth to reach a total of zero wealth. Moreover, 60 percent of the heirs receive no inheritances. This is both due to the fact that negative wealth is not transferred at death and that surviving spouses may keep the entire estate (see Section 3).

The top 10% share of wealth/inheritances are estimated to be 64 and 68 percent, respectively, so that inheritances are more concentrated in the hands of the top 10% than is wealth. However, that order is reversed when considering higher cutoffs than 4%, which is approximately the point where the two Lorenz curves cross. For instance, the wealth share in the hands of the top 1% is higher than that of inheritances, 30 against 24 percent.

More importantly, Panel A compares the Lorenz curve of wealth before and after receiving inheritances. It shows that inheritances reduce the share of wealth in the hands of top individuals independently of the level at which we define the top group. For instance, the share of the top 10% (1%) is reduced from 64% (30%) to 61% (28%).

The top shares of wealth are reduced by inheritances since the inheritance shares of top groups are smaller than their wealth shares. For example, the top 10% (1%) holds 64% (30%) of the pre-inheritance wealth but receive only 26% (6%) of the total inheritances (see the inheritance accumulative share by the pre-inheritance rank curve in Panel A). This means that the inherited share of wealth is decreasing in wealth right after receiving inheritances. This pattern is reversed over time as we will see in later sections.

Proposition 1 points out two forces that determine the short-run effect of inheritance on wealth inequality, namely intergenerational wealth mobility and inheritance inequality. The following counterfactual analysis distinguishes the role of each of these forces by measuring the inheritance effect under extreme levels on these two forces.

Panel B of Figure 1 presents the results of this exercise. To facilitate the comparison, it depicts the effect of inheritances on top shares' wealth, which is the negative of the inheritance effects on the Lorenz-curves of wealth. For instance, inheritance flows reduce the share of wealth in the hands of the top 10% (1%) by 2.78 (1.65) percentage points.

Panel B also shows the inheritance effect if we take the inheritance tax that each heir pays, using the observed amounts from tax reports, into account. This adjustment suggests an infinitesimal effect of inheritance taxes, e.g. the inheritance effect on the wealth share of the top 10% (1%) goes from -2.78

(-1.65) to -2.76 (-1.64). Note that the tax *reduces* the equalizing effect of inheritances – an issue which we discuss in detail in Section 8.

How does the impact of inheritances on wealth inequality change if we also take inter-vivo transfers into account? The inheritance and estate data contain taxable inter-vivo gifts for 2002-2004. We use these data to compute the average value of life-time gifts within each percentile of the wealth distribution in 2003 depending on when their parents die during the years 2003-2015. We then add the cumulative value of gifts over the last twelve years, percentile-by-percentile, assuming that gift patterns within the years before death are constant across generations. This generates a measure of total intergenerational transfers.

Panel B of Figure 1 shows the effect of these total intergenerational transfers on the Lorenz curve of wealth. We document two facts from this exercise. First, we estimate the average gift level and the ratio of the total amount of received gifts over a child's individual wealth, for each percentile of wealth. Similar to inheritances, gift shares of wealth decrease over the wealth distribution, indicating that gifts are also wealth-inequality decreasing. We also document a linear pattern of gift amounts against years to death that falls to around 100 SEK per year during the thirteen years before death. See Panels A and B of Figure D.5 in the Appendix for details. We thus multiply these annual gifts for each wealth percentile by 12 or 16 to get a lower and upper bound for gifts during life-time.[36] Panel B of Figure 1 as well as Panel C of Figure D.5 present the results: gifts are increasing the equalizing effect of inheritances, but not by any great deal.[37]

Taking the hidden wealth of donors and heirs into account, Panel B illustrates that the equalizing effect of inheritances increases slightly. More precisely, we allocate the estimated hidden shares of wealth over the wealth distribution according to Alstadsaeter et al. (2017) to both heirs' and donors' wealth. For example, the inheritance effect on the wealth share of the top 10% (1%) goes from -2.78 (-1.65) to -2.75 (-1.63). The adjustment of the hidden wealth increases inequality among both heirs and parents, which according to Proposition 1 creates two countervailing forces. Panel C of Appendix Figure D.6 illustrates this point empirically: the adjustment of the heir's (parent's) wealth distribution reduces (increases) the equalizing effect of inheritances. In sum, neither the inheritance tax nor the hidden wealth adjustment alter our results quantitatively. However, this is not the case for the hypothetical scenarios suggested by our model, which are presented next.

The first hypothetical case is the world with full intergenerational mobility. The effect of inheritances on top shares in this hypothetical case is equivalent to the case where all heirs inherit the same amount (inheritance equality). In both of these two cases, the total amount of inheritance received by each wealth group is the same. Proposition 1 predicts that in the short run, all top shares would be reduced after inheritances. This hypothetical case is equivalent to moving to either the x- or the y-axis in Graph 1. We construct this hypothetical case in the data by assigning donors randomly to heirs. Figure 1, Panel B confirms the prediction of the model as the triangled blue dots are all below zero. It also shows that inheritances are more wealth-inequality reducing in this hypothetical scenario than

[36] This uncovered empirical pattern of gifts during the life time allows us to estimate the level of life-time gifts, extending the approach of Elinder et al. (2018).

[37] It is worth noting that these patterns generalize to the population. Appendix Section D.4 investigates general gift-patterns in the entire Swedish population. We find that gifts increase nominally but decrease in relative terms over the wealth distribution. Moreover, the steep gradient in age of gift-giving from a low value of gifts holds true also in general.

in the real world.

The second hypothetical case considers a world with no intergenerational mobility, which is equivalent to moving to the ceiling in Graph 1. In this case, Proposition 1 predicts that inheritances can be wealth-inequality reducing/increasing if the inheritance inequality is low/high. In order to test this in the data, we construct a hypothetical case by matching donors and heirs perfectly assortatively: assigning parents' wealth measured one year before death to children such that children in each percentile of the wealth distribution get the average inheritance of the same percentile of the inheritance distribution. We then measure the change in the Lorenz curve of wealth due to these hypothetical inheritances.

The red squared series of Panel B in Figure 1 shows that in the hypothetical case of no intergenerational mobility, inheritances are wealth-inequality increasing depending on which level of the top shares we consider. For example, the share of wealth in the hands of the top 1% is reduced after inheritances while the share of the top 10% increases. This occurs since wealth shares are larger/smaller than inheritance shares at 10% (1%), see Panel A. This suggests that the Lorenz curves of wealth and inheritance cross each other between the 90 and the 99 percentile.

The third and last hypothetical case is that of extreme inheritance inequality. This hypothetical case corresponds to moving to the right wall in Graph 1. Proposition 1 predicts that inheritances can reduce/increase wealth inequality depending on the level of intergenerational mobility. To test this prediction, we allocate all inheritances to the top 1% parents. The result is a large wealth-inequality increasing effect of inheritance in this case. More precisely, if only the wealthiest top 1% of the parents give inheritances to their heirs, then the inheritance effect on wealth inequality is almost of the same magnitude but with the opposite sign. The fact that the case of no mobility and extreme inheritance inequality is equivalent for people below the 60th percentile reflects that the share of such heirs who have a very wealthy parent is extremely low.[38]

In sum, the actual effect of inheritance on the top wealth shares is much closer to the full intergenerational mobility case than to the no intergenerational mobility case, suggesting that a relatively low inheritance inequality is the main driver of the inequality-reducing effect at the top of the Swedish wealth distribution in the short run.

5 Empirical strategy for the long-run effect

5.1 Empirical strategy

To uncover the long-run effects of inheritances, we exploit a research design which provides estimates of the causal effects of receiving inheritances on individual-level outcomes and aggregate outcomes – relative and absolute measures of wealth inequality. This section explains our strategy.

We compare individuals of the same birth cohort and education level who receive an inheritance

[38]Appendix Figure D.6, Panel A exhibits other extreme cases where the inheritances are allocated to the top 10, 1, 0.1 or 0.01%. Panel B illustrates the inheritance effect on the top wealth shares while top heirs are defined (and fixed) in the pre-inheritance period. The higher is the concentration of inheritances, the higher is the share of newcomers in the post-inheritance top wealth group, which means that we are further away from the setting of Proposition 1 and closer to the generalized model in the appendix.

at age s (treatment) to those who receive an inheritance at age $s + \delta$ (control). This empirical strategy exploits the randomness of timing of death within δ years and builds directly on Fadlon and Nielsen (2015) and is related to Ruhm (1991), Grogger (1995) and Hilger (2016).

The identification assumption is that the life-cycle patterns of outcomes, e.g. wealth, are the same for children with a similar education who lose a parent within δ years in absence of the event. This strategy identifies effects until period $s + \delta$ when the control group receives inheritances, i.e. becomes treated. We reweight observations in the control group by four education levels (primary school, high school, vocational tertiary education and college graduates) to match the treatment group following DiNardo et al. (1996). Our weights range from 0.46 to 11.93.

Figure 2, Panel A verifies the parallel trend assumption between the treatment and the control group for different levels of δ, ranging from 3 to 14. It does so by plotting the time series of median nominal wealth for heir groups losing a parent in different calendar years. All time series exhibit the same trend before the event, thus supporting the assumption that these individuals are facing the same life-cycle pattern in the absence of treatment. However, a larger δ enables an evaluation of long-run effects. Comparing the 2000-cohort to 2003 (2006) identifies effects over a period of 3 (6) years.[39]

Figure 2, Panel B compares wealth for individuals who receive inheritances in 2000 (treatment) to the wealth of potential control groups ($\delta \in \{2, 10\}$). Three patterns are illustrated in this panel. First, the immediate effect of losing a parent on wealth, measured one year after parent death, is insensitive to the choice of control group within 10 years. Second, the dynamic effects suggest a declining pattern of inheritance. This pattern of a depletion of inherited wealth is also similar across different control groups. Third, the differences after the control group receives inheritances – the dashed lines – are constant over time. This supports a *strong* parallel trends assumption. The treatment and control groups exhibit the same life-cycle patterns after both have received their inheritances. This is not necessary for our research design to be valid, but it is reassuring. We conclude from Figure 2 that the wealth of heirs receiving an inheritance in different years evolves similarly.[40]

With these illustrative results, our baseline estimation strategy uses children who receive an inheritance during 2000-2004 to form the treatment group while those receiving an inheritance in 2008-2012 constitute the control group. Our choices are constrained by the availability of wealth data between 1999-2007. We thus estimate inheritance effects on wealth until 2007. The only role of the control group is to identify deviations of the treatment group from a calendar-time trend around the event of receiving an inheritance. We demean each outcome with the control-group mean so that heir i's outcome $\hat{y}$ at time t is $\hat{y}_{i,t} = y_{i,t} - \bar{y}_{C,t}$ and $\bar{y}_{C,t}$ is the control group mean of y at time t.[41] We then estimate the following event-study equation:

[39] These results are not specific to median wealth as the outcome. Appendix Figure E.4 shows time-series for mean winsorized wealth, percentile ranks in the distribution and the inverse hyperbolic sine function, see Section 5.2. These alternative outcomes all support the assumption that treatment and control groups would evolve in parallel in absence of the treatment.

[40] Panel D of Appendix Figure E.4 holds the control group constant (to 2008-2012) but varies the treatment group. It provides further evidence for the parallel-trend assumption and that the treatment effect is similar independent of δ, with the exception of the post-2005 period where the absence of the inheritance tax creates a larger effect (see Section 8).

[41] Appendix tables 7 and 8 show summary statistics of parents and children in our sample.

$$\hat{y}_{i,t} = \sum_{k} \beta_k I_{t-\sigma(i)=k} + \varepsilon_{i,t} \tag{2}$$

where $\sigma(i)$ denotes the year when child i receives an inheritance. Index k is thus event-time and the β_k-coefficients capture the average effects of losing a parent dynamically in a non-parametric way.[42] We use the same estimation strategy when estimating dynamic effects on wealth inequality in Section 6.

We refer to this approach as the *fixed-control* method since it uses the same control group for all treatment groups. This method is different from the *fixed-delta* method of the previous literature, which uses individuals treated at $s + \delta$ as a control for those treated at s. Given that the choice of δ is not relevant within the 2-10 window investigated above, we prefer the fixed-control method for all wealth-related outcomes since our panel is unbalanced (data on wealth are only available for 1999-2007) and in this method, the control group is balanced. However, for labor market outcomes where we have a longer panel, we use the fixed-delta method for those variables, see Section 7.[43]

There are three additional merits to the fixed-control method. First, the role of the control group is transparent: it only identifies calendar-year patterns. Second, it is computationally faster since the control group is only used for demeaning. Third, we can also measure the proportional effect of treatment without using the logarithmic function, implemented as $\hat{y}_{i,t} = y_{i,t}/\bar{y}_{C,t}$. This is particularly useful for variables which can be non-positive, like our main variable of interest here, wealth.

Appendix Figure E.5 compares our main estimates with the fixed-delta method and shows that our findings are the same irrespective of the approach we use when both strategies are available. Our choice of approach thus only optimizes our empirical strategy to data availability.

We further confirm our empirical strategy, using a pure event-study approach. More precisely, all outcome variables expressed in ranks are stable over time. For those outcomes, we do therefore not need a control group. Panel C in Figure 2 makes this point. The wealth rank of heirs is stable over time until the inheritance receipt. This illustrates that treatment effects can be detected without the use of a control group.

5.2 The effect of inheritances on the average heir's wealth

To set the stage, we use the empirical methodology above to investigate how the average individual's wealth responds to receiving an inheritance. Namely, we estimate both the size of the inheritance received and the dynamic evolution of the inherited wealth.

Figure 3, Panel A presents the coefficients from estimating Equation 2 with different measures of individual-level nominal wealth expressed in thousand SEK. More precisely, we start by estimating effects on wealth at market value using current prices and using fixed prices in the solid blue and dashed green series, $p_t.q_t$ and $p_{2000}.q_t$, respectively.[44] The wealth measured at 2000-prices is clear

[42] All our results are robust to also including indicators for the year of inheritance (treatment group fixed effect).

[43] To be precise, the treatment group is the same, cohorts 2000-2004, but the control group comprises heirs receiving an inheritance 8-11 years after the treatment group (i.e. $\delta \in \{8, 11\}$). The latter choice of pooling several δ's only increases the precision.

[44] Because the wealth distribution is skewed, our results for wealth in thousand SEK as the outcome are sensitive to outliers. To prevent the results to be driven by these, the thousand SEK-estimates in the main text are based on winsorized (top-

from asset price changes during 1999-2007, allowing us to interpret the wealth change as a volume effect rather than a combined volume and price effect. This addresses the issue of understanding wealth changes when asset prices fluctuate. As King (1927) notes: "To calculate changes in the volume of wealth, we need a physical scale rather than a dollar standard".

On average, nominal wealth increases by around 58 thousand SEK (6.5 thousand USD) one year after the parent's death.[45] This amounts to 10 percent of the pre-inheritance wealth (or 30 percent of average annual labor income).[46]

Over time, we see a declining pattern of the inheritance effect on wealth. Seven years after losing a parent, the wealth effect is recorded at 28 thousand SEK, as indicated in Table 1, or around half of the original inheritance effect.

The dynamic effects are similar irrespective of whether we consider current or fixed prices. This suggests that the observed depletion of wealth is due to changes in quantities of assets, i.e. savings, rather than capital gains. In fact, if heirs had kept their inherited wealth untouched, changes in prices would have led to a constant inheritance effect over time. In order to show this, we fix the portfolio at event-time one (after the inheritance receipt) and only allow asset prices to vary over time. The resulting series marked *Constant-q* in Figure 3, Panel A present the inheritance effects on wealth in the absence of any behavioral responses.

A constant inheritance effect in *Constant-q* series is interesting given that the average individual's wealth is growing substantially during this time period. An explanation for this can be found in Appendix Figure E.8, which breaks down the average wealth effect into subcomponents. Financial assets, which include bank account wealth, comprise around 80% of the mechanical effect while housing wealth only accounts for about 10% of inherited wealth.[47] Even though the analysis period is characterized by large house price increases, housing is not an important component of inherited wealth, generating similar effects for wealth at current and fixed prices.[48] In contrast, the effects in Figure 3, Panel A titled *Benchmark* denote the inheritance effects if the inheritance had been invested according to the pre-inheritance portfolio, i.e. in money, real estate, stocks and funds in the same proportions as the portfolio composition before receiving the inheritance (calculated at the individual level). With such an investment and in the absence of behavioral responses, the average heir would have doubled her inherited wealth during the seven-year period.

Panel B considers a non-linear transformation of nominal wealth at current prices that shows a very similar pattern to that in Panel A. We estimate the proportional effect of inheritances on wealth by using two different and complementary strategies that overcome the challenge that wealth can

---

and bottom-coded) wealth at the 0.1 and 99.9 percentiles, by calendar year. However, we perform a battery of robustness tests to investigate the extent to which our results are driven by a few wealthy individuals (see Appendix Figures E.6 and E.7).

[45] This is due to a delay in the estate division. For example, the Inheritance and Estate Tax Register reveals an average of 4.8 months between the death date and the approval date of the estate file, implying that about 40% cases will carry on to the next calendar year.

[46] We discuss and assess the magnitude of this effect in Section 9.2. Appendix Figure E.8 replicates the analysis of market value effects in Figure 3 and adds the underlying effects on tax values. These series are, by construction, lower in magnitudes and the declining pattern remains unchanged.

[47] It is natural that financial wealth accounts for a larger share of received inheritances than that of estates, which amount to roughly 50% of the wealth of the deceased one year before death (see Appendix Figure E.3), as many heirs sell indivisible assets, such as houses, upon death and split the resulting cash receipt. This then registers under financial wealth.

[48] Appendix Figure E.1 shows that wealth increases during this period are the result of capital gains in real estate.

be negative or zero. The first strategy draws on our empirical strategy. Instead of demeaning the treatment outcome with the control-group mean, it measures the ratio, as explained in Section 5.1. The second strategy uses the inverse hyperbolic sine function.[49] Panel B suggests that both methods deliver the same pattern of inherited wealth over time as do the level and rank.[50]

At the household level, the direct impact of the inheritance on total wealth is estimated to be 20% larger, i.e. 69 as opposed to 58 thousand SEK (Appendix Figure E.8). However, the declining pattern of inherited wealth is as apparent at the household level, suggesting that the depletion is not due to intra-household transfers. Household wealth includes the wealth of the partner (spouse or cohabitant) and the children (irrespective of whether they reside in the household or not).

The declining importance of inherited wealth is the most striking feature in Figure 3. Seven years after losing a parent, half of the inherited wealth is depleted and the 10% increase in wealth upon receiving the inheritance has shrunk to 2.5%.

There are two direct implications of the observed rather rapid depletion of inherited wealth. First, although this is aligned with previous findings where wealth shocks crowd out saving (for inheritance effects, see Joulfaian, 2006, Karagiannaki, 2017 and Druedahl and Martinello, 2018 and for the impact of lottery gains, see Cesarini et al., 2017), it is not reconcilable with complete markets or an intergenerational budget constraint, an issue we discuss further in Section 9.3. Second, the disappearance of inherited wealth in the relatively short span of time provides some direct evidence for the Kotlikoff-Summers and Modigliani debate on the share of inherited wealth in the total stock of aggregative capital. Most of the initial debate came from conceptual differences, as pointed out in the pioneering work of Piketty (see Piketty and Zucman, 2015 and references therein). Our finding that inherited wealth does not last long suggests that the total size of inherited wealth in the hands of a generation is only considerable around the time of receiving the inheritance.

6 Long-run effect of inheritances on wealth inequality

Two factors determine how the short-run inheritance effects on wealth inequality evolve over time. Those factors are heterogeneity in behavioral responses to inheritances and heterogeneity in the rate of return on inheritances across the wealth distribution. These components lead to two relevant questions. Namely, do wealthier heirs deplete their inheritances at a different pace as compared to less wealthy heirs? Do they invest their inheritances more wisely? These questions constitute the focus of this section and we answer them from different complementary angles.

Figure 4 investigates the evolution of heirs' wealth after we divide heirs by their wealth before inheritance receipt and by inheritances. Then, we apply the empirical strategy in Section 5.1 to each of these subsamples and show the effects on average wealth within these subsamples. For heirs

[49] See (Johnson, 1949; Burbidge et al., 1988). [Write "Johnson (1949) and Burbidge et al. (1988)" and not parenthesis around the two]We use $\operatorname{arsinh}(A) = \log(\theta A + \sqrt{1 + (\theta A)^2})$, with $\theta = 4$ to ensure that the estimated proportional mechanical effect matches the ratio of the mechanical effect on wealth divided by the average wealth before the inheritance.

[50] In addition, Panel D of Appendix Figure E.8 shows that the almost-linear adjustment is present also when considering population-wide within-cohort ranks as an outcome. This measure is preferable to across-cohort rank since it accounts for life-cycle trends in wealth. For ties, we take the average rank. Since many individuals have zero wealth, this is important as we avoid adding unnecessary noise by creating unique ranks.

among the bottom 95% of the distribution who receive inheritances within the bottom 95% of the inheritance distribution, we see the depletion pattern over time, which is familiar by now. However, heirs who belong to the top 5% or the bottom 95% but receive large inheritances exhibit a constant inherited wealth amount, irrespective of whether we study wealth at nominal or real prices. Not only are the depletion patterns different across groups, but the size of the wealth effects just after inheritance receipt differ substantially. For heirs in the bottom 95% (99%) of the distribution who receive inheritances in the bottom 95% (99%), the estimated inheritance amounts to 40 (51) thousand SEK, while poor heirs who receive inheritances among the top 5% (1%) get 560 (1130) thousand SEK on average. The same pattern holds when splitting heirs and parents into the top 1% / bottom 99% of the corresponding distributions in Appendix Figure D.8, even though the estimates become more noisy.[51]

This suggests that the long-run inheritance effect on the wealth distribution is concentrated at the top, since heirs who are pushed to the top of the wealth distribution have a lower depletion rate than others. Figure 5 illustrates this point directly by applying the empirical strategy in Section 5.1 to the likelihood of being in different parts of the *population* wealth distribution. The figure shows that upon receiving inheritances, the distribution of wealth among heirs shifts to the right. It also shows that inheritances increase the likelihood of instantaneously locating in the top 35% of the population-wide distribution. More importantly, Panel A shows that within seven years, the wealth distribution of heirs shifts back over time so that it looks similar to the distribution of their cohort members who did not receive inheritances. It is only at the top of the distribution that we see persistent effects: the likelihood of being in the top 10% is higher than the counterfactual after seven years. Panel B emphasizes that the long-run shift is particularly pronounced at the top 2%.

Appendix Figure D.16 replicates this analysis for capitalized wealth. The advantage of this wealth measure is that data exist for a longer period. Even ten years after the inheritance, we find a positive and significant effect of locating in the top 2 percentiles of the population wealth distribution.

The finding in Figures 4 and 5 that inherited wealth seems to persist only for wealthy people is similar to the findings of Bleakley and Ferrie (2016). Studying the wealth gain through the land lotteries in the 19th century in the United States, they find no wealth effect on the lower part of the wealth distribution 18 years after the lottery.

Not only does the wealth distribution of heirs shift to the right, but the dispersion of wealth among heirs also increases upon the injection of inherited wealth. Figure D.10 shows that the distance between top (e.g. 75, 90, 95, 99, and 99.9) percentiles and the median of the wealth distribution of heirs increases upon inheritance, and that the increase is larger for higher percentiles. The wealth dispersion increases upon inheritances since wealthier heirs receive more inheritance due to the two factors explained in Section 4. Over time, however, the wealth dispersion returns to the pre-inheritance levels except for the top 1%. This illustrates the same phenomenon that we observed in Figures 4 and 5: the wealth effect is persistent only at the top of the wealth distribution.[52]

[51] We also do a simple split by heir wealth in Appendix Figure D.9, where we show that these effects also hold for the wealth ranks and for the inverse hyperbolic sine function.

[52] Appendix Figure D.11 exhibits the inheritance effect on a similar measure of dispersions of real wealth, defined as the difference in percentiles when denominating all assets in prices of 2000. The results are similar to those for nominal wealth. This reflects the main role of agents' different savings decisions, as opposed to capital gains differences.

The persistence of inherited wealth at the top of the wealth distribution implies that the short-run equalizing effect of inheritances on relative measures of wealth inequality must be reverted over time. We verify this in Figure 6 by estimating the effect of inheritances on two types of relative measures of wealth inequality: Kuznets (percentile) ratios and top shares.

First, we focus on Kuznets ratios, for example the ratio of the 99th percentile of the wealth distribution to the median. Figure 6, Panel A shows that this ratio falls from around 26 to 22 upon inheritance, but almost reverts back to the initial level after seven years. The Kuznets ratios of the 75th to 99.9th percentiles show the same pattern of an initial fall and a strong convergence within seven years. Appendix Figure D.12 exposes the inheritance effects on additional Kuznets ratios, which all show the same patterns.

Second, we measure the effect of inheritances on the share of wealth in the hands of top individuals. This is an inequality measure that is sensitive to the level and fluctuations of wealth of a few individuals at the very top of the wealth distribution. To avoid our results to be spuriously driven by a few individuals, we adjust the Pareto tail of the wealth distributions.[53] Figure 6, Panel B shows that all top shares of wealth decline in the short run but revert back over time. For instance, the share of wealth in the hands of the top 1% falls by around one percentage point upon inheritance receipt, but reverts back and becomes even larger than the counterfactual after seven years, although the difference is not statistically significant (95%-confidence intervals are from 1000 bootstrapped samplings).[54]

To look beyond seven years post inheritances, Appendix Figure D.17 investigates the inheritance effect on inequality using constructed capitalized wealth series. The increase in inequality between event year 1 and 7 that we observed in Figure 6 is also apparent for capitalized wealth. Most importantly, the increase does not stop after seven years, implying that inheritances have become an inequality-increasing force ten years after their receipt. The point estimates are consistently positive in the last year for which we have data. Although the top share measures are noisier in the capitalized wealth series (Panel B), they reveal the same story: a negative immediate effect of inheritances followed by a reverting pattern that eventually makes inheritances inequality-increasing in a decade.

Taken together, our findings show that the almost-linear depletion of inherited wealth for the average heir (Section 5.2) masks considerable heterogeneity in responses. Heirs who receive large inheritances or are wealthy to begin with keep their inherited wealth intact, whereas others spend their inheritances on consumption goods and leisure. These differential responses are crucial for the evolution of wealth inequality after inheritances, because they imply that the relative importance of inherited wealth among the wealthy increases over time.

[53]Concretely, individuals at the top 0.01 percent, who represent fewer than 20 observations in each treatment group, hold a large share of total wealth. This leads to sensitivity of the results to the level and fluctuations of wealth of these super-wealthy individuals. For example, in one of our treatment groups, the two wealthiest individuals each hold 42 times more wealth than the third wealthiest heir, the equivalent number for other cohorts are around 2 (Figure D.13). To remedy this problem, we adjust the very high tail of the wealth distribution so that each treatment group distribution has the same Pareto coefficient. Appendix Figure D.14 shows that our main results are not sensitive to this specific adjustment by considering two other types of adjustments.

[54]Note that there is a slight discrepancy between the estimated short-run effects on wealth inequality here as compared to those presented in Section 4. This is because we here exploit the wealth records only, while the short-run analysis uses the inheritance and estate records directly.

7 Mechanisms

While the average heir's wealth increases by around 10% upon losing a parent, the lion's share of this inherited wealth disappears within the first decade. Moreover, we saw that this depleting pattern is driven by the poor. How is the inherited wealth spent? How much of the spent inheritances are devoted to the consumption of goods, i.e. what is the marginal propensity to consume (MPC) out of inherited wealth? Do inheritances lead to a reduction in labor supply, i.e. what is the marginal propensity to earn (MPE)? How do these responses vary over the years after the inheritance receipt?

7.1 Mincerian dynamic approach

To answer these questions, we will estimate the effect of inheritances on three elements of the heir's intra-temporal budget constraint in each of the seven years following inheritance receipt, that is:

$$C_t = Z_t + \underbrace{R_t - S_t}_{y_t = \text{unearned income}}, \tag{3}$$

where C_t is consumption, Z_t labor income, and y_t unearned (non-labor) income. The latter is the sum of capital income, R_t and savings, S_t, and denotes the sum of extra resources allocated to each period.

We call the estimated effects on labor earnings and consumption in each period *dynamic, inter-temporal* MPEs and MPCs to distinguish them from *static* MPEs and MPCs. These are related but not the same. In fact, assuming time-separable (not necessarily additive) utility, we can decompose the consumption responses at time t to a wealth shock in the initial period as:

$$\underbrace{\varepsilon\left(C_t, B\right)}_{\text{inter-temp MPC}} = \underbrace{\varepsilon_t\left(C_t, y_t\right)}_{\text{Static MPC}} \times \underbrace{\varepsilon_t\left(y_t, B\right)}_{\text{MPS}}. \tag{4}$$

Similarly, labor supply responses can be decomposed as:

$$\underbrace{\varepsilon\left(Z_t, B\right)}_{\text{inter-temp MPE}} = \underbrace{\varepsilon_t\left(Z_t, y_t\right)}_{\text{Static MPE}} \times \underbrace{\varepsilon_t\left(y_t, B\right)}_{\text{MPS}}. \tag{5}$$

The dynamic MPEs and MPCs are mixtures of inter-temporal saving decisions and intra-temporal (static) MPCs/MPEs. In fact, following Gorman (1959), we can think of individual choices as a two-step budgeting decision. The *intra-temporal* problem of the individual is $v_t\left(y_t, w_t\right) = \max_{c_t, z_t} u_t\left(c_t, z_t / w_t\right)$, subject to the intra-temporal budget constraint eq. 3. This problem dictates the intra-temporal MPC/MPE, i.e. elasticities of commodity expenditure and labor earnings with respect to within-period unearned income, denoted by $\varepsilon\left(Z_t, y_t\right)$ and $\varepsilon\left(C_t, y_t\right)$. The *inter-temporal* decision of the agent can then be formulated as $\max_{\{y_t\}, B'} \sum v_t\left(y_t, w_t\right) + U_h\left(B'\right)$ subject to the inter-temporal budget constraint $\sum y_t + B' \leqslant B$, where B and B' denote received and transferred bequests, respectively.[55] The inter-temporal decision determines how much extra resources are allocated to each period t, $\varepsilon\left(y_t, B\right)$. This elasticity

[55] For expositional purposes we assume a zero interest rate and no time discounting.

is closely related to the marginal propensity to save (MPS).[56]

To see the intuition, note that the effect of a wealth shock at time zero on labor earnings at time t is determined both by how agents allocate the extra wealth dynamically across time and also how they allocate extra resources within a time period on commodity consumption and leisure. So the intra- and inter-temporal MPEs and MPCs are connected to each other through the marginal propensities to save.

An example with real numbers might be helpful. When implementing this approach below, we will show that an increase in wealth by 58 thousand SEK leads to a 1.2 thousand SEK decline in annual labor earnings in the 5th year after inheritance (dynamic MPE of t=5). We also estimate that the 58 thousand SEK extra wealth is spread across time so that there are 7.6 kSEK more resources in that year (MPS of t=5), from which 1.2 kSEK are spent on labor and the rest on consumption. This implies a static MPE of 1.2/7.6=0.16. The main idea is that the earnings reduction of 1.2k should be compared to the 7.6k increase in the unearned income and not to the initial 58k gain.

There is a theoretical value in measuring the wealth effect on unearned income in the following periods, in addition to estimating and connecting the static MPE/MPCs to each other. Under the assumption of time-separable utility, but without any further assumptions, the agent's inter-temporal decision leads to a smoothing of marginal utility of unearned income across time. Assuming further that the intra-temporal utility is separable in consumption and leisure leads to a smoothing of the marginal utility of consumption. The smoothing of marginal utility of unearned income (consumption) is equivalent to equal unearned income (consumption) across time if: i) the indirect (direct) utility function and relative prices, including real wage, are time-invariant and, ii) the interest rate is equal to the discount rate.

The decompositions 4 and 5 have been obtained under Stone-Geary utility assumptions in prior work (see Imbens et al., 2001, page 787). However, in that particular case, the MPS is equal to an annuity multiplier. Thus, the dynamic MPEs are constant across time and equal to a multiplier of the static MPE. The intuition behind this result is that in this case, the agent equalizes the *level* of unearned income across time. In addition to being equal to an annuity multiplier, the MPS is time invariant and independent of the wage stream faced by the agent. Stone-Geary preferences thus represent a way to parametrically convert dynamic MPEs to static ones, as suggested by Jakob Mincer (Holtz-Eakin et al., 1993, page 432).

To put this approach into perspective, the previous literature has measured the left-hand sides of these equations, i.e. the inter-temporal MPCs/MPEs. Cesarini et al. (2017) then simulate a life-cycle model with Stone-Geary preferences to match those dynamic MPEs in order to estimate the static MPEs. Imbens et al. (2001) apply the same design but given that the lottery gains in their settings are installments over 20 years, they argue that the MPS is close to 1.[57]

The *Mincerian dynamic approach*, instead, connects the dynamic, inter-temporal MPEs/MPCs to the

[56] Decompositions 4 and 5 are similar to the decomposition of household responses to between and within-individual decisions, e.g. Equation (2) in Nekoei (2013). In those settings, the required separability in utility comes from assuming an efficient intra-household allocation of resources, see Chiappori (1992).

[57] Under such preferences, the static MPE is constant across time, so it can be interpreted as life-time MPE, ignoring the elasticity of the inter-generational transfer with respect to the wealth gain. In a general setting, the life-time MPE depends on a weighted average of static MPEs, where the weights are relative to the share of life-time unearned income, and the elasticity of inter-generational transfer with respect to the wealth gain.

static ones, and points out that the connection is due to the inter-temporal saving decision (MPS). The approach requires an estimation of both dynamic MPE/MPCs and the MPSs.

We call this a *Mincerian dynamic approach* since a similar idea was proposed by Jacob Mincer (Holtz-Eakin et al., 1993, page 432). Given the data limitations at the time, Mincer suggested to convert inheritances into an equivalent annuity while we here are able to directly estimate the *actual* extra resources brought to each period. Then we provide estimates of the inter-temporal MPCs/MPEs, similar to what the previous literature reports. Finally, we combine these two steps and infer the implied static MPEs/MPCs.

7.2 MPS: How is the inherited wealth spread across time?

Unearned income, the non-labor resources in each period, has two components, as illustrated in Equation 3. The first component is capital income, which is directly observable in our data. To be precise, we measure capital income as the sum of interest income, dividends, coupon payments, rental income net of interest payments and costs associated with renting out a private residence.[58]

The challenge lies in measuring the second component, annual savings. Here we leverage the richness of the Swedish administrative wealth data which do not only provide us with wealth value at the individual level, but also contain asset-by-asset ownership at the individual level. For each asset (at the ISIN level), we retrieve the price from other databases, and thus separate changes in the wealth of an individual due to changes in quantity versus changes in asset prices, described below.

Wealth fluctuates both due to active rebalancing decisions (changes in quantity) and due to market-level price variation (changes in prices). The first element is equivalent to savings and enters the individual budget constraint. To be able to estimate the effect of an inheritance receipt on all elements of the budget constraint, we decompose the total wealth changes into these two elements. An individual's wealth at time t is denoted by A_t, which consists of q_{jt} units of asset j with price p_{jt} at time t, so that $A_t = p_t.q_t = \sum_j p_{jt}q_{jt}$. Then the decomposition of the wealth change over time would be $\Delta A_t = p_t \cdot \Delta q_t + \Delta p_t \cdot q_{t-1}$, or

$$\Delta A_t = \sum_{asset\ j} \underbrace{p_{jt}\Delta q_{jt}}_{\textbf{Quantity}\text{ changes: saving}} + \underbrace{q_{jt-1}\Delta p_{jt}}_{\textbf{Price}\text{ changes: Capital gain}} . \tag{6}$$

The first element of this decomposition, the active changes in wealth, is our object of interest. To measure savings, denoted S_t, we first categorize wealth into nine categories: bank deposits, bonds, quoted options, funds, stocks, capital insurance, houses and land, tenant-owned apartments and debt, and then compute active changes within each component, described in detail in Appendix Section C. Our wealth data include quantities, q_{ijt}, at the individual-asset-year level and we value changes in the quantities from one year to the next using prices from financial databases, such as Bloomberg, Factset, Datastream as well as from the tax authority. Purchases and sales of real estate (houses and land) are valued hedonically by knowing the tax value of each transacted unit as well as its characteristics. Statistics Sweden collected and provided data on the ratio of market-price over tax-price

[58]This is not equivalent to taxable capital income, as it does not include realized capital gains or losses.

for transacted units, by those characteristics, and we inflate the tax price of each transaction with that ratio.[59] Active changes in tenant-owned apartments are defined as the value in year t minus the value in $t-1$, interacted with a moving-residency indicator. Active changes in bank deposits are defined as the change in value from one year to the next. Finally, capital insurances, a tax-favored savings vehicle, are observed with the overall value in the data, but not with the asset decomposition. We take the change in the value of insurances over two years and add that to savings, but our results are robust to assuming that capital insurances grow at the rate of the Stockholm Stock Exchange Index. To capture behavioral responses of inheritances on retirement savings, we also add contributions to individual retirement accounts to our savings definition.

There are two caveats in our measure of savings. First, saving is $p_t \cdot \Delta q_t$ where p_t is the transaction price which we do not observe since we are unaware of the timing of the transaction. Equation 6 implicitly assumes that individuals re-balance their portfolios at the end of each year, but our results are robust to relaxations of this assumption.[60]

The second caveat is that any changes in quantity are assumed to be due to saving. In particular, any wealth transfer to or from agents is defined as saving. This is a relevant concern in our setting since the treatment group receives the inheritance. However, the remedy is simple because we observe parents' wealth prior to death and can therefore impute inheritances for each individual.[61] We then add this to the treatment group's savings-measure at event-time 0 and 1 (spread out according to the share of the total effect on wealth that occurs at time 0 and 1, respectively).

The solid, circled series in Panel A of Figure 7 shows the effects of receiving the inheritance on unearned income.[62] The average effect is around 6.4 thousand SEK per year, which suggests that the strong depletion of wealth observed in Figure 3 reflects active dissavings decisions. Panel C additionally displays effects on unearned income rank. Inheritances raise the average rank by about two percentiles on impact, but the effects are slightly declining over time.

7.3 MPE/MPC: How is inherited wealth allocated to the consumption of commodities and leisure?

The heirs can spend the extra resources allocated to each period on the consumption of commodities or on the consumption of leisure. First we estimate the dynamic MPCs and MPEs, i.e. the effects of the inheritance on consumption and labor earnings, and then we estimate the implied static MPCs and

[59] Our data cover real estate transactions from 2002 and onwards. For 2000 and 2001, we observe the total value in houses and land. To measure the active changes during those years, we take the value in t minus the value in $t-1$. From that difference, we subtract the return component, measured as the average return on owner-occupied housing, provided by Statistics Sweden.

[60] More precisely, we have:

$$\Delta A_t = \sum_{asset\ j} \left(\alpha p_{jt} + (1-\alpha)\, p_{jt-1}\right) \Delta q_{jt} + \left((1-\alpha)\, q_{jt} + \alpha q_{jt-1}\right) \Delta p_{jt}.$$

where $p_\alpha(k,t) = \alpha p(k,t) + (1-\alpha)\, p(k,t-1)$. We use $\alpha = 1$ in our main computation, while keeping $\alpha = 0$ for assets that cease to exist. We have employed several alternative assumptions, including $\alpha = .5$, and our results are robust to changes in these assumptions.

[61] We describe how we impute the inheritance amount in Appendix Section B.

[62] Because unearned income at time t is constructed using snapshot information at time t and t-1, our data start in 2000, implying that we only have three pre-treatment years.

MPEs, i.e. the marginal propensities to consumption of commodities and leisure within each period, using the Mincerian dynamic approach above.

First, a note on the measurement of the main outcomes. Labor income is defined as the sum of wage earnings, business income, self-employment earnings, fringe benefits and severance pay gross of personal income taxes. Recall that we use the fixed-delta method when analyzing effects on labor income (see Section 5.1).

We construct consumption as the residual of the individual intra-temporal budget constraint, Equation 3. This approach builds on the pioneering work of Browning and Leth-Petersen (2003) and Koijen et al. (2014).[63] In order to get the post-tax consumption, we deduct taxes and add transfers. Taxes include labor and capital taxes, property taxes, wealth and inheritance taxes. Transfers include sickness-, unemployment- and disability benefits, pension income, parental benefits and housing transfers. The net consumption measure then takes the usual value added tax (VAT) rate of 20 percent into account.[64]

Panel A of Figure 7 displays the effects of inheritance on consumption before and after taxes and transfers and labor earnings. We observe an increase in the net consumption of goods of around 3 thousand SEK in the year of inheritance receipt. The difference between the effects on gross and net consumption amounts to 470 SEK, on average, which suggests that 10% of the unearned income effects are net transfers to the government. The magnitude seems to increase across event-time, but such a comparison is marred by the results being expressed in current prices. A larger effect in one period could reflect higher asset prices in that year. One simple approach to understanding the dynamic effects is to look at the rank effects. Again, Panel C of Figure 7 illustrates that the effect on unearned income rank is the highest upon receiving the inheritance, i.e. the amount of extra resources brought into the first periods is larger than the amount in the later years whereas the increase in consumption is more stable over time. The unearned income rank responds more than consumption rank and unearned income in level do, because the distribution of unearned income has a high concentration at zero: a few individuals consume all but not more than they earn, i.e. they live hand to mouth. Moreover, the labor earnings responses decline sharply in magnitude over time.[65] Interestingly, post-tax consumption ranks respond more than pre-tax ranks. This is because the distribution of post-tax consumption is less dispersed (due to redistributive policies), implying that a constant SEK-increase in consumption spans more individuals in the post-tax distribution as compared to the pre-tax one.

Next, we follow the strategy in Section 7.1 and use the effect of inheritances on unearned income to measure the intra-temporal MPEs and MPCs for each post-inheritance period. Figure 7, Panel

[63] Browning and Leth-Petersen (2003) initiated the literature on using administrative data to back out consumption as a residual by approximating saving as observed changes in the wealth level. To the best of our knowledge, Koijen et al. (2014) is the first paper that measures saving as the change in quantity of assets, i.e. excluding price changes.

[64] There is an insurance program providing extra resources for people reducing their labor supply due to care-giving to a close relative. In the year 2000, only 8229 individuals use this insurance receiving 6,210 SEK on average. Assuming that all recipients are children who care for their parents at the end of their life, this leads to a 360 SEK average extra transfer.

[65] Appendix Figure E.9 investigates how much of these responses are due to inheritances, grief and care-giving. We split the sample into heirs who receive no inheritances (according to the parent's wealth one year before death) and those who do. We then estimate the effects on labor supply for these two samples separately. The results suggest that at most one third of the labor supply effect is due to grief and care-giving. The main assumption is that such responses are similar across heirs with different amounts of inheritances. Note, however, that we estimate a small but statistically significant effect on wealth also for the no-inheritance group. This is because the parent's wealth one year before death is not a perfect proxy for the estate.

B presents the resulting MPEs. The intra-temporal MPEs are around 30% in the first three years before declining towards 10% for the last three years. One interpretation of the varying intra-temporal MPE/MPC is that the time-separable utility assumption does not hold. Another interpretation is the indivisibility of labor (Hansen, 1985).

Upon receiving the inheritance, the labor income declines by 2 thousand SEK, or by 1%, corresponding to a 0.4 percentile decline in rank (see Panel A of Appendix Figure E.10). However, the instantaneous reduction of labor income shows an almost-complete recovery during the seven years after inheritance receipt.

Decomposing this labor supply effect into intensive and extensive responses, Panel A of Figure 8 shows that both margins contribute to the total decline in labor income. The intensive margin is defined as the log of labor income when positive, whereas the extensive margin is either the likelihood of having a positive labor income or labor earnings above a low time-varying threshold.[66] Our findings are robust to either definition.

Along the intensive margin, labor supply is reduced by one percent when an individual receives the inheritance but the reduction vanishes completely after seven years. The extensive margin effect amounts to a 0.4 percentage points reduction from a baseline of 85%. However, the extensive-margin response seems to persist longer over time, even though it also diminishes in magnitude. Panel B of Appendix Figure E.10 shows responses in hours worked. We document a small but statistically significant drop in hours when receiving the inheritance, which amounts to 0.05 hours per week, or 0.15% of the baseline. The effect persists during three years.

The panel aspect of the data sheds some light on the nature of the reduced participation in the labor market. More precisely, we define the hazard of entering (exiting) the employment by whether an individual has positive (zero) earnings, conditional on having zero (positive) earnings the year before. Panel B of Figure 8 shows that receiving the inheritance leads to an increase in the exit rate from the labor market during the first four years. More precisely, inheritances lead to a 0.3 percentage-point increase in the exit rate from a base of 4%. However, part of these exits is temporary as they lead to an increased entry in the years after. This pattern is indeed consistent with the idea that labor is indivisible (Hansen, 1985).

These findings are related to the literature that tests Andrew Carnegie's century-old conjecture that the labor supply incentives of children who receive large inheritances are distorted (see e.g. Holtz-Eakin et al., 1993 and Joulfaian and Wilhelm, 1994).

The magnitude of the estimated labor supply effects can be compared to the ones found in response to the lottery wins and previous work on inheritances. Our estimates suggest that an inheritance of one million SEK reduces labor earnings by 26 thousand SEK in the year after the inheritance receipt. Appendix Figure E.18 provides a meta-analysis and illustrates that our point estimate is larger than most of the previous estimates. The estimates in Cesarini et al. (2017) and Imbens et al. (2001) using lotteries are 10,000 SEK and 16,000 SEK, respectively, while the ones in Holtz-Eakin et al. (1993) for inheritance amount to 1,860 SEK for singles and 8,100 SEK for joint filers. All these estimates are substantially smaller than those found in Elinder et al. (2012) (92,000 SEK) for inheritance. Moreover,

[66] We use a time-varying price index that the Swedish government sets to index various benefits against. In 2018, the index amounts to 45, 500 SEK .

the recovering pattern we find for the inheritance effect is in contrast to the stable labor supply effect of lottery gains. The difference in magnitude in the labor supply responses might be related to the fact that larger inheritances are received by higher income individuals and the size of the labor response is larger for these groups (Figure 3, Panel E in Cesarini et al., 2017 shows that labor supply responses to lottery gains are larger for individuals with high earnings).

To investigate the workings of the consumption responses further, Appendix Figure E.11 studies the effects of receiving inheritances on car consumption, using the Swedish car registry. Heirs increase their car consumption upon receiving an inheritance by around 2 thousand SEK, which is about half of the total consumption responses in the first years (see Table 1). This is similar to the findings in Parker et al. (2013) on tax rebates. Expenditures on non-durables are negative in the later years, suggesting that the inheritances advance the timing of a car purchase, although the short panel prevents us from looking further than three years post inheritance.

Taken together, this section uses the Mincerian approach to show that the almost-linear depletion pattern of wealth after inheritances is mirrored by an almost constant effect on unearned income in each year following the inheritance receipt. Moreover, these extra resources are allocated to the consumption of goods and leisure in different proportions over time, with around 40% on leisure in the first years to about 15% seven years after.

8 Policy interventions

Our main goal here is to investigate the potential role of inheritance taxation in changing wealth inequality in light of the empirical evidence presented so far. To support our arguments, we also provide new evidence using an inheritance tax reform. However, one should be cautious in reading this section and in drawing policy conclusions as empirical evidence is still thin.

We start by considering an *unexpected* inheritance tax. In the short run, a flat tax increases relative measures of wealth inequality since inheritances are wealth-inequality reducing in the absence of a tax, as shown in Section 4. For example, we have seen that inheritances reduce the share of wealth of the top 1% by 1.65 percentage points. In the presence of a flat unexpected tax of 10, 50 or 90 %, the reduction in the top share would instead have been lower at 1.51, 0.9 and 0.2 percentage points , respectively (see Panel A of Figure D.7 in the Appendix for the results for all top shares).

The wealth-inequality increasing effect of an unexpected inheritance tax might seem contradictory in light of our theoretical results in Section 4. In fact, Proposition 1 predicts that reducing inheritance inequality should make the inheritance flows even more wealth-inequality reducing. Panel B of Appendix Figure D.7 shows that this is indeed the case for a revenue-neutral inheritance tax. Once the revenue of the unexpected flat tax is uniformly redistributed among all heirs, which is equivalent to a reduction in inheritance inequality, we find that the inheritance tax would lower wealth inequality. However, a flat inheritance tax without redistribution would increase wealth inequality simply by attenuating the equalizing effect of inheritances. Given that inheritance tax revenues are almost never redistributed among heirs in practice, we focus on a simple inheritance tax from now on.

Even more surprising, a progressive unexpected tax is inequality-increasing in the short run, unless it is extremely progressive. To be more precise, our results show that progressive taxes are almost always wealth-inequality increasing: Only a marginal tax of 90% on the top 1%-inheritances can reduce wealth inequality. But even in this case, the reduction is marginal, increasing the above-mentioned reduction in the wealth share of the top 1% from 1.65 to 1.68 percentage points. Interestingly, taxing very large inheritances has infinitesimal effects on short-run wealth inequality. For example, taxing the top 1% at 90% has a small effect, whereas taxing the top 10% at 10% dramatically increases wealth inequality. This is because the share of wealth from the top 1% is the same for the top 1% of heirs than for average heirs. Two countervailing forces are at play, namely that the top 1% has a higher share of inheritances stemming from top 1% parents but a lower share of their wealth is inherited.[67] This explains why Elinder et al. (2018) find that the Swedish inheritance tax affects the short-run wealth inequality among heirs only slightly.

In the long run, such an unexpected tax always reduces wealth inequality no matter its progressivity. A more progressive tax would be more inequality-reducing in the long run since it affects inheritances of wealthy heirs more. In fact, all that matters is how much the inheritances of wealthy heirs post-inheritances are taxed, since our evidence in Section 6 showed that wealthier heirs are the only ones who keep their inherited wealth.

One might argue that heirs' behavioral responses and the resulting depletion rates of a windfall gain/loss due to a tax reform might be different thanthose for inherited wealth. We exploit the repeal of the Swedish inheritance tax to provide direct evidence on this matter by investigating the depletion pattern of the extra inheritances received due to the reform.

The repeal was submitted to the parliament on October 21, 2004 and then voted into law on December 17 the same year, suggesting that the repeal was not anticipated for a long period of time. Given that the administrative data on wealth end in 2007, we use the capitalization method described in Section 3.2 and in Appendix Section A.3 to construct longer wealth series.

Figure 9 shows the results. Panel A displays the average capitalized wealth of heirs who receive inheritances in the top decile against calendar time, depending on whether they were subject to inheritance taxes (lost a parent in 2004, solid circled series) or not (lost a parent in 2005, dashed squared series).[68] Focusing on parents who die close to each other in time around the tax repeal implies that behavioral responses on behalf of the parents, such as wealth accumulation responses, are likely to be small. We focus on large inheritances since inheritances are skewed and the inheritance tax was progressive and thus, we should see an effect of the tax only within the upper part of the inheritance distribution. By assuming that the wealth of the two groups would have grown at the same rate in absence of the tax repeal, we attribute the difference in outcomes between those groups to the tax.

We find support for this finding in Panel B, comparing the effect of losing a parent in 2005 (post-repeal) rather than 2004 for different inheritance deciles on wealth in 2006. There is no short-run

[67] Note that a revenue-neutral progressive inheritance tax would be effective in reducing wealth inequality due to the skewness of the inheritance distribution. In particular, in this case, progressivity is a very useful tool. Figure D.7 shows that taxing the top 1% inheritances is a policy as strong as taxing the top 10%, or a uniform tax in reducing the top 1% wealth share. Comparing this with the effectiveness of taxing the top 1% with no compensation points out that the main drive is the redistribution of the top 1% inheritance, not its taxation.

[68] To be precise, the repeal date of the inheritance tax was retroactively adjusted to December 17, 2004. The goal was to exempt heirs of those who died in the Asian tsunami around December 26, 2004 from inheritance tax. Therefore, we assign children who lose a parent during December 17-December 31 2004 to the no-tax regime. We also explored a regression discontinuity approach around the repeal date but this exercise lacks power due to a small sample size.

effect of the tax repeal on wealth within the bottom 70% of the inheritance distribution. Moreover, comparing the two groups in 2011, Panel B shows that the tax-induced extra inheritance is depleted for the 8th and 9th decile, whereas the top decile keeps the additional inherited wealth. In sum, the introduction of an unexpected inheritance tax reduces wealth inequality in the long run by reducing large inheritances, but exacerbates the inequality-increasing effect of inheritances in the short run.

Now we consider the case of an *expected* inheritance tax. The effect of an expected tax on wealth inequality consists of three forces. First, conditional on inheritance flows, such a tax changes the heirs' wealth distribution in a similar way as an unexpected tax. This is the direct mechanical effect of the tax itself. The difference as compared to an unexpected reform is that an expected tax also triggers behavioral responses before death. Parents who plan to leave an inheritance behind in the absence of a tax will be induced to use non-financial channels, e.g. higher investment in their human capital, rather than inter-vivos or inheritance (Stantcheva, 2015). As a result, we would expect a higher self-made wealth inequality among heirs (second force). But we will also have a lower inheritance inequality which, according to Proposition 1, would make inheritances more inequality-reducing in the short run (third force). The effect of such behavioral responses on wealth inequality is second-order and dominated by the direct mechanical effect of the tax itself, which is wealth-inequality increasing. The influence of an unexpected inheritance tax on short-run inequality is just attenuated and cannot be reversed by the behavioral responses in the case of an expected tax.

The long-run effect of an expected inheritance tax on wealth inequality depends on the persistence of the short-run effect. So conditional on the short-run effect, the expected or unexpected tax has the same long-run effect. This means that again what matters is how much the inheritances of the rich are taxed since the poor spend and the rich keep their inheritances. The evidence in Section 6 and the evidence mentioned above from the tax reform show that only the top 1% keep inheritances under the current tax system, thereby supporting this claim. Therefore, it is straightforward to conclude that inheritance taxes, expected or not, are wealth-inequality reducing in the long run.

We thus conclude that an expected or unexpected tax would reduce the equalizing effect of inheritances in the short run and are thus wealth-inequality increasing, but both are wealth-inequality decreasing in the long run.

The evidence that inheritances reduce wealth inequality under the current tax system, provided in Section 4, can be interpreted in light of this discussion. Since the Swedish inheritance tax system at the time compressed the inheritance distribution but uncompressed the wealth distribution, inheritances would have been less equalizing in the absence of the tax. However, this does not limit the external validity of our findings to Sweden without an inheritance tax since the high degree of intergenerational mobility implies that independent of the degree of inheritance/wealth inequality, inheritances remain wealth-inequality decreasing in Sweden.

9 Discussions

9.1 Validity tests for the empirical strategy

A few remarks about the validity of our results are in order. To the extent that individuals anticipate inheritances, they may act in advance, for instance by adjusting their pre-inheritance consumption. Our research design would show the existence of such responses as they would manifest through a violation of the parallel trend assumption. Nevertheless, Appendix Figure E.12 shows the results for deaths that are unexpected and those that are not. We follow Andersen and Nielsen (2011) in defining unexpected inheritances as natural acute deaths, such as strokes or cardiac arrests, as well as unnatural deaths, such as accidents and violence. The displayed absence of a difference between the parallel trends across those subsamples supports the fact that individuals are not changing behavior in anticipation of an inheritance.[69]

Our research design exploits randomness in the timing of the inheritance receipt. However, the timing of the inheritance receipt may induce behavioral responses already while the parents are alive. In our design, the control group receives inheritances at a later age than the treatment group, but since the likelihood of receiving inheritances increases in age, heirs may be inclined to act in advance at later ages. It may also be the case that parents who live longer pass on more of their wealth to the next generation through inter-vivo transfers, generating a depletion pattern that would in part be driven by the control group receiving wealth before their parents die.

Such responses may be particularly strong if the inheritance tax incentivizes inter-vivo transfers. However, the inheritance tax was accompanied by a gift tax to prevent such responses. The same progressive scheme as for inheritances was applied to annual transfers that exceeded 10 thousand Swedish kronor for each donor, an exemption threshold lower than that for inheritance tax. In order to reduce tax avoidance by spreading transfers across time, taxed gifts within the last ten years were added to the inheritance tax base at the time of death. Therefore, the main strategy to minimize the total tax would be to distribute the gift payments across years far from death. The consensus in the literature is well expressed by Kopczuk (2013): “gifts appear to be significantly underutilized as a tax planning tool”.

However, to alleviate these concerns, first note that the depleting inheritance pattern begins right after the inheritance receipt (see for instance Figure 3). It seems unlikely that the control group heirs would start acting on expected inheritances in a discontinuously different way when the treatment group receives inheritances. Second, Panel C of Figure 2 shows the simple time series of wealth ranks. Even without the use of a control group, we see a depleting pattern. Third, unexpected deaths are immune to this critique, because they cannot be predicted, by construction. Nevertheless, as alluded to above, Appendix Figure E.12 shows that the pattern is similar across deaths that are unexpected and those that are not.[70] Taken together, we do not believe that our results are caused by behavioral responses within the control group.

[69] It could still be that the heirs anticipate bequests and would like to act on them in advance, but are cash-constrained and are not able to take any action. Appendix Figure E.13 displays the inheritance effects for heirs who are liquidity-constrained and those who are not. We do not find any evidence of a difference in the parallel trends across those two groups, and therefore reject that most heirs are constrained but would like to act in advance.

[70] There is a difference in the depletion rate which we discuss in Section 9.3.

Relatedly, individuals who live longer tend to be wealthier, implying that the control group will receive larger inheritances. Level-differences in parental wealth are not a threat to our identification strategy as long as they do not induce behavioral responses among the control group while the parent is alive, of which we do not find any evidence . Moreover, Appendix Figure E.14 shows wealth trajectories for parents of same-aged children dying in 2003 and in 2009. Despite level-differences, the parental wealth of those cohorts evolves in a similar way.

Finally, we investigate health patterns at the end of life for our parent generation, by studying hospitalizations during the years before death. This is useful for two reasons. First, it provides insights into how much parents spend on health care at the end of their lives. Second, the pattern of hospitalizations indicates how expected the inheritances are. Appendix Figure E.15 shows that the number of days in hospital and the likelihood of being hospitalized increase slowly until two years before death and then rise rapidly with a peak in the year of death. Hospitalizations are roughly four times more pronounced in the death year compared to two years before. With publicly provided health care, the cost of hospitalization in Sweden is capped at 100 SEK per day. This means that the average parent spends 1 thousand SEK on hospitalization in the year of death, or 1.7% of the direct inheritance effect on heirs.

9.2 Magnitude of the mechanical effect of inheritance on wealth

We compare the estimated magnitude of the direct inheritance effect on wealth with two benchmarks, described in detail in Appendix Section B.

First, we contrast the mechanical effect with the inheritance each heir receives according to the Inheritance and Estate Tax Register. Small estates are not liable for a full inheritance declaration. Therefore our inheritance data cover roughly 99% of all children who lose a parent. We replicate our empirical analysis on this subsample. Since inheritances are denoted at tax values (typically lower than the market values) and our baseline wealth measure is expressed at market values, the replication employs tax values and arrives at a 52,170 SEK mechanical effect. This should be compared with an average inheritance net of the inheritance tax of 55,800 SEK according to tax registers. A small difference between the two sources might be due to the fact that estates are self-reported whereas wealth is third-party reported or due to a slight difference in the tax bases of inheritance and wealth taxes, in particular regarding durable goods, unlisted firms and pension wealth. We conclude from this exercise that the order of magnitude of the estimated mechanical effect is similar to the inheritance reported for the inheritance tax.

Second, we compare the mechanical wealth effect to the implied inheritance from parents' wealth one year before death. As opposed to the first comparison, this exercise only uses wealth registers and is therefore immune to differences in tax reporting or the tax base mentioned above. By observing each parent's wealth in the year before death, the number of siblings, and the average share of the estate that is transferred to children, we impute inheritances. The last component is measured using the Inheritance and Estate Tax Register. We arrive at an imputed average inheritance at tax values of 60.26 thousand SEK . Subtracting the average inheritance tax of 5 thousand SEK we arrive at a number which is close to the estimated inheritance effect of 52.17 thousand SEK.

Although these numbers are aligned, our estimated marginal propensity to consume out of inheritances will be biased if there are wealth components that are transferred across generations which are not observed in either the wealth or the inheritance data. One such example is pension wealth, which is a component that we do not observe and which comprises 17% of household balance sheets.[71] Following the discussion on the implications of this drawback in Section 3.2, the true mechanical effect would amount to 61 thousand SEK as opposed to the estimated 58 thousand SEK.

9.3 Potential interpretations of the empirical results

The observed rapid depletion of inherited wealth as well as the estimated consumption or labor supply responses to inheritance are difficult to explain in the standard models.[72] If the inheritance amounts are expected with uncertainty in their timings, our results are not reconcilable with complete markets or an intergenerational budget constraint (Barro, 1974). In such a setting, the timing of the inheritance is irrelevant: an expected inheritance does not affect real behaviors and there should not be any mechanical effect on heirs' wealth.

The failure of either of these assumptions might explain our empirical findings. A first realistic scenario is one where heirs are over-saved and unable to borrow against future expected bequests. Over-saving seems realistic in the Swedish setting due to the extensive and mandatory public and occupational pension systems and because of the rise in illiquid housing wealth (joint with the low supply of rental flats due to the rent-control system). In such a setting, heirs will deplete their inheritances over time after receiving them and approach their optimal wealth trajectory. Even with credit constraint agents, the estimated depletion rate must reflect a very high discount factor.

Appendix Figure E.13 sheds some light on this explanation using a sample-split strategy. We define heirs with more than 58 thousand SEK (average inheritance size) in cash just before the inheritance receipt as unconstrained. Importantly, the figure shows a high depletion rate of wealth even for this group. This could either be because liquidity constraints are not the cause for the observed depletion or because our proxy for liquidity constraints is inaccurate. We have also used other proxies for liquidity constraints, such as having more than double the monthly income in the bank accounts, with similar results. However, as we showed in Section 6, individuals with a high level of wealth show much lower (almost no) depletion. One interpretation is that the amount of wealth is a better proxy for liquidity constraints since holding illiquid assets is a sign of high transitory income risk. Under this interpretation, liquidity constraints may still be a valid explanation for the high depletion rate of inherited wealth as well as the estimated labor supply and consumptions responses.

A second realistic scenario is one where young heirs facing an increasing labor income are not able to borrow against future incomes. Appendix Figures E.16 and E.17 show that the empirical evidence is in contrast to this hypothesis since the younger heirs display a lower depletion rate.

[71] This number could be larger among the deceased simply because pension wealth is more important among the elderly. On the other hand, the average age at death is 80, which means that some of the pension wealth has been decumulated. Depending on whether the propensity to consume out of wealth for retired individuals is different for pension wealth compared to other wealth, this number could be different.

[72] Similarly, Cesarini et al. (2017) document that 80% of lottery gains are consumed within seven years, while the rest seems to last. Parker et al. (2013) instead find that 50-90% of an unexpected tax rebate are consumed during a three-month period.

Third, it could be that inheritances are unexpected to some degree. An unexpected inheritance would show a mechanical effect and a depletion pattern. But again, to make sense of the observed depletion rate, we need to have both a large share of inheritances being unexpected and also a high degree of impatience (a high discount factor).

We test this hypothesis in Appendix Figure E.12, where we split the sample into parents who die unexpectedly and those who do not. Three things stand out. First, the inheritances received by heirs in those two groups are very similar. Second, we do see a stronger depletion pattern among those who receive inheritances unexpectedly as compared to the rest. The difference is statistically significant seven years after inheritance receipt. Third, the same dynamic depletion pattern emerges in both groups. In other words, unexpected inheritances cannot by themselves explain the depletion pattern.

All in all, our evidence suggests that the average heir in Sweden behaves like a credit-constrained agent with a high discount factor.

10 Conclusion

There are two sources for the observed wealth inequality. First, it can stem from inequality in self-made wealth due to heterogeneity in labor income, the savings rate or the rate of return on savings. Second, it may be the result of inequality in bequeathed wealth, which reflects inequality in self-made wealth in previous generations perpetuating through inheritances. This paper focuses on the role of inheritances in shaping wealth inequality, and on the modifications which inheritance taxation can make.

Our motivation is threefold. From a policy perspective, the relative contributions of self-made and inherited wealth determine the potential of different taxes in changing the wealth distribution. Second, we may want to tax inherited and self-made wealth differently (Harbury et al., 1977 and Fisman et al., 2017). Third, wealth brings power and influence, an issue which motivated the pioneering work on wealth inequality (King, 1927 and Lampman, 1962). Therefore, an understanding of wealth inequality is at the heart of any social struggle.

Using Swedish administrative data on wealth and inheritances, we find that inheritances reduce relative measures of wealth inequality, i.e. the Kuznets ratio and top shares. This is due to a relatively high degree of intergenerational mobility. Moreover, inheritance taxation only attenuates the inequality-decreasing effect of inheritances, generating an opposite effect to what they are intended to do.

However, the long-run effects of inheritances and inheritance taxes on wealth inequality are determined by the behavioral responses they induce and how those differ across the wealth distribution. We find that a majority of the heirs consume their inherited wealth within seven years while the wealthiest children leave their inheritances intact. Interestingly, these heterogenous responses imply a reversal of the equalizing effect of inheritances in the short run. In fact, we find that top shares have reverted back to their pre-inheritance levels after seven years. Since behavioral responses differ across the wealth distribution and since wealthier heirs receive larger inheritances, taxation of larger inheritances will have a long-run effect on the distribution of wealth.

Our result that inherited wealth does not play an important role in shaping the wealth of most people (bottom 99%) is also related to the literature that decomposes intergenerational wealth correlations into pre- and post-birth factors. Fagereng et al. (2015) establish a causal effect from adoptive parents' wealth to adoptees and find a small role for direct financial transfers (inter-vivo gifts or inheritances). Our results are also broadly consistent with Black et al. (2017) who show that the environment (excluding inheritances but including inter-vivo transfers) plays a much larger role than pre-birth factors in the intergenerational correlation of wealth. Together with our findings of the depletion of inherited wealth, these results indicate that environmental factors are the drivers of the observed intergenerational wealth correlation, and not direct financial transfers.

With these results in hand, we now suggest avenues for future research. It should be clear from the preceding discussions that the focus of this paper is on intergenerational wealth transfers at the time of death, with the exception of Section 4. In that section, we augment the short-run effects on wealth inequality with inter-vivo gifts and find that inter-vivo transfers are also wealth-inequality decreasing. Under the assumption that the detected behavioral responses to inheritances are also representative of those from inter-vivo gifts, we conclude that the total sum of intergenerational transfers increases wealth inequality in the long run. Future work should directly test this assumption by estimating the long-run effects of inter-vivo transfers on wealth inequality.

References

ALSTADSAETER, A., N. JOHANNESEN, AND G. ZUCMAN (2017): "Tax Evasion and Inequality," NBER Working Paper 23772. 16

ALVAREDO, F., A. B. ATKINSON, T. PIKETTY, E. SAEZ, AND G. ZUCMAN (2016): "The world wealth and income database," *Website: http://www. wid. world*. 2, 11, 75

ALVAREDO, F., B. GARBINTI, AND T. PIKETTY (2017): "On the Share of Inheritance in Aggregate Wealth: Europe and the USA, 1900-2010," *Economica*, 84, 239–260. 14, 74

ANDERSEN, S. AND K. M. NIELSEN (2011): "Participation Constraints in the Stock Market: Evidence from Unexpected Inheritance Due to Sudden Death," *The Review of Financial Studies*, 24, 1667–1697. 33, 120

ATKINSON, A. B. (2013): "Wealth and Inheritance in Britain from 1896 to the Present," Working paper, Oxford University. 11

ATKINSON, A. B., T. PIKETTY, AND E. SAEZ (2011): "Top incomes in the long run of history," *Journal of economic literature*, 49, 3–71. 99

ATKINSON, T. R. (1956): "The Pattern of Financial Asset Ownership: Wisconsin Individuals, 1949," *NBER Books*. 10

BARRO, R. J. (1974): "Are government bonds net wealth?" *Journal of political economy*, 82, 1095–1117. 35

BLACK, S. E., P. J. DEVEREUX, P. LUNDBORG, AND K. MAJLESI (2017): "Poor Little Rich Kids? The Determinants of the Intergenerational Transmission of Wealth," . 37

BLANCHET, T., J. FOURNIER, AND T. PIKETTY (2017): "Generalized Pareto Curves: Theory and Applications," WID World Working Paper Series, no 2017/3. 75

BLEAKLEY, H. AND J. FERRIE (2016): "Shocking behavior: Random wealth in antebellum Georgia and human capital across generations," *The Quarterly Journal of Economics*, 131, 1455–1495. 22

BLINDER, A. S. (1988): *Comments on Chapter 1 and Chapter 2*, Oxford, UK Clarendon Press,, 68–76. 7

BOSERUP, S. H., W. KOPCZUK, AND C. T. KREINER (2014): "Stability and persistence of intergenerational wealth formation: Evidence from Danish wealth records of three generations," . 12, 14, 70

——— (2016): "The Role of Bequests in Shaping Wealth Inequality: Evidence from Danish Wealth Records," *American Economic Review, Papers & Proceedings*, 106, 656–661. 3, 6, 7, 8

BROWN, J. R., C. C. COILE, AND S. J. WEISBENNER (2010): "The Effect of Inheritance Receipt on Retirement," *The Review of Economics and Statistics*, 92, 425–434. 7

BROWNING, M. AND S. LETH-PETERSEN (2003): "Imputing Consumption from Income and Wealth Information," *The Economic Journal*, 113, 282–301. 28, 66

BURBIDGE, J. B., L. MAGEE, AND A. L. ROBB (1988): "Alternative Transformations to Handle Extreme Values of the Dependent Variable," *Journal of the American Statistical Association*, 83, 123–127. 21

Calvet, L. E., J. Y. Campbell, and P. Sodini (2007): "Down or Out: Assessing the Welfare Costs of Household Investment Mistakes," *Journal of Political Economy*, 115, 707–747. 10, 57

Cannan, E. (1905): "The division of income," *The Quarterly Journal of Economics*, 19, 341–369. 6

Carnegie, A. (1899): "Wealth," *The North American Review*, 148, 653–664. 4

Cesarini, D., E. Lindqvist, M. J. Notowidigdo, and R. Ostling (2017): "The Effect of Wealth on Individual and Household Labor Supply: Evidence from Swedish Lotteries," *American Economic Review*, 107, 3917–3946. 7, 21, 25, 29, 30, 35, 126

Charles, K. K. and E. Hurst (2003): "The correlation of wealth across generations," *Journal of political Economy*, 111, 1155–1182. 2, 14, 75

Cheng, I.-H. and E. French (2000): "The effect of the run-up in the stock market on labor supply," *Economic Perspectives*, 24, 48–65. 126

Chetty, R. (2006): "A New Method of Estimating Risk Aversion," *American Economic Review*, 96, 1821–1834. 7, 126

Chetty, R., A. Guren, D. Manoli, and A. Weber (2013): "Does Indivisible Labor Explain the Difference Between Micro and Macro Elasticities? A Meta-Analysis of Extensive Margin Elasticities," *NBER Macroeconomics Annual 2012*, 27, 1–56. 126

Chiappori, P.-A. (1992): "Collective labor supply and welfare," *Journal of political Economy*, 100, 437–467. 25

Davies, J. B. and A. F. Shorrocks (2000): "The Distribution of Wealth," in *The Handbook of the Income Distribution*, ed. by A. B. Atkinson and F. Bourguignon, Amsterdam; New York; Elsevier, vol. 1, chap. 11, 605–675. 6

DiNardo, J., N. M. Fortin, and T. Lemieux (1996): "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach," *Econometrica*, 64, 1001–1044. 7, 18

Druedahl, J. and A. Martinello (2018): "Long-Run Saving Dynamics: Evidence from Unexpected Inheritances," . 7, 21

Edlund, L. and W. Kopczuk (2009): "Women, wealth, and mobility," *The American Economic Review*, 99, 146–178. 7

Elinder, M., O. Erixson, and H. Ohlsson (2012): "The Impact of Inheritances on Heirs' Labor and Capital Income," *The B.E. Journal of Economic Analysis & Policy*, 12, 1–35. 7, 29, 126

Elinder, M., O. Erixson, and D. Waldenström (2018): "Inheritance and Wealth Inequality: Evidence from Population Registers," *Journal of Public Economics*, 165, 17–30. 3, 5, 6, 7, 16, 31

Fadlon, I. and T. H. Nielsen (2015): "Household Responses to Severe Health Shocks and the Design of Social Insurance," NBER Working Paper 21352. 7, 18

Fagereng, A., M. Holm, and G. J. Natvik (2016): "MPC heterogeneity and household balance sheets," . 7

Fagereng, A., M. Mogstad, and M. Rønning (2015): "Why do wealthy parents have wealthy children?" *Statistics Norway, Discussion Papers*, 813. 37

Fisman, R., K. Gladstone, I. Kuziemko, and S. Naidu (2017): "Do Americans Want to Tax Capital? Evidence from Online Surveys," . 2, 36

Garbinti, B., J. Goupille-Lebret, and T. Piketty (2017): "Accounting for wealth inequality dynamics: Methods, estimates and simulations for France (1800-2014)," . 14, 74

Gorman, W. M. (1959): "Separable utility and aggregation," *Econometrica: Journal of the Econometric Society*, 469–481. 24

Grogger, J. (1995): "The Effect of Arrests on the Employment and Earnings of Young Men," *Quarterly Journal of Economics*, 110, 51–71. 7, 18

Haider, S. and G. Solon (2006): "Life-Cycle Variation in the Association between Current and Lifetime Earnings," *American Economic Review*, 79, 504–513. 70

Hansen, G. D. (1985): "Indivisible Labor and the Business Cycle," *Journal of Monetary Economics*, 16, 309–327. 29

Harbury, C. D., D. M. Hitchens, and P. C. McMahon (1977): "On the Measurement of Inherited Wealth," *Review of income and Wealth*, 23, 309–314. 2, 36

Hernández, L., J. Tejero, A. Suárez, and S. Carrillo-Menéndez (2014): "Percentiles of sums of heavy-tailed random variables: beyond the single-loss approximation," *Statistics and Computing*, 24, 377–397. 14

Hilger, N. G. (2016): "Parental Job Loss and Children's Long-Term Outcomes: Evidence from 7 Million Fathers' Layoffs," *American Economic Journal: Applied Economics*, 8, 247–283. 7, 18

Holtz-Eakin, D., D. Joulfaian, and H. S. Rosen (1993): "The Carnegie Conjecture: Some Empirical Evidence," *The Quarterly Journal of Economics*, 108, 413–435. 3, 4, 7, 25, 26, 29, 126

Horioka, C. Y. (2009): "Do bequests increase or decrease wealth inequalities?" *Economics Letters*, 103, 23–25. 6

Imbens, G. W., D. B. Rubin, and B. I. Sacerdote (2001): "Estimating the Effect of Unearned Income on Labor Earnings, Savings and Consumption: Evidence from a Survey of Lottery Players," *American Economic Review*, 91, 778–794. 7, 25, 29, 126

Jäntti, M. and S. P. Jenkins (2015): "Income mobility," in *Handbook of income distribution*, Elsevier, vol. 2, 807–935. 10

Johansson, P., L. Laun, and M. Palme (2016): *Social Security Programs and Retirement Around the World: Disability Insurance Programs and Retirement*, University of Chicago Press, chap. Pathways to Retirement and the Role of Financial Incentives in Sweden, 369–410. 50

Johnson, D. S., J. A. Parker, and N. S. Souleles (2006): "Household Expenditure and the Income Tax Rebates of 2001," *American Economic Review*, 96, 1589–1610. 7

Johnson, N. L. (1949): "Systems of Frequency Curves Generated by Methods of Translation," *Biometrika*, 36, 149–176. 21

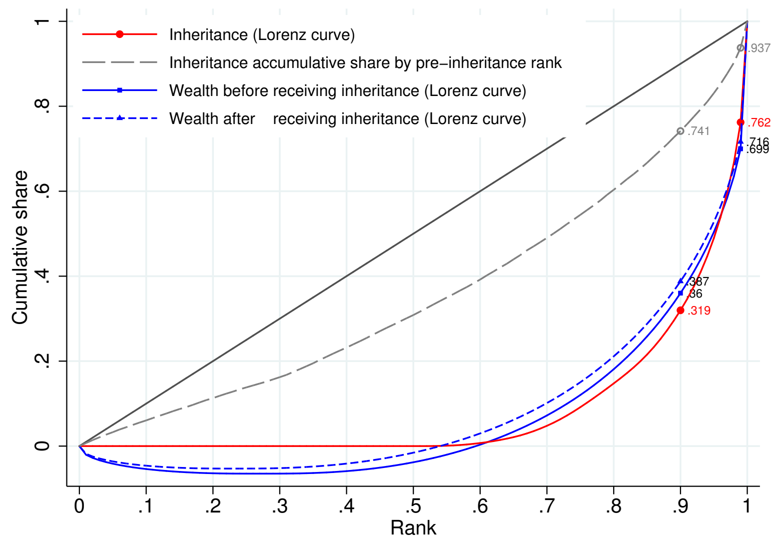
JOULFAIAN, D. (2006): "Inheritance and Saving," NBER Working Paper 12569. 7, 21
JOULFAIAN, D. AND M. O. WILHELM (1994): "Inheritance and Labor Supply," *The Journal of Human Resources*, 29, 1205–1234. 7, 29
KARAGIANNAKI, E. (2017): "The Impact of Inheritance on the Distribution of Wealth: Evidence from Great Britain," *Review of Income and Wealth*, 63, 394–408. 3, 6, 7, 21
KING, W. I. (1927): "Wealth distribution in the continental United States at the close of 1921," *Journal of the American Statistical Association*, 22, 135–153. 20, 36
KOIJEN, R., S. VAN NIEUWERBURGH, AND R. VESTMAN (2014): "Judging the Quality of Survey Data by Comparison with Truth as Measured by Administrative Records: Evidence from Sweden," University of Chicago Press. 4, 28
KOPCZUK, W. (2013): "Taxation of intergenerational transfers and wealth," in *Handbook of public economics*, Elsevier, vol. 5, 329–390. 33
KOPCZUK, W. AND E. SAEZ (2004): "Top Wealth Shares in the United States, 1916-2000: Evidence from Estate Tax Returns," *National Tax Journal*, 57: 445-487. 2
KOTLIKOFF, L. J. AND L. H. SUMMERS (1981): "The Role of Intergenerational Transfers in Aggregate Capital Accumulation," *Journal of Political Economy*, 89, 706–732. 7
LAMPMAN, R. (1962): *The Share of Top Wealth-Holders in National Wealth, 1922-56*, Princeton University Press, Princeton. 36
LORENZ, M. O. (1905): "Methods of measuring the concentration of wealth," *Publications of the American statistical association*, 9, 209–219. 15
MAGGIO, M. D., A. KERMANI, AND K. MAJLESI (2018): "Stock Market Returns and Consumption," Tech. rep., National Bureau of Economic Research. 7
MODIGLIANI, F. (1988): "The Role of Intergenerational Transfers and Life Cycle Saving in the Accumulation of Wealth," *Journal of Economic Perspectives*, 2, 15–40. 7
NEKOEI, A. (2013): "Immigrants' labor supply and exchange rate volatility," *American Economic Journal: Applied Economics*, 5, 144–164. 25
OHLSSON, H., J. ROINE, AND D. WALDENSTRÖM (2017): "Inherited Over the Path of Development: Sweden, 1810-2016," Working Paper. 7, 11
PARKER, J. A., N. S. SOULELES, D. S. JOHNSON, AND R. MCCLELLAND (2013): "Consumer Spending and the Economic Stimulus Payments of 2008," *American Economic Review*, 103, 2530–2553. 7, 30, 35
PIKETTY, T. (2011): "On the Long-Run Evolution of Inheritance: France, 1820-2050," *The Quarterly Journal of Economics*, 126, 1071–1131. 7, 11, 74
PIKETTY, T., G. POSTEL-VINAY, AND J.-L. ROSENTHAL (2006): "Wealth concentration in a developing economy: Paris and France, 1807-1994," *American economic review*, 96, 236–256. 2, 14, 74
PIKETTY, T. AND G. ZUCMAN (2015): "Wealth and inheritance in the long run," in *Handbook of income distribution*, Elsevier, vol. 2, 1303–1368. 2, 21
RUHM, C. J. (1991): "Are Workers Permanently Scarred by Job Displacements?" *American Economic Review*, 81, 319–324. 7, 18
SAEZ, E. AND G. ZUCMAN (2016): "Wealth Inequality in the United States since 1913: Evidence from Capitalized Income Tax Data," *The Quarterly Journal of Economics*, 131, 519–578. 2, 10, 14, 50, 59, 75
SEAGER, H. R. (1904): *Introduction to Economics*. 6
SEIM, D. (2017): "Behavioral Responses to an Annual Wealth Tax: Evidence from Sweden," *American Economic Journal: Economic Policy*, 9(4), 395–421. 8, 9, 119
STANTCHEVA, S. (2015): "Optimal Income, Education, and Bequest Taxes in an Intergenerational Model," Tech. rep., National Bureau of Economic Research. 5, 32
WALDENSTRÖM, D. (2016): "The National Wealth of Sweden, 1810-2014," *Scandinavian Economic History Review*. 61
WATSON, R. AND I. GORDON (1986): "On quantiles of sums," *Australian & New Zealand Journal of Statistics*, 28, 192–199. 14
WEDGWOOD, J. (1928): "The influence of inheritance on the distribution of wealth," *The Economic Journal*, 38, 38–55. 2, 6
——— (1929): *The Economics of Inheritance*, Taylor & Francis. 6
WOLFF, E. N. (2002): "Inheritances and Wealth Inequality, 1989-1998," *American Economic Review*, 92, 260–264. 3, 6

Table 1: Regression Coefficients

Event year	Wealth	Unearned income	Net consumption	Labor earnings
-4	-1.224			0.455
	(1.749)			(0.142)
-3	-1.414	0.955	0.878	0.160
	(1.193)	(0.704)	(0.578)	(0.132)
-2	-1.488	-0.672	-0.620	0.0530
	(0.761)	(0.605)	(0.497)	(0.114)
-1	0	0	0	0
0	31.00	4.933	2.984	-1.566
	(0.505)	(0.524)	(0.429)	(0.106)
1	58.11	7.094	4.071	-2.240
	(0.716)	(0.501)	(0.411)	(0.133)
2	56.94	6.072	3.758	-2.131
	(0.914)	(0.487)	(0.399)	(0.160)
3	56.32	6.357	3.858	-1.986
	(1.116)	(0.504)	(0.413)	(0.183)
4	52.85	7.001	4.295	-1.687
	(1.632)	(0.544)	(0.449)	(0.202)
5	46.65	7.589	4.690	-1.236
	(2.241)	(0.612)	(0.508)	(0.224)
6	36.66	6.979	3.954	-0.788
	(3.139)	(0.723)	(0.605)	(0.237)
7	28.12	5.387	2.396	-0.571
	(4.902)	(0.988)	(0.836)	(0.248)
Treated individuals	712,270	712,270	712,270	712,270
Observations	6,376,500	5,603,060	5,603,060	14,469,717

Note: This table presents regression coefficients for the outcomes wealth (at current market values), unearned income, net consumption of goods and labor earnings. The unit is thousand Swedish kronor (denoted by kSEK). Net consumption is consumption after taxes and transfers. The treatment group is defined as individuals losing a parent in the years 2000-2004. For wealth, unearned income and consumption, we apply the fixed-control method while labor earnings employ the fixed-delta method. All regressions reweigh the birth-year distribution as well as the education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level.

Panel A



Panel B

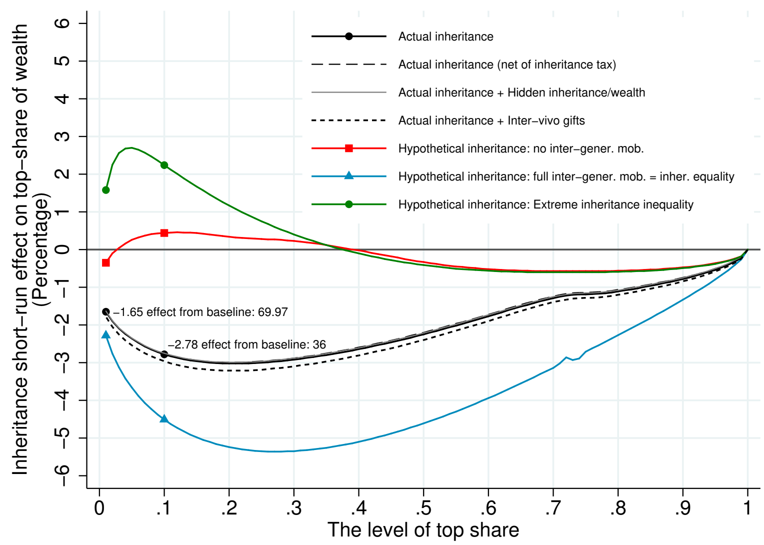


Figure 1: The short-run effect of inheritance on wealth inequality

Note: Panel A displays the Lorenz-curve of wealth before and after receiving the inheritance in the blue solid and dashed lines and the Lorenz-curve of inheritance in the solid red line. The long-dashed gray line represents the accumulative share of inheritance by pre-inheritance wealth rank. Panel B displays the difference between the Lorenz-curves after and before inheritance receipt, presented as the effect on the top-share wealth under six different scenarios, in the order: 1) the actual effect of inheritance (the difference between solid and dash blue line in Panel A), 2) the inheritance effect after taking the inheritance tax paid by heirs into account, 3) the effect taking the hidden wealth of both generations into account, and 4) the effect when including inter-vivo transfers (see Section 4 and Appendix Figure D.5 for more details). The next three colored lines represent three hypothetical scenarios: 5) the hypothetical case of no intergenerational mobility of wealth. It is constructed by assigning parents' wealth measured one year before death to children such that children in the q'th quantile of the heirs' wealth distribution get the average wealth of parents in the q'th quantile of the parents' wealth distribution and 6) the world of full intergenerational mobility or, equivalently, the world of no inheritance inequality. This is constructed by assigning the wealth of a random parent to each heir, 7) the case of extreme inheritance inequality where we assign all estates to the top 0.1% wealthiest parents. See Appendix Figure D.6 for alternative measures of extreme inheritance inequality. These analyses consider children who lose a parent in 2002-2004.

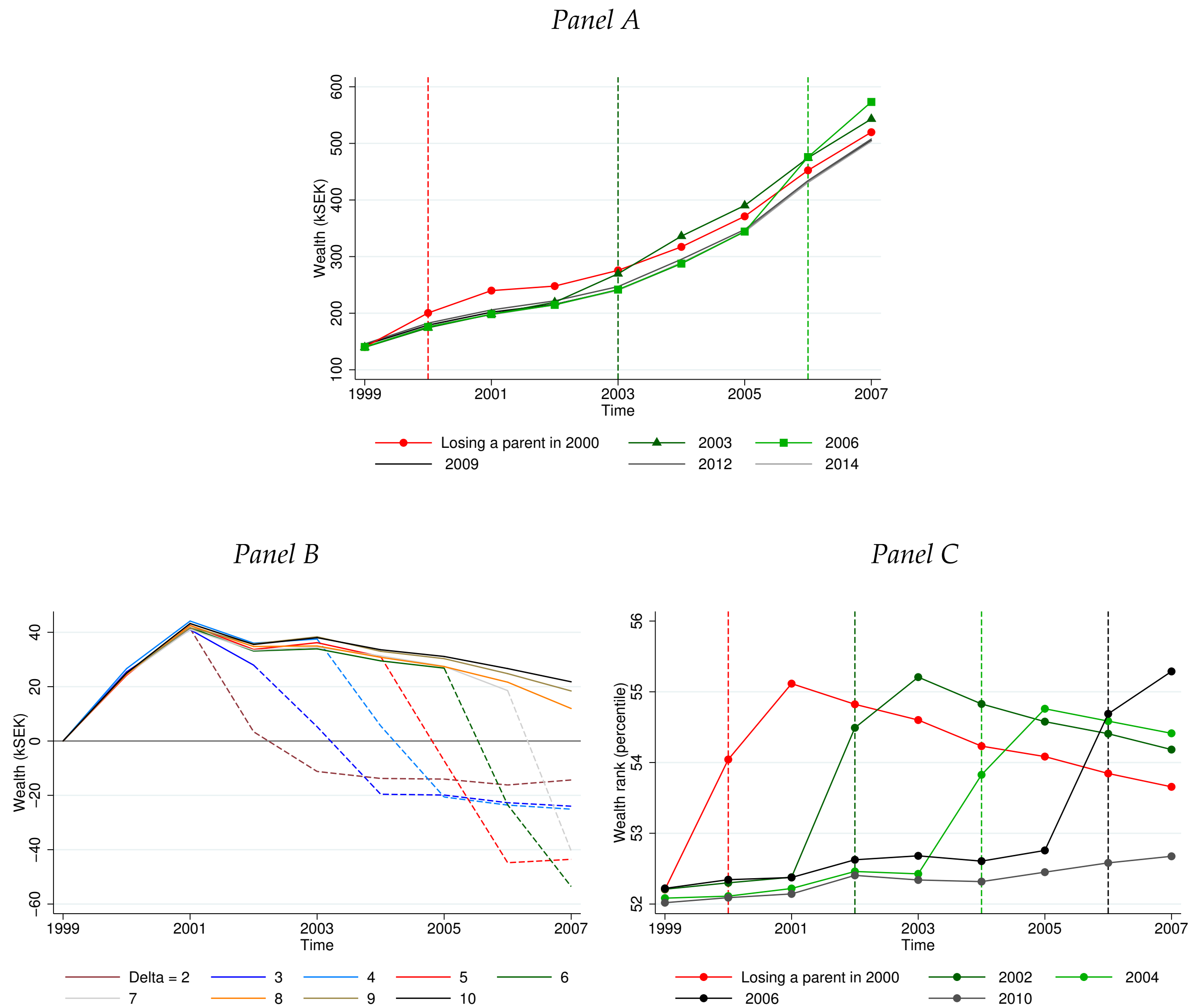


Figure 2: Empirical design

Note: Panel A shows the evolution of median wealth in thousand Swedish kronor (kSEK) over time for children who lose a parent in different calendar years. Panel B shows the difference between median wealth of children losing a parent in the year 2000 (treatment group) and different potential control groups, normalized in 1999. For example, Delta = 2 means that the control group lost a parent in 2002. The solid (dashed) component of the time-series shows differences before (after) the control group loses a parent (gets treated). Panel C shows the evolution of the wealth percentile rank in the birth cohort for children who lose a parent in different years. In each graph, we reweigh the birth-year distribution as well as the education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000.

Panel A *Panel B*

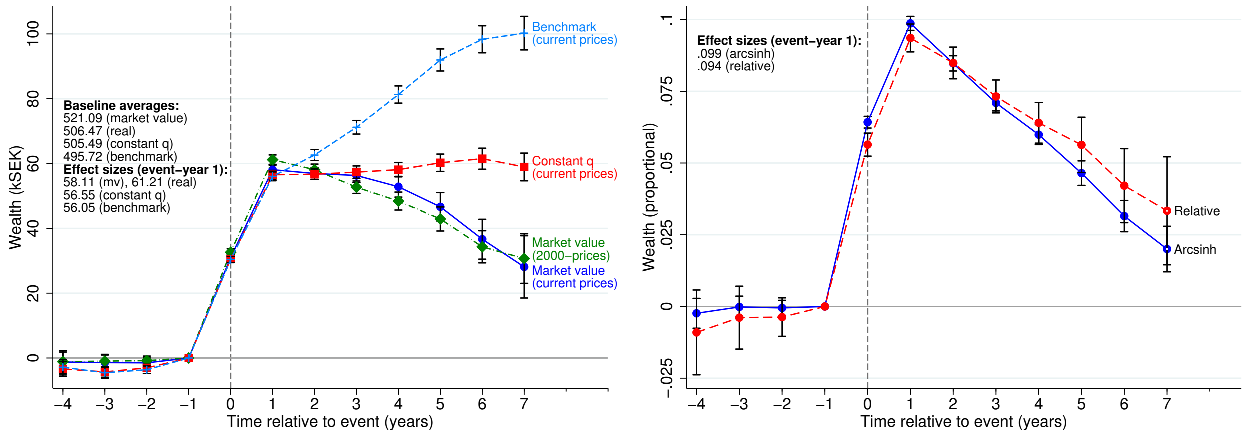


Figure 3: The effect of inheritance on wealth of heirs

Note: This figure presents the effect of inheritance on wealth in thousand Swedish kronor (kSEK) at market value using current and fixed prices, as well as *benchmark* and *constant q* (Panel A) and the inverse hyperbolic sine function and wealth relative to the control group average (Panel B). Wealth at current prices is the total market value of assets, i.e.$p_t \cdot q_t$ where p_t and q_t are the vector price and quantity at time t, respectively. The fixed prices arethen $p_{2000}.q_t$ and *constant q* $p_t.q_{s+1}$, where s is the year of receiving the inheritance. The benchmark case indicates the hypothetical level of wealth if the initial wealth had been invested anindividual-specific pre-inheritance portfolio, i.e. $p_t.\hat{q}_{s+1}$ where $\hat{q}_{s+1}$ is average portfolio and $p_{s+1}.\hat{q}_{s+1} = p_{s+1}.q_{s+1}$. We use the fixed-control group method with children who lose a parent in 2000-2004 (2008-2012) as the treatment (control) group, with the exception of the series labeled *benchmark* and *constant q* which are constructed using the fixed-delta method, i.e. each treatment cohort (death years 2000-2004) gets assigned a control group which receives inheritances after 8-11 years. All regressions reweigh the birth-year distribution as well as the education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

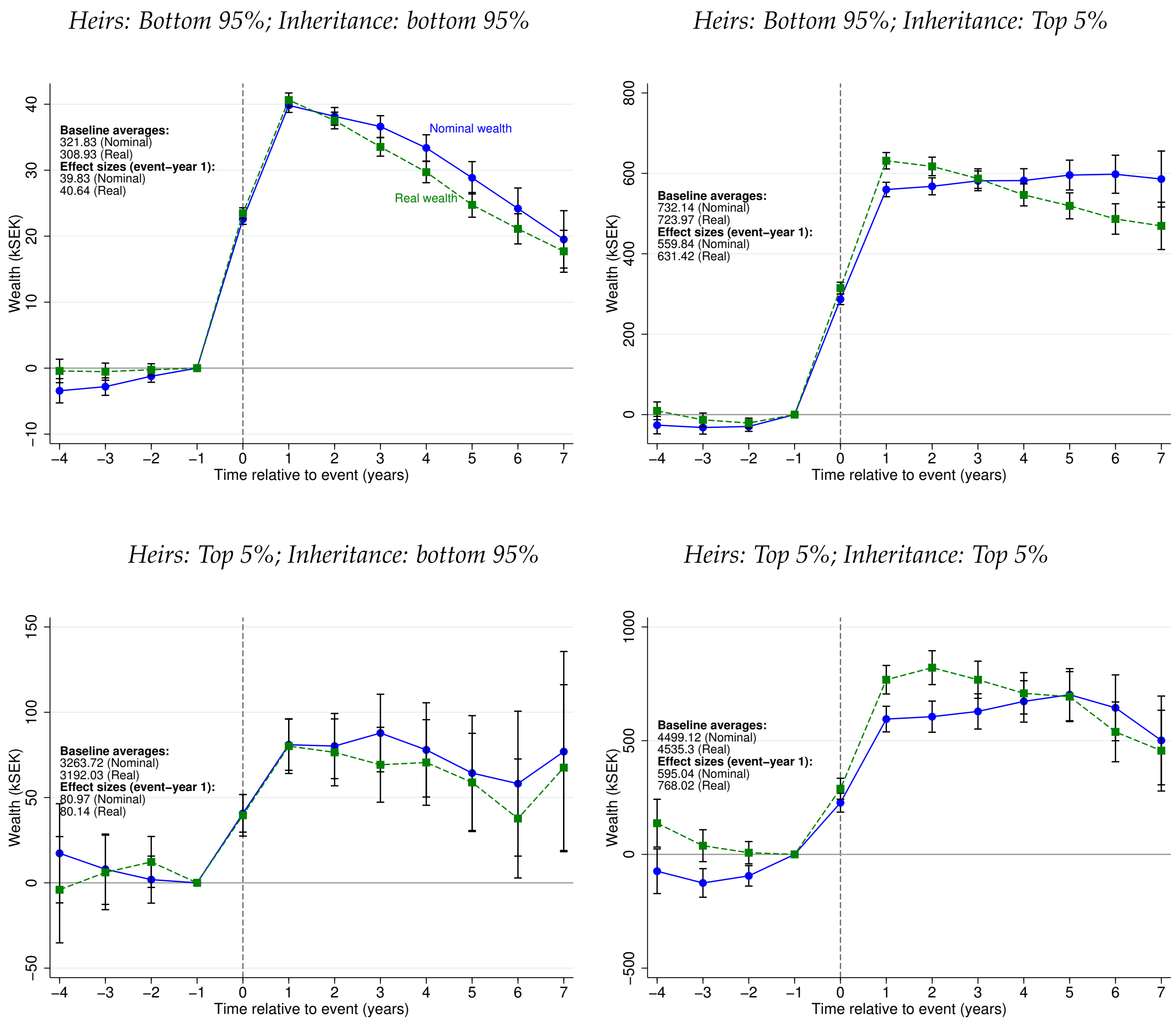


Figure 4: The effect of inheritance on wealth by heir and parents' wealth

Note: This figure shows effects of inheritances on wealth in thousand Swedish kronor (kSEK) for four subsamples by heir and parent wealth. The estimates in each panel are based on separate and independent regressions. For example, the top left panel focuses on children who belong to the bottom 95% of the wealth distribution with the bottom 95% inheritance (both computed in 1999). The fraction of heirs in the different categories is, reading from the top left, 92.4%; 2.6%; 4.2% and 0.8%. We computed expected inheritances as follows. We take the parent's wealth in 1999, multiply it with the share of the estate that goes to children and divide by the number of children. For 2002-2004 when we know the actual inheritances, we compute the child-share directly at the individual level, but for the other inheritance cohorts (2000-2001 and 2008-2012), we impute the child-share from the 2002-2004 generation as the average child-share within cells defined by wealth quantile and the indicator of having a surviving spouse. These estimates are based on the fixed-control method where our treatment (control) group comprises children who receive inheritances in 2000-2004 (2008-12). All regressions reweigh the birth-year distribution as well as the education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

Panel A: 5 percentile bins *Panel B: 1 percentile bins*

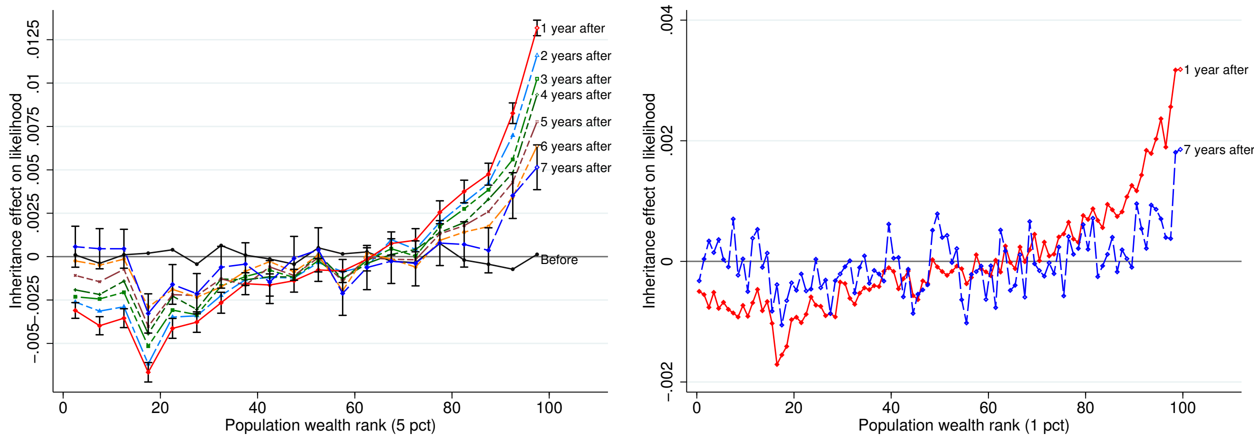


Figure 5: The inheritance effect on the likelihood of being in each percentile of the population wealth distribution

Note: Panel A plots the effect of inheritance on the likelihood of heirs being in each 5-percentile bin of the population wealth distribution across all seven years and in the year before inheritance receipt as a placebo. For illustrative purposes, we only show confidence intervals for the effects in one and seven years post inheritance receipt. Panel B instead shows effects on 1-percentile bins, emphasizing that the effect is concentrated within the top two percentiles.

Panel A: Kuznets ratios *Panel B: Top shares*

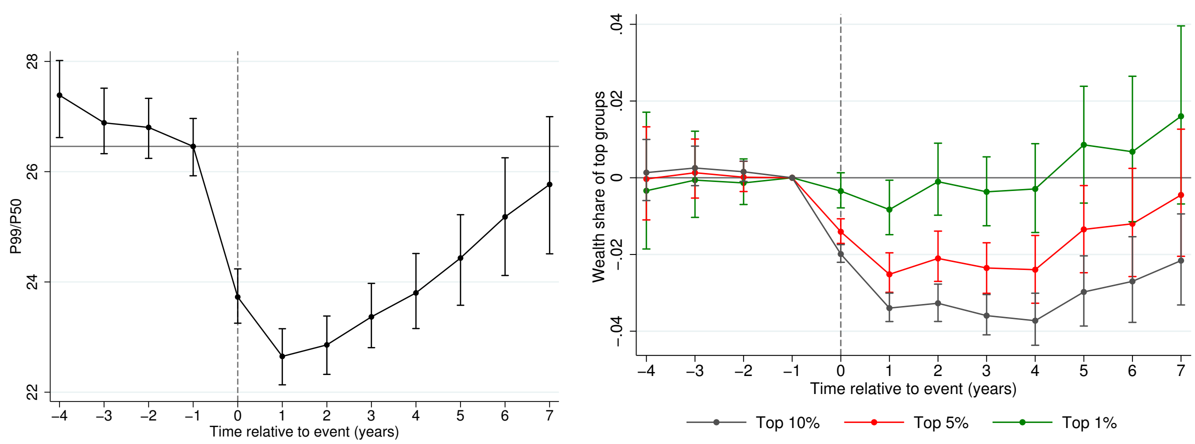


Figure 6: The effect of inheritance on long-run wealth inequality

Note: Panel A plots the effect of inheritance on the P99/P50 percentile ratio. For a more complete image, see Figure D.12 in the Appendix. Panel B does the same but focuses on the share of wealth in the hands of the wealthiest individuals. All regressions reweigh the birth-year distribution (1-year-intervals) as well as the education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of birth-years of children who lose a parent in 2000. We omit event-time minus one as the reference period. The figures display 95%-confidence intervals from 1000 bootstraps.

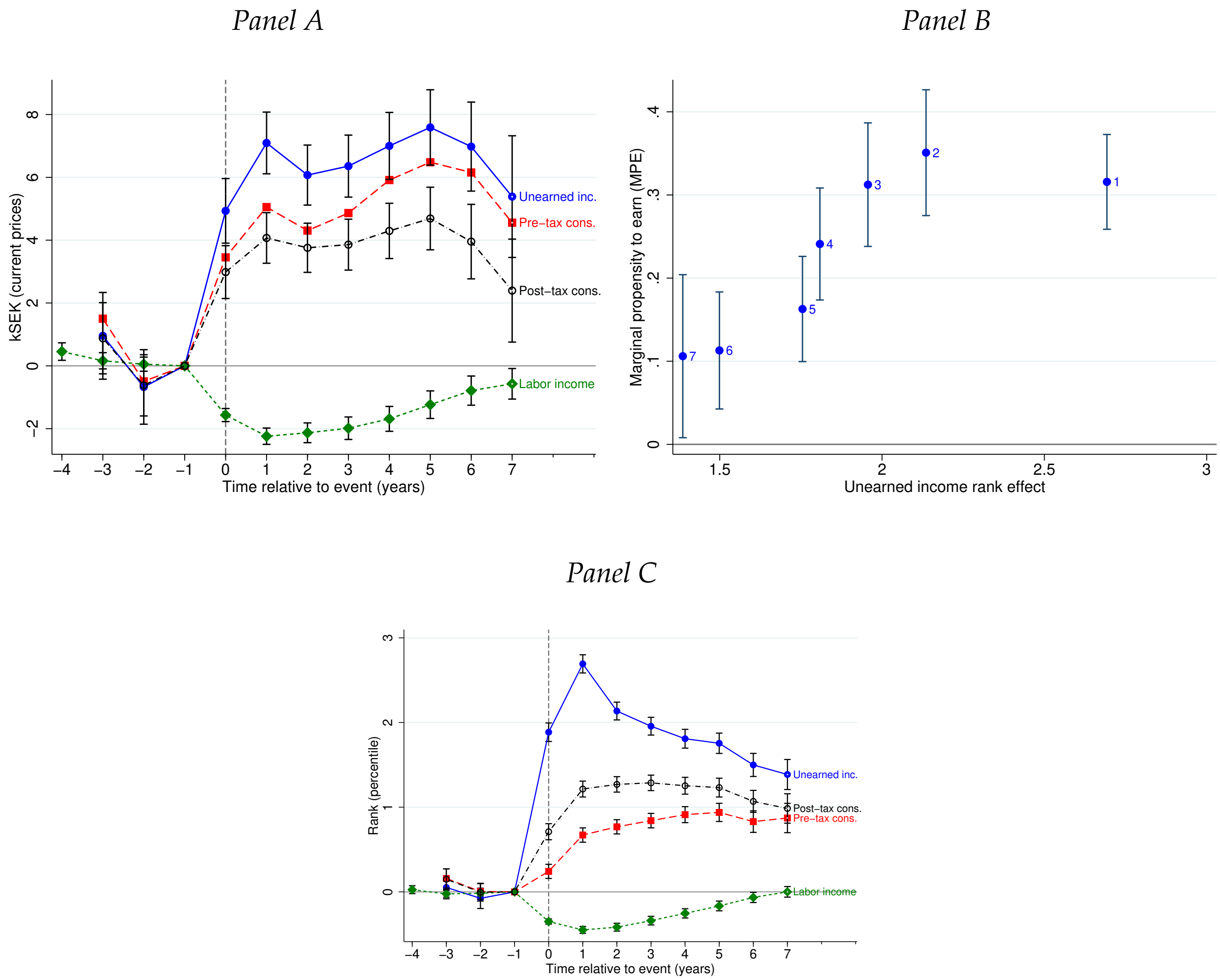
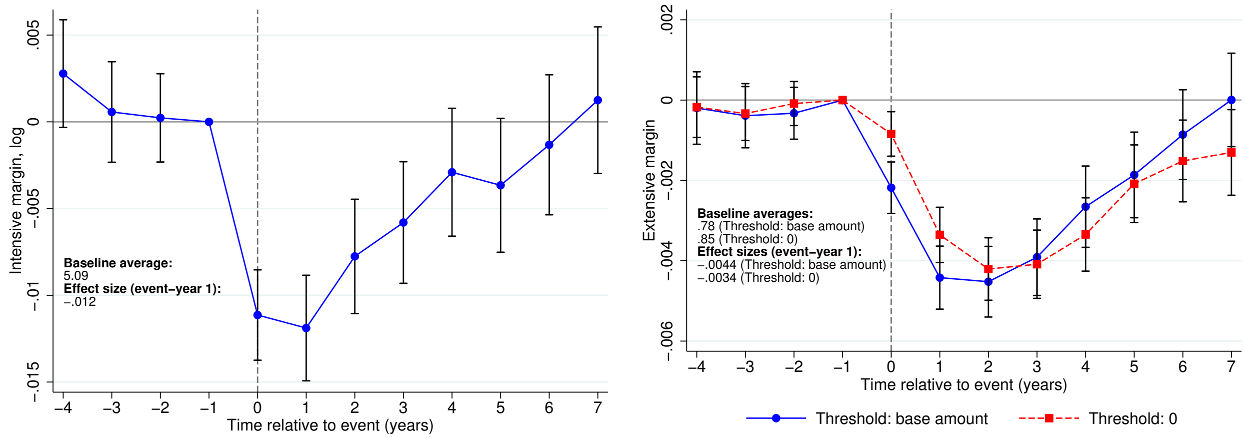


Figure 7: How the inherited wealth is spread across time and responses it generates

Note: Panel A shows the effect of inheritance on unearned income, consumption (net and gross of taxes and transfers) and labor earnings in thousand Swedish kronor (kSEK). Panel B presents the estimated marginal propensities to earn (MPE) against unearned income rank effects. MPE is defined as the absolute value of the inheritance effect on labor income divided by the effect on unearned income coefficients. The labels refer to event-times and standard errors are obtained using the delta-method. Panel C is similar to Panel A, but shows the inheritance effects on within-birth-cohort ranks. The labor income effects are obtained using the fixed-delta method while all other effects use the fixed-control strategy. All regressions reweigh the birth-year distribution as well as the education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of birth-years of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals. We omit confidence intervals for pre-tax consumption in Panel A to increase the readability.

Panel A



Panel B

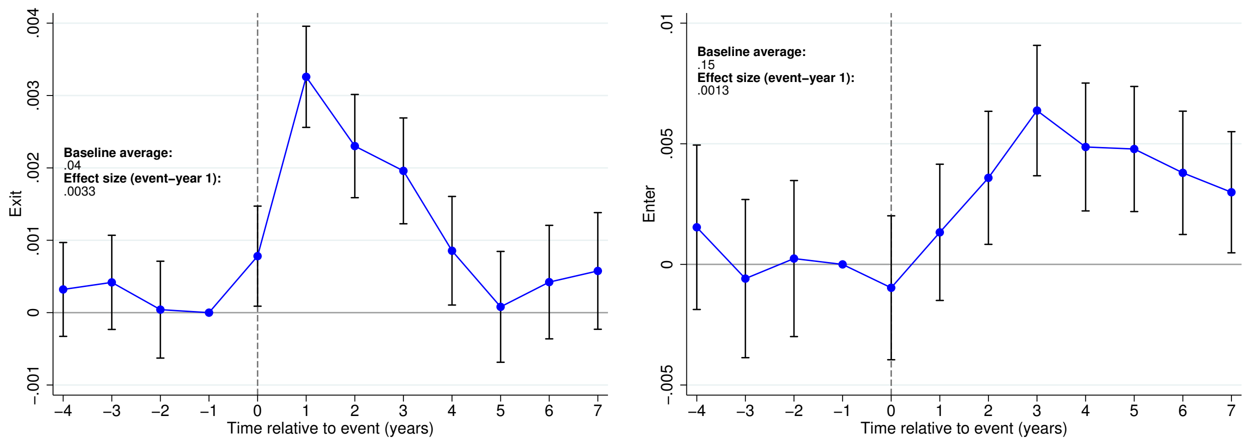


Figure 8: The effect of inheritance on labor supply of heirs

Note: Panel A shows the effect of inheritance on the intensive and extensive margins of labor supply: the log of labor income and the indicator of having positive labor income. Panel B shows the likelihood of exiting (entering) employment, defined as having zero (positive) earnings, conditional on positive (zero) earnings in the previous year. The estimates are based on the fixed-delta method with the treatment (control) group comprising children of parents who die during 2000-2004 (2008-15). All regressions reweigh the birth-year distribution as well as the education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of birth-years of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

Panel A Panel B

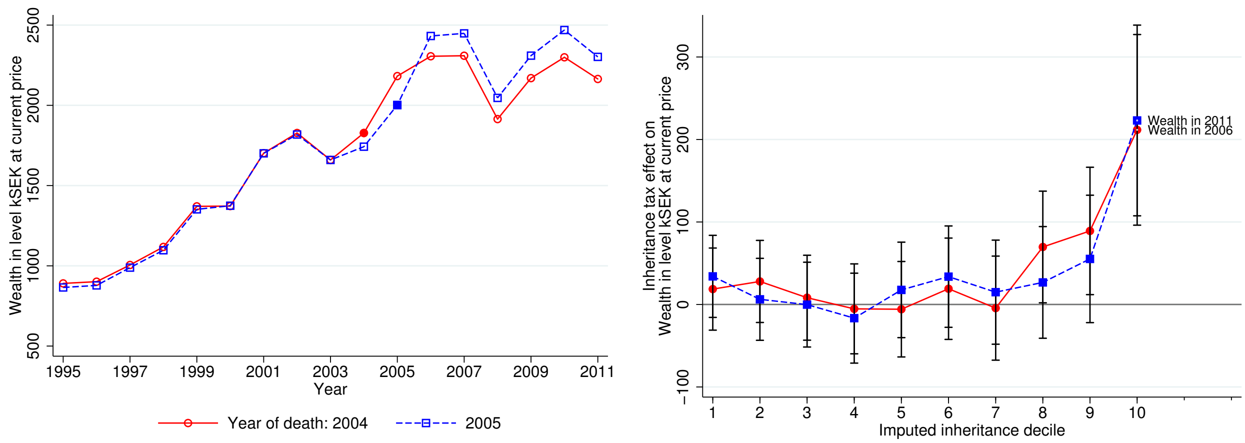


Figure 9: The evolution of excess inheritance due to the inheritance tax repeal in 2004

Note: Panel A shows capitalized nominal wealth in thousand Swedish kronor (kSEK) against time for children with a top decile inheritance so that they are subject to tax. It does so for two groups, children who lost a parent in 2004 and 2005 (solid circled and squared dashed series) so they are and are not subject to inheritance tax, respectively. The parental death year is demarcated by the filled circle/square. Panel B investigates the effect of the additional inheritance due tothe tax reform on wealth for different parts of the inheritance distribution. It does so by plotting the difference between the wealth of the cohort of 2004 and 2005 first in 2006 and then in 2011. This difference can be interpreted as the extra wealth from the additional inheritance due to the inheritance tax reform. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

Online Appendix (not for Publication)

How do inheritances shape wealth inequality? Theory and evidence from Sweden

Arash Nekoei

David Seim

Abstract

Inheritances reduce relative measures of wealth inequality according to recent evidence from several countries. Using a theoretical model and Swedish administrative data, we first show that this counter-intuitive finding can be explained by high intergenerational wealth mobility and low inheritance inequality relative to wealth inequality. We then exploit two quasi-experiments: randomness in the timing of death and an inheritance tax repeal. We find that the equalizing effect of inheritances is short-lasting and reverted within a decade since less wealthy heirs deplete their inherited wealth rapidly in contrast to more affluent heirs. This depletion represents a constant reduction in annual savings equivalent in size to 10% of the average inheritances amount. 70% of this additional annual non-labor income are allocated to consumption (half of it is car purchases) in the first years, compared to 90% in later years. The remaining 30% (or 10%) reflect a considerable albeit declining labor supply elasticity with respect to inheritances. Taken together, our findings suggest that inheritance taxation can reduce long-run wealth inequality solely through the taxation of very large inheritances.

Part I

Appendix

A The measurement of wealth

A.1 Wealth registry vs. household balance sheets

In this section, we first provide three adjustments to increase the coverage of our wealth measure mainly to limit the influence missing wealth components on our results. Then we compare our individual-level wealth definition with that of the household balance sheets from National Accounts.

First, regarding the value of households' defined contribution pension savings, we observe contributions to and withdrawals from personal retirement accounts as well as withdrawals from private occupational pension accounts.[73] We observe contributions because they were tax deductible and automatically submitted by banks and financial institutions to the Tax Agency. Withdrawals are observed as they are subject to the income tax. We are thus able to capture potential behavioral responses of receiving inheritance on savings in retirement accounts. Regarding occupational pensions, contributions and withdrawals to these accounts can only be changed by altering labor earnings and we capture responses to inheritance receipts along these margins through our labor supply and consumption outcomes.

Second, ownership in closely held corporations was taxable according to the wealth tax but the enforcement was poor, leaving us with hardly any information on such assets. We therefore capitalize business income to obtain measures of such assets, following the approach in Saez and Zucman (2016) and described in the next section. Adding wealth in capitalized businesses increases the baseline average wealth, but has only a marginal influence on the estimated effects of inheritances on wealth accumulation (see Appendix Figure A.8).

Third, during 1999-2005, third-parties were obliged to report bank values if the total annual interest paid to the consumer exceeded 100 SEK. The reporting of bank accounts increased extensively in 2006, as the reporting requirement changed to having a balance of at least SEK 10,000 at the end of the year. In total, we capture 60-75 % of total bank holdings over the 1999-2005 period, but as wealth is skewed, only around 44 percent of our analysis sample have interest payments above the cutoff. We provide two solutions that bound the potential bias. The first approach, described in detail in Appendix Section A.2, compares the direct inheritance effect using the wealth data with the inheritance recorded in the inheritance data, exploiting that bank values are always included in the inheritance records. Reassuringly, the estimated inheritance effect using the wealth records is at least as large as the inheritance data and, importantly, this is true across the heir-wealth distribution. Second, a subset of individuals who do not meet the requirements for bank reporting still have positive values. We first show that this is because some banks report all their customers' bank values. Treating this as a random sample conditional on certain observables, we then impute bank values for those with no

[73] The Swedish pension system consists of three pillars: a public defined contribution scheme; occupational pensions and private retirement savings plans. For a detailed overview, see Johansson et al. (2016). See also Appendix Section C and Figure C.1, where we estimate the effect of inheritances on retirement contributions directly.

bank information. We divide individuals into cells defined by wealth (excluding bank value), year of birth, calendar year and parental year of death and compute the mean bank value within this subpopulation. We then assign that value – cell-by-cell – to the individuals who do not meet the requirements and who do not report.[74] Estimating inheritance effects with and without adjusting bank values yield similar results, potentially because unreported bank accounts have two offsetting effects. On the one hand, the bias from not observing all bank accounts could lead to an underestimation of the inheritance effect if some inheritances end up in unreported bank accounts. On the other hand, it could also lead to an overestimation since inheritances can make some bank accounts visible, by increasing interest income above the threshold.

Now we compare our individual-level wealth definition with that of the household balance sheets from National Accounts. The cross-walk of the asset types between two sources is straight-forward, with one exception: insurance savings in the Household Balance Sheets includes endowment policy, life insurance and pension insurance, while in the individual-level records it only includes endowment policy only.

The microdata do not contain information on pension wealth, but we see withdrawals as they are subject to income taxation and we see contributions to individual retirement accounts (see Section 3.2 for a detailed account on how we deal with this).

Asset class	Micro data	National Accounts	Share of National account included in micro data	Share of National account accounted for after adjustments
	(1)	(2)	(3)	(4)
1. Cash and bank	9.5%	8.2%	74.7%	100%
2. Bonds	1.5%	1.6%	67.8%	67.8%
3. Listed equity	8.8%	6.1%	91.6%	91.6%
4. Unlisted equity	0	5.1%	0%	96.6%
5. Funds	7.6%	5.8%	85%	85%
6. Insurance savings	2.3%	7.9%	19.0%	100%
7. Private pension savings	0	17.3%	0%	100%
Total financial assets	**29.8%**	**52%**	**36.8%**	95.8%
1. Housing and land	59.1%	40%	95.0%	95.0%
2. Tenant-owned apartments	11%	8%	88.4%	88.4%
Total non-financial assets	**70.2%**	**48%**	**93.9%**	**93.9%**
Total assets	**5147744**	**8020432**	**64.2%**	94.9%
Liabilities	**1533096**	**1628872**	**94.1%**	94.1%
Net Wealth	**3614647**	**6391561**	**56.5%**	95%

Table A.1: Comparison between micro wealth data and National Accounts

Note: This table presents aggregate average values over 1999-2007 of all households' ownership in different asset classes. Percentages in columns (1)-(2) refer to shares of total assets, while numbers denote current million SEK. Column (1) uses the individual-level wealth data

[74] Again, see Appendix Section A.2 for a detailed description of the procedure.

used in this paper, while column (2) offers the counterpart from the National Account's Household Balance sheet data. The third column shows the share of assets in the microdata relative to that in the National Accounts. Column (4) shows the share of National account wealth that we capture in microdata and through our adjustments, described in Section 3.2. Bank accounts are adjusted according to an imputation strategy (see Section A.2). Unlisted equity are computed using the capitalization technique (see Appendix Section A.4). At the heir-level we observe changes in retirement wealth and insurance holdings through tax-deductible retirement contributions (see Appendix Section C), through changes in labor supply (contributions are indexed against labor income) and through changes in consumption (withdrawals of retirement savings are taxable and therefore part of after-tax income which is used to construct our post-tax consumption measure). Non-financial assets include land, dwellings, vacation homes, apartment houses. Liabilities include mortgages, student loans and financial debt (issued options).

A.2 Imputing Bank Values

As mentioned in Section 3.2, our data do not capture bank holdings completely. During our sample period, money in bank accounts were taxable, but not always reported by the third parties (banks) to the tax authorities. For 1999-2005, they were required to be reported by third-parties if the total annual interest paid by the third-party exceeded 100 SEK. In 2006, the reporting requirement changed to having a balance of at least 10 thousand SEK at the end of the year. This extensively increased the reporting of bank accounts in 2006-2007. As a result, for the 1999-2005 period, we observe the bank holdings of around 45% of the population, amounting to 60-75% of the aggregate bank holdings in the Financial Accounts. The equivalent numbers in 2006-2007 are 67.5% of the population and 86-89% of total bank holdings.

To illustrate this, Figure A.1 plots the fraction of bank accounts that pay interest below the reporting threshold against bank value. The dashed and solid series correspond to 2005 and 2006, i.e. right before and after changing the requirements. The difference between the two series illustrates the issue of unreported bank values. For instance, out of all reported bank accounts with a value of 100 kSEK, around 10% generated less than 100 SEK of interest in 2005. In 2006, the corresponding share was above 20%.

Three facts worth mentioning about this figure. First, the fraction of bank accounts with interest received below 100 SEK is positive in 2005, even though reporting of these accounts was not required. Second, the share of low-interest accounts rises dramatically after the reporting regime shift in 2006. Third, the fraction of low-interest accounts for bank values below 10 thousand SEK (i.e. for those accounts where no change in reporting requirement occurred) is constant over time suggesting that the interest rate on those accounts was constant between 2005 and 2006. In sum, reporting requirement in the period of 1999-2005 leads to majority but not all bank holdings with small interest be missing in the data.

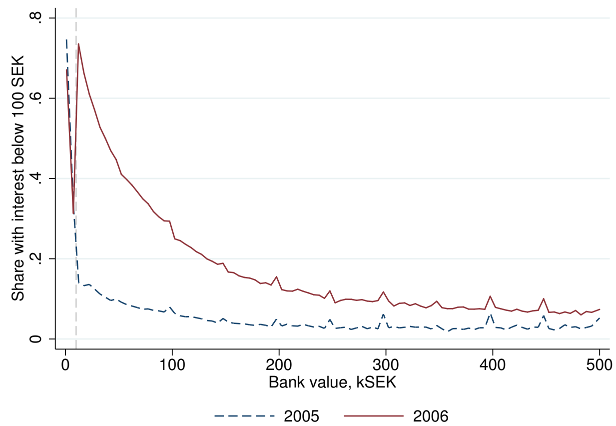


Figure A.1: Share of low-interest bank accounts across bank holdings before and after the reporting shift

Note: The figure shows the fraction of bank accounts that pay interest below 100 SEK against bank account value before the reporting regime change, in 2005 (dashed), and after, in 2006 (solid). During the period 1999-2005, bank values were reported automatically by third-parties to the Tax Agency if the interest received amounted to 100 SEK, while values were reported if the balance exceeded 10 thousand SEK for the period 2006-2007. This 10k-threshold is demarcated by the vertical grey line. We winsorize bank values above 500 thousand SEK(above the 97th percentile in the bank value distribution over those years) for expositional purposes.

This shortcoming might imply that we do not capture the inheritance effect on wealth correctly. The bias can go either way: It could lead to an underestimation of the inheritance effect if part of inherited wealth end up in unreported bank accounts. It could alternatively generate an overestimation of the inheritance effect since inherited wealth can increase the likelihood that a bank account got reported. The implication of the shortcoming for the dynamic effects is also a priori ambiguous.

We propose two solutions to the issue of censored bank holdings . Our first approach compares the short-term effect of receiving inheritance on wealth using our empirical strategy, to the actual value of recorded inheritance recorded in the inheritance data. A higher actual value in the inheritance data would be consistent with unreported bank values biasing our estimate downwards while a lower value represents an upward bias. Figure A.2 displays the direct, mechanical effect of losing a parent on wealth against inheritance for each heir-wealth decile in 1999. Each observation represents a moment and a wealth decile, indicated by the number next to the marker. The graph reveals that the short-term effect of receiving inheritance on wealth using our empirical strategy (i.e. the mechanical effect) is at least as large as the inheritance. Importantly, this is true also in the lower heir-wealth deciles, in which censored bank values are more of a concern.

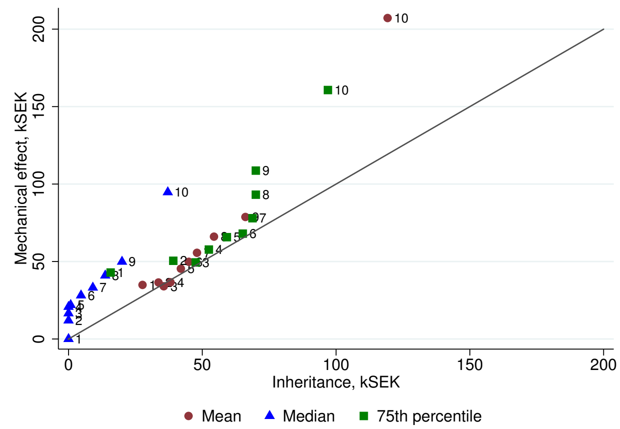


Figure A.2: Short-term effect of receiving inheritance on wealth against reported inheritance

Note: The figure shows the direct, mechanical effect of losing a parent on wealth against inheritance for individuals who lose a parent in 2002-2004. To construct this graph, we first divide heirs with non-negative wealth into ten equally-sized groups based on their wealth in 1999. Within each decile, we estimate the mean, median and 75th percentile mechanical effect, defined as the taxable wealth difference between treatment and control group (comprising year-of-death cohorts 2006-2008) in event-year one, net of the difference in the year before the event. Children's birth cohorts and four-digit education levels are reweighed to match the distribution of those who lose a parent in year 2002. Within each decile, we also compute the mean, median and 75th percentile inheritance for the treatment group, from the inheritance data. The red circled series show the estimated average mechanical effect against the average inheritance within each decile. The labels next to each observation indicate the corresponding heir-wealth decile.

The caveat of the first approach is that it does not address the potential consequences of censored bank values on the dynamic effects of inheritance on wealth. Our second approach speaks to this issue by imputing bank values for individuals whose deposits are not reported. For 7% of the total population who face interest payments below 100 SEK and thus are not meeting the bank-reporting requirement in 1999-2005, bank values are still reported. We use the information on bank accounts from this subset to infer and impute values for the censored ones.[75]

Our imputation strategy is valid if the reported bank values are representative of those without bank holdings in the data. It is likely that retail banks either reported all accounts or only those above the threshold. To test whether this conjecture is true, we exploit the reporting regime change in 2006 described above. The new rules increased the total number of accounts reported. If some banks were already reporting all accounts, we should expect no increase in the number of accounts from those banks but increases from others.

Panel A of Figure A.3 shows the number of accounts per year for the ten largest banks in Sweden. For six out of the ten, the number of accounts is relatively constant, while the number of reported accounts increases dramatically for others. We thus conclude that there is a set of individuals who did not meet the requirement for reporting but for whom reported bank values exist anyway, because some of the major banks reported all their customers' bank values independent of the balance.

We impute bank values from similar individuals who received interest below the threshold but had their bank values reported anyway. More precisely, we define cells of similar individuals and

[75] An alternative imputation strategy uses the bank values of individuals with interest payments just above the threshold. If bank values are monotonically increasing in the interest paid, this would constitute an upper bound on bank holdings for those with interest below 100 SEK. Unfortunately the alternative reporting regime in place during the years 2006-2007 reveals that large bank deposits can generate interest payments of zero, violating that monotonicity-assumption.

then we assign the mean bank value for the subpopulation below the threshold with reported bank holdings to those without. Our imputation strategy is valid if there are no systematic differences in the customer base across the major banks.

As a validity check, we impute bank holdings for the total population and compare the aggregate values with the total bank values in the Household Balance Sheets of the National Accounts. We here define cells by calendar year, birth cohort (5-year intervals) and being within the top 10% of the wealth distribution. We inflate the bank holdings by a factor of 1.2 to ensure that we match the aggregate bank values. Panel B of Figure A.3 shows the aggregate time series of bank wealth in the hands of households, when imputing and not imputing missing bank values. Panel C of Figure A.3. presents the difference between the adjusted and unadjusted bank values as a fraction of unadjusted bank values against wealth decile for the total population. This adjustment increases the value of average bank holdings by a factor of 10 for individuals with low wealth, but does not have a large relative effect for top deciles.

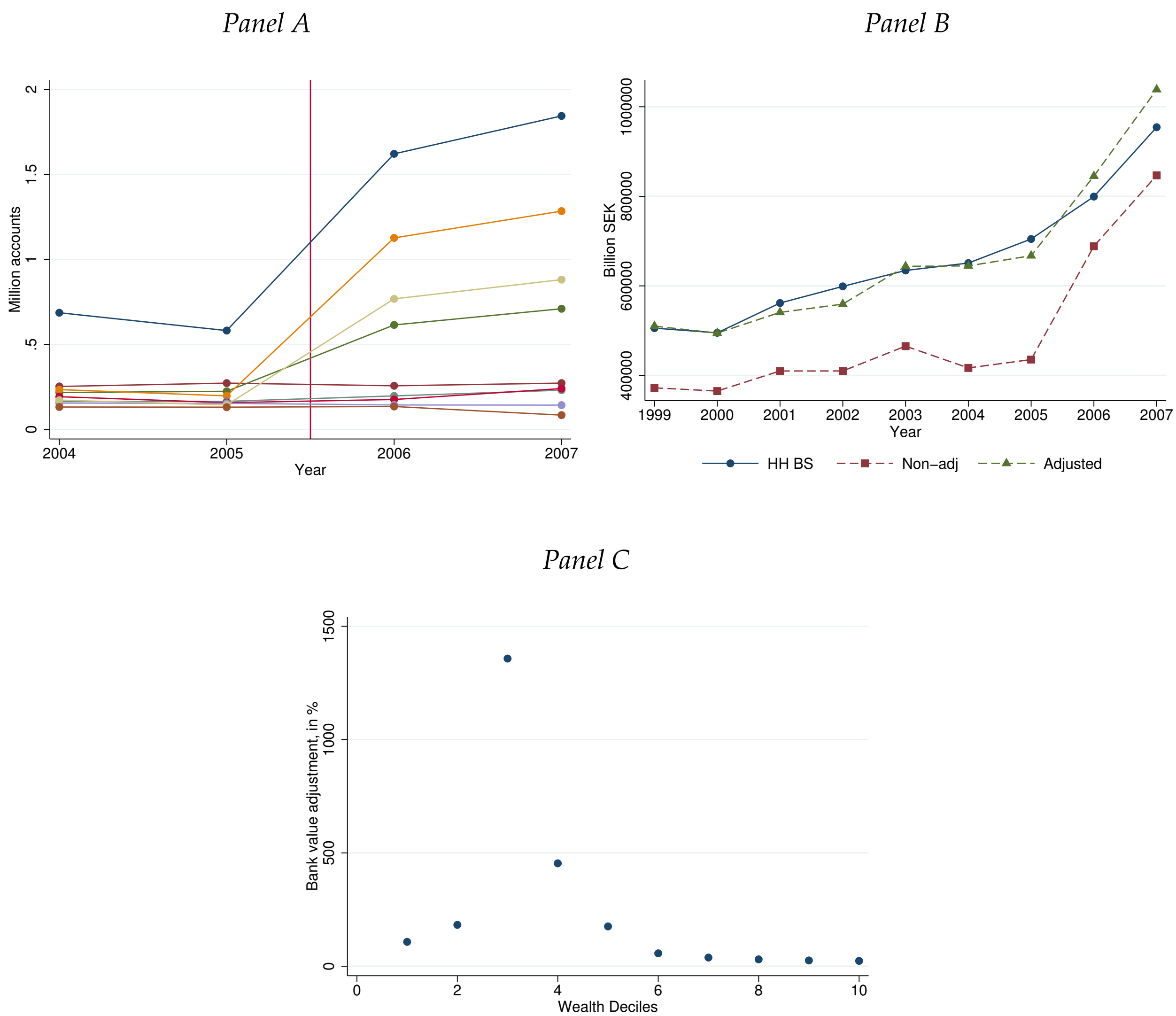


Figure A.3: Imputation of the value of bank holdings

Note: This figure is for the total population and not our estimation sample. Panel A shows the number of accounts over time for the ten largest banks in 2005. Panel B reports the total value of households' bank values over time in the National Accounts (circled solid series); the micro data when not imputing and when imputing missing bank values (squared dashed series and triangled dashed series, respectively). The imputed series are constructed as follows. We create cells defined by year of birth, calendar year and wealth decile (within year). For each cell we compute the average bank value for the subpopulation who do not meet the requirement for bank value reporting but who report anyway. We assign that value to those who do not meet the requirement and have no bank value and multiply the resulting bank holdings by a factor of 1.2. Panel C presents the difference between adjusted and unadjusted averages of bank values, divided by the unadjusted bank value against wealth decile.

To assess the impact of missing bank values on our dynamic inheritance effects, we define cells by the year of parental death, birth cohort (5-year intervals), calendar year, parent's wealth being within the top 10% (computed in the year prior to death, within death cohort) and own wealth being within the top 10% (in the year prior to the parent's death). For each cell, we assign the mean bank value for the subpopulation below the threshold with reported bank holdings to those without.[76]

Figure A.4 shows the impact of the imputations on mean and median bank holdings and wealth, respectively, within our analysis population. Panel A shows that the method has a positive impact on average bank values in our data and Panel B confirms that the effect is concentrated in the lower part of the wealth distribution, shifting the median by a larger amount than the mean. For wealth, our main outcome of interest, the imputation has a much more limited effect – it increases average wealth by at most 5% – because bank accounts represent only a small fraction of total wealth. Panels C and D show that average and median wealth are barely affected, suggesting again, that missing values for bank holdings are more of a concern in the lower end of the wealth distribution.

Another procedure would have been to follow Calvet et al. (2007) and regress the bank balance on age and age squared of the household head as well as on income and financial wealth outside bank accounts, for the subsample of individuals whose bank values are reported even though their interest income is below 100 SEK. Using the estimated coefficient we could predict the balance using that sample. We abstain from this approach for two reasons. First, such a regression imposes strong parametric assumptions about the relationship between holdings and the regressors. Second, imputing bank values this way adds a much smaller amount of wealth to individuals with missing bank accounts.

[76]Our results are robust to taking the median within each cell instead. We have also tried different cell-definitions for the imputation. For instance, defining cells by parental year of death, birth cohort (5-year intervals) and calendar year only gives similar results. Importantly, our strategy does not suffer from the problem of empty cells. We do not have cells that include only individuals with zero bank holdings.

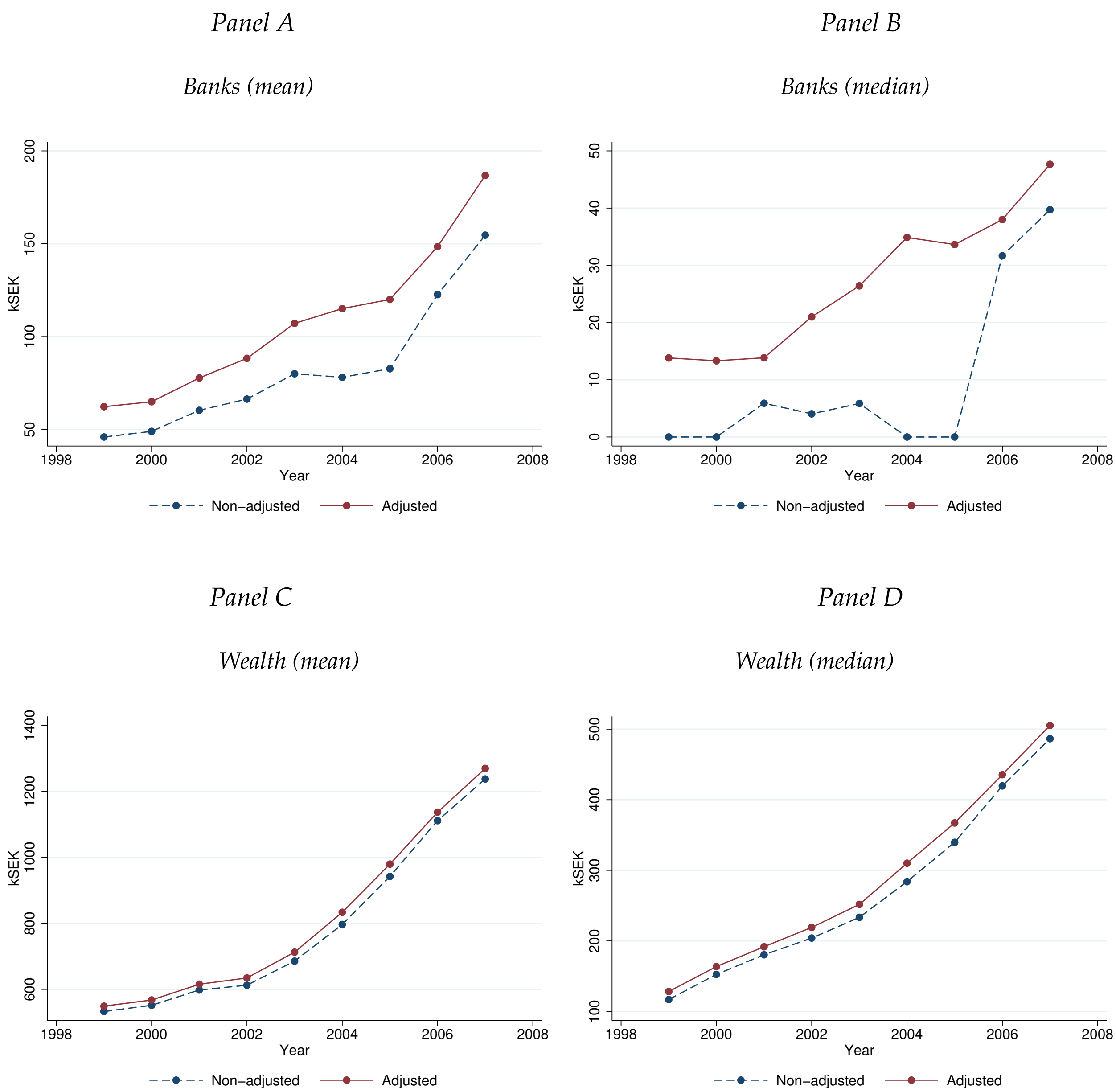


Figure A.4: Comparison of bank values and total wealth before and after the imputation

Note: The figure shows adjusted series of the value of bank holdings (Panels A and B) and wealth (Panels C and D) before and after adjusting for missing bank values, corresponding to the dashed and solid lines, respectively. We define cells by parental death year, cohort (5-year intervals), calendar year and parental wealth being in the top 10% in the year prior to death and heir wealth (excluding bank values) being in the top 10% in the year prior to parent's death. For each cell we compute the value of average bank holdings for the subpopulation who do not meet the requirement for reporting but whose bank holdings are reported anyway. We assign that value to the population who do not meet the requirement and have missing values. We multiply the adjusted bank values by 1.2 to arrive at a bank variable that matches the aggregate data (see Figure A.3). Panels A and C display the average and Panels B and D the median.

Panel A of Figure A.5 shows the effect of losing a parent on wealth when imputing (dashed series) and not imputing (solid) missing bank holdings. The dynamic effects of inheritances are largely unaffected by the imputation. Panel B instead displays the proportional effects on wealth. Even in this case, where the imputation method presumably has a greater impact (Panel C, Figure A.3), the difference between the adjusted and original series is small.

We thus conclude that the missing information on bank holdings has a marginal impact on our point estimates. We nevertheless use our adjusted wealth series when studying inequality series, where using the adequate measurements across the entire wealth distribution is key.

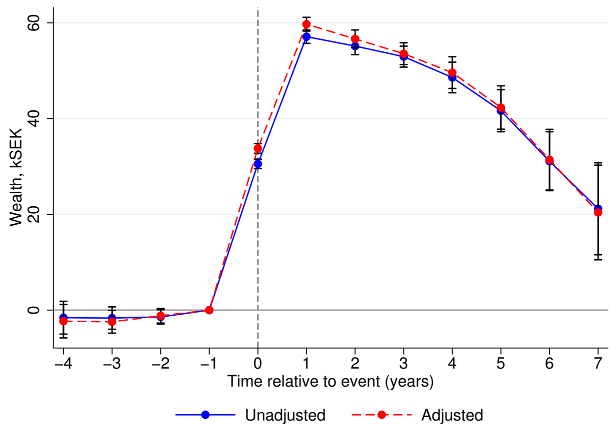


Figure A.5: The effect of inheritance on wealth after imputation of bank holdings

Note: The graph shows the effects of inheritance on wealth not adjusting (blue solid series) and adjusting (red dashed series) for missing bank values. We define cells by parental death year, cohort (5-year intervals), calendar year and parental wealth being in the top 10% in the year prior to death and heir wealth (excluding bank values) being in the top 10% in the year prior to parent's death. For each cell we compute the value of average bank holdings for the subpopulation who do not meet the requirement for reporting but whose bank holdings are reported anyway. We assign that value to the population who do not meet the requirement and have missing values. We multiply the adjusted bank values by 1.2 to arrive at a bank variable that matches the aggregate data (see Figure A.3). All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level. .

A.3 Validation of Capitalization Method

Our goal is to generate longer wealth series using the capitalization technique described in Saez and Zucman (2016). The idea is to divide the concept of wealth into subcomponents and then, within each component, map total individual flows in tax returns to aggregate household-level balance sheets, provided by the Financial Accounts. We then construct capitalization factors as the ratio of total wealth to tax return income, which we use to construct each individual's wealth in the different subcomponents. The general assumption behind the capitalization method is that the rate of return is constant across individuals within each asset class, an assumption that we can test using wealth at the micro level.

We start from individuals' capital income, as reported in the tax forms, which include the five subcategories: interest income from bank accounts; dividends; fixed income claims; business income and mortgage interest payments. Panel A of Figure A.6 shows the distribution of total positive capital income in the four categories that capture positive transfers to the individuals in 2010.[77]

[77] The shares in different classes vary slightly over time.

Panel A

Panel B

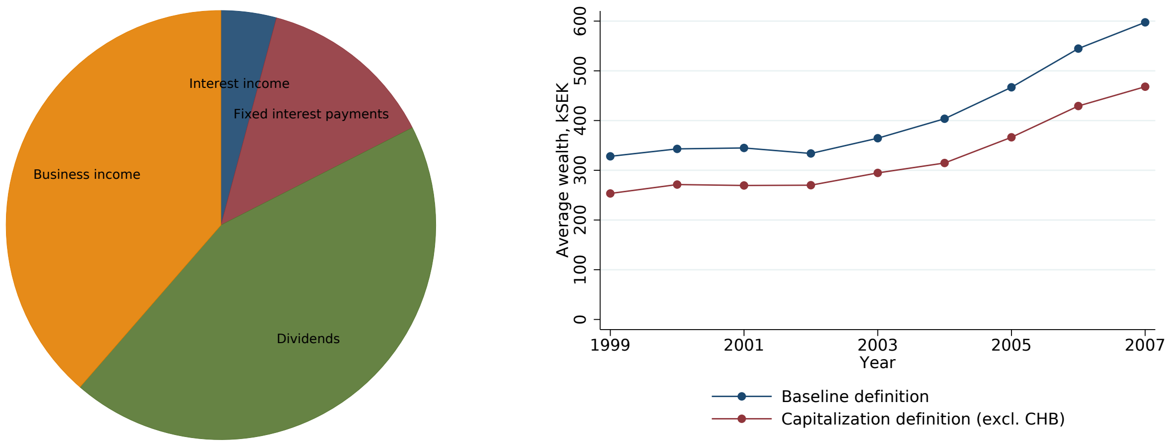


Figure A.6: Capital Income Components

Note: Panel A shows the fraction of individuals' total capital income on tax returns in business income; interest income from bank accounts; fixed-income claims and dividends in 2010. Panel B depicts average wealth according to the baseline definition (blue series) as well as that of the capitalization definition (red series), retrieved using the wealth records. The latter is not exactly identical to the wealth definition used for capitalization, as the latter includes closely-held businesses.

We map the five subcategories between the tax files to the Financial Accounts as follows:

- Interest income (in tax files): Transferable and other deposits (in Financial Accounts)
- Fixed-income claims: Debt securities
- Dividends: Listed equity and stock funds
- Business income: Unlisted shares
- Interest payments: Liabilities

The wealth of individual i in subcategory j at time t is then estimated as follows: $\hat{a}_{i,j,t} = R_{i,j,t}/\bar{r}_{j,t}$, where $R_{i,j,t}$ is capital income of individual i in asset category j at time t and $\bar{r}_{j,t} = R_{j,t}/a_{j,t}$. By construction, total capitalized wealth in these components match the financial accounts aggregates perfectly.

An inherent issue of the capitalization method is that not all assets deliver capital income, e.g. properties. For real estate, we either use direct ownership, observable during the period 1999-2011 or capitalize property taxes paid by the individual (1995-1998). For the former, we observe holdings together with associated property tax prices. We convert those to market values using estimated ratios of transaction prices to tax values that vary across years, property type and geographic location (provided by Statistics Sweden). For the latter, $\hat{a}_{i,j,t} = T_{i,j,t}/\bar{\tau}_{j,t}$, where $T_{i,j,t}$ is tax paid by individual i in asset category j (housing) at time t and $\bar{\tau}_{j,t} = T_{j,t}/a_{j,t}$ where $a_{j,t}$ is obtained from the Swedish National Wealth Database (Waldenström, 2016).

The definition of wealth in the capitalization approach differs slightly from the baseline concept. It exclude capital insurance vehicles and tenant-owned apartments, since the former do not deliver taxable capital income and the latter is not subject to the property tax. It does, however, include closely-held businesses. Panel B of Figure A.6 shows average wealth in the population, retrieved from the wealth register, according to the baseline definition (blue series) and the capitalization definition excluding closely-held businesses (red series).

We use these capitalized wealth series and apply the same empirical strategy to estimate inheritance effects. Figure A.7 below presents the coefficients using both the wealth series and the capitalized wealth, respectively. First, we see that the effect on capitalized wealth is smaller in magnitude. Second, there is a small delay in the mechanical effect in the capitalized wealth series. This is because it takes time before inheritances generate capital income. Third, the dynamic patterns are very similar across the series.

Panel A | *Panel B*

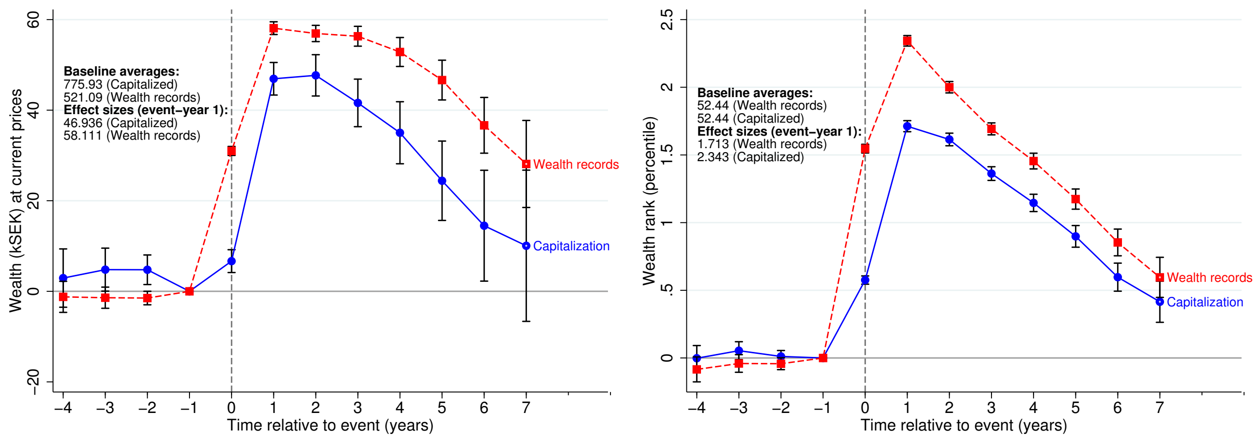


Figure A.7: The effect of inheritance on children's wealth, baseline measure and capitalized wealth

Note: This figure presents coefficient estimates of Equation 2 on our baseline wealth definition and wealth obtained using the capitalization method. In Panel A, we focus on wealth in levels defined by thousand Swedish kroner (kSEK). In Panel B, we focus on percentile ranks, created within the total Swedish population and cohort, i.e. not in our subsample of children who lose a parent. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

A further advantage of our capitalization approach is that we can correct our baseline wealth definition with information that is missing. In Figure A.8 below, we add ownership in unlisted companies, obtained using the capitalization approach, to our definition of wealth.

Panel A

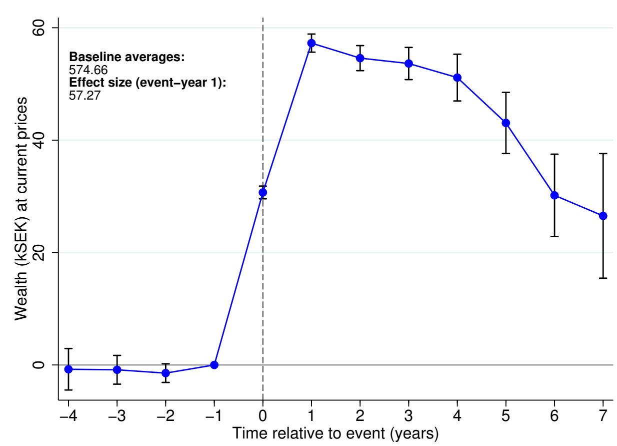


Figure A.8: The effect of inheritance on children's wealth, adding capitalized unlisted companies

Note: This figure presents coefficient estimates on wealth in thousand Swedish kroner (kSEK), defined as our baseline wealth definition plus ownership in unlisted companies. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figure display 95%-confidence intervals.

B Aligning the effect of inheritance on wealth

We compare our direct effect of losing a parent on wealth against two benchmarks, described in this section.

First, we compare the magnitude of the mechanical effect to the data in the Inheritance and Estate tax register. These data include the inheritance and the inheritance tax at the deceased- and heir-level and are almost complete for the years 2002-2004. Small estates are not liable for full inheritance declaration which means that 99% of our population who lose a parent during those years are also present in the inheritance data. However, we replicate our empirical analysis on this wealthier sample of individuals who lose a parent in 2002-2004 in Figure B.1. Because the inheritances are denoted at tax values, which are lower than the market values, we focus on tax values (we also present these effects for our main sample in Figure E.8). We find a direct effect of losing a parent of 52.17 kSEK. This should be compared with an average inheritance net of taxes at 55.8 kSEK. A small difference between the two sources might be due to the fact that the estate is self-reported while wealth is mainly third-party reported or due to a slight difference in tax bases of inheritances and wealth taxes, in particular regarding goods, unlisted firms and pension wealth.[78] This exercise suggests that the order of magnitude of the estimated direct effect is similar to the average inheritance in the Inheritance and Estate tax register.

Second, we compare the direct effect of losing a parent on wealth with the implied inheritance from parents' wealth one year before death. The imputed inheritance is constructed as: $inh_{i,j} = ch * max(A_{j,t-1} - c, 0)/n_j$. The inheritance of child i of parent j is given by j's wealth in the year before death, $A_{j,t-1}$, minus funeral costs, c (typically paid by the estate). If the parent's net wealth (including funeral costs) is negative, the imputed inheritance is zero as one cannot inherit net liabilities. We then multiply the transferable wealth with, ch, the average share of the estate that is transferred to children (computed using the Inheritance and Estate register) and then divide by n_j, the parent's number of children.

According to the Organization of Funeral Agencies (Sveriges Begravningsbyråers Förbund), 94% of all deceased have a funeral ceremony. Summing the total sales of all funeral agencies in firm-level data provided by Statistics Sweden provides an average cost of 20 thousand SEK per funeral. Appendix Figure E.2 shows the share of the estates allocated to different heir-types within our sample population matched to the Inheritance and Tax Register. We measure the share transferred to children at 43.2 %. We then arrive at an imputed inheritance of 60.26 kSEK, again similar to the mechanical effect estimated at 52.17 kSEK. A small but positive difference is expected since the calculation does not take inheritance taxes into account (the average inheritance tax is 5 kSEK).

This approach does not use the default rules in the inheritance division law. Instead, it directly measures how much of estates are transferred to children. As opposed to the first comparison, this approach uses the wealth registers only, and is therefore immune to differences in tax reporting or the

[78] Despite some differences in the tax bases, there was extensive harmonization in the bases across the two taxes. For instance, properties were generally taxed at 75% of the assessed market value. Shares in listed equity were taxes at 80% of the end-of-year market value according to the wealth tax (with the exception of young firms that were listed on a particular branch of the Stockholm Stock Exchange) while their tax value was 75% of the market value in the inheritance tax. Bank holdings were taxed at 100% of their value.

tax bases mentioned above.

Panel A

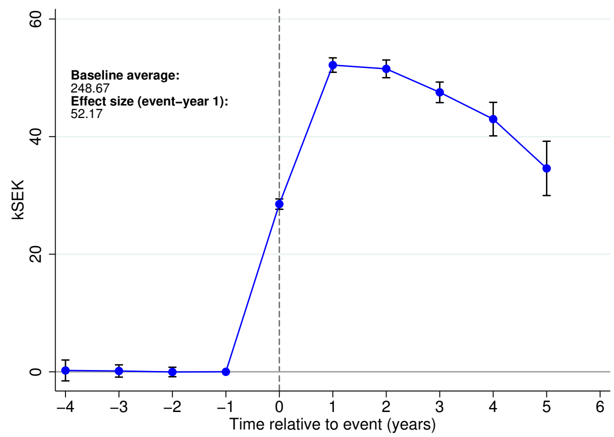


Figure B.1: The effect of inheritance on children's wealth, children in Inheritance and Estate tax register

Note: This figure presents coefficient estimates of Equation 2 on wealth, measured in thousand Swedish kroner (kSEK) at tax values, for the subsample of children who appear in the Inheritance and Estate tax register during the years 2002-2004 (i.e. lose a parent in those years and are present in the Inheritance and Estate tax register). All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figure display 95%-confidence intervals.

C Savings

This section describes how we construct a measure of annual savings. Let wealth change, $\Delta A_t = \sum_j p_{jt}q_{jt} - p_{jt-1}q_{jt-1}$, where p_{jt} is the price of asset j at time tand q_{jt} is the quantity of asset j held at time t.Wealth growth can be divided into two distinct components:

$$\Delta A_t = \sum_j \underbrace{p_{jt}(q_{jt} - q_{jt-1})}_{\textbf{Active}\text{ changes: saving}} + \underbrace{q_{jt-1}(p_{jt} - p_{jt-1})}_{\textbf{Passive}\text{ changes: Capital gain}},$$

where the active component is savings. In constructing our measure of savings, we take advantage of the detailed wealth data, reported at the individual-asset-year level by third-parties to the Tax Agency. By observing both the stock, q_{jt}, and prices, p_{jt} we overcome the problems faced in Browning and Leth-Petersen (2003), in which only individuals' total values in different asset classes are observed and therefore assumptions on what portfolios individuals hold within each category have to be imposed. As we only observe snapshots of wealth once per year, we have to make assumptions on when the individuals rebalance their portfolios. In decomposing wealth growth above, we assume that rebalancing takes place at the end of the year, but our results are robust against this assumption. In more detail, the components of our measure of savings:

$$\tilde{S}_t = \sum_j p_{jt}(q_{jt} - q_{jt-1})$$

are classified into different categories and computed within asset class as follows:

Financial assets

Stocks and funds: We obtain end-of-year prices on listed stocks and funds from financial databases, such as Bloomberg, Datastream, Factset, Morningstar and OMX Stockholm. These are matched with the wealth data asset-by-asset using each asset's International Securities Identification Number (ISIN). We price the change in quantity of asset j from December 31 in year t-1 to t using prices as of December 31 in t. In case the asset ceased to exist during year t so the price for December 31 of year t does not exist, we resort to the price of December 31 in year t-1. As unreported robustness exercises, we have priced the change in quantity using both prices as of December 31 year t-1 as well as the average of the two.

One may be worried that stock splits generate spuriously large fluctuations in savings. To deal with this we generate alternative savings measures by first pricing the quantities held in each year and then multiplying the value in time t-1 by the *split-adjusted* return of each stock, also obtained from the financial databases mentioned above. Then we simply take the value in December 31 of year t minus the return-adjusted value in t-1. The results using this adjustment are similar to the ones reported above.

Bonds and quoted options: Bonds and quoted options are reported to the tax authorities by third-parties along with prices as of year t as well as position (short or long) and we use those to value active savings in these components. This assumes that rebalancing of the portfolio takes place on December 31 of year t. As with stocks and funds, we have performed robustness exercises

Checking and savings accounts: Savings in such accounts are measured as the difference in balance between year t and t-1.

Debt issuance/repayment: We capture repayments of existing debt and issuing new loans as the difference in total debt between year t and t-1. Our liability measure includes student loans and mortgages.

Capital insurance: We observe the total value of capital insurance products, which is a tax-favored savings vehicle, but not the allocation of these assets. In our benchmark definition of savings, we take the difference in the value between the years t and t-1 and add it to savings.

Real estate

Housing and land: We observe all transactions of housing and land together with the tax value of those properties since 2002. From Statistics Sweden, we obtain average ratios of market to tax values by year, geographical region and property type (e.g. agricultural property, country house, owner-occupied house, industrial building), where the market value stems from actual transactions. We inflate the tax values of the observed transactions using these ratios.

For active changes for the years 2000 and 2001, we take the value of the real estate holdings at the end of the year minus the corresponding value the year before. From that we subtract the return, which is measured as price changes for small owner-occupied houses, retrieved from Statistics Sweden. An alternative strategy would be to interact the change in value with an indicator for moving residence (as we do for tenant-owned apartments, described below). The caveat of this approach is that land property and holiday homes are included in these data, and sales and purchases are not proxied well by a moving indicator.

Tenant-owned apartments: For each individual, we take the market value of wealth in such apartments in year *t* and subtract the value in *t-1*. That difference captures both active and passive changes. To isolate the former component, we interact the difference with an indicator that the individual moved residency that year. The Swedish residential regulation prevents investors to own apartments and sublet them for investment purposes, which means that moving residency is a good predictor of active changes.

Inheritance Effects on Retirement Savings

Figure C.1 displays the effect of inheritance on retirement contributions. We see a statistically significant increase in retirement contributions, but the effect is small relative to the baseline inheritance. Nevertheless, retirement contributions are included in our measure of savings.

Panel A

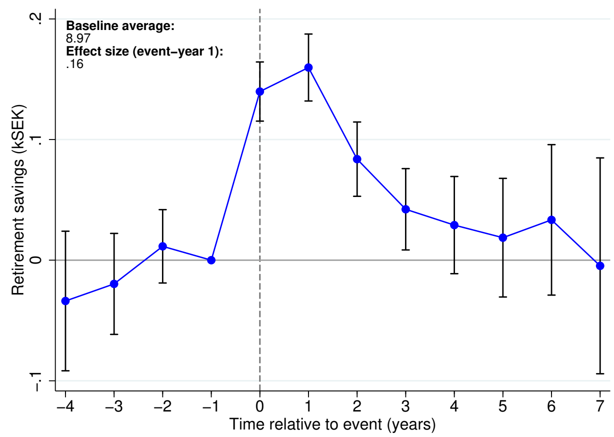


Figure C.1: The effect of inheritance on retirement contributions

Note: The figure shows coefficient estimates of Equation 2 for annual retirement savings in thousand Swedish kroner (kSEK) as outcome variable. The analysis sample comprise children of parents who die during 2000-2004. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figure display 95%-confidence intervals.

D Inequality

D.1 Proof of Proposition 1

We here provide the proof of a more general version of Proposition 1 in the main text.

Consider a dynastic economy where each individual has one child (heir). For simplicity, assume that all agents receive inheritances at the same age and denote each individual by her rank in the within-cohort wealth distribution just before receiving inheritance.

We denote the proportion of children among the top θ of the heir wealth distribution whose parents are within the top θ of the parent wealth distribution by $\overline{\alpha}$. The corresponding share for bottom $1-\theta$ share is denoted by $\underline{\alpha}$. There is a one-to-one mapping between the two alphas, $\frac{1-\overline{\alpha}}{1-\underline{\alpha}} = \frac{1-\theta}{\theta}$, and a higher alpha means a lower level of intergenerational wealth mobility. In fact, $\overline{\alpha} \in [\theta, 1]$ and $\underline{\alpha} \in [1-\theta, 1]$ where the lower bounds are attained if there is perfect wealth mobility.

$\overline{A}$ and $\underline{A}$ denoted the average wealth among heirs before receiving inheritance. Similarly, $\overline{A_p}$ and $\underline{A}_p$ for the parent generation. Parents' wealth just before passing away (inheritance) is parametrized as $\overline{\gamma}\overline{A_p}$ and $\underline{\gamma}\underline{A}_p$ for each group, where γ's denote wealth patterns over life-cycle. $\{\overline{\gamma}, \underline{\gamma}\}$ thus captures heterogeneity in the life-cycle pattern of wealth. We assume that wealthier parents leaves larger amount of inheritance behind, $\frac{\overline{\gamma}}{\underline{\gamma}}\frac{\overline{A_p}}{\underline{A}_p} > 1$, although we allow that they consume bigger share of their wealth during their life-time, $\frac{\overline{\gamma}}{\underline{\gamma}}$ can be smaller than one.

We denote by $\overline{\lambda}$ the difference between the wealth of top parents who have top and bottom heirs, respectively. More precisely, $\overline{\lambda}$ is the ratio of average inheritance of top θ heirs relative to bottom $1-\theta$ heirs, conditional on both having top θ parents. In the same way, $\underline{\lambda}$ is the ratio of average inheritance of top θ heirs relative to bottom $1-\theta$ heirs, conditional on both having bottom $1-\theta$ parents. Positive intergenerational mobility implies that both lambdas are larger than one.

The inheritances *received* by the top θ and bottom $1-\theta$ of the new generation are

$$\overline{I} = (1-\overline{\alpha})\,\underline{\lambda}\,\underline{\gamma}\underline{A}_p + \overline{\alpha}\,\overline{\lambda}\,\overline{\gamma}\overline{A_p} \tag{7}$$

and

$$\underline{I} = \underline{\alpha}\underline{\gamma}\underline{A}_p + (1-\underline{\alpha})\,\overline{\gamma}\overline{A_p}, \tag{8}$$

respectively. From the senders side, the inheritances left by the top θ and bottom $1-\theta$ of the old generation are

$$\overline{I_p} = \left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)\overline{\gamma}\overline{A_p} \tag{9}$$

and

$$\underline{I}_p = \left(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda}\right)\underline{\gamma}\underline{A}_p, \tag{10}$$

respectively.

The wealth share in the hand of the top θ heirs before inheritances is denoted by $S^W = \frac{\theta\overline{A}}{\theta\overline{A}+(1-\theta)\underline{A}}$. The share of inheritances from top θ parents is $S^I = \frac{\theta\overline{I_p}}{\theta\overline{I_p}+(1-\theta)\underline{I}_p}$. The latter is not the top θ share of inheritances since the θ-groups are defined by wealth. S^I is approximately equal to the top share of

				Parent	
				Top θ	Bottom $1-\theta$
		$\mathit{Average\ Wealth}$	$\mathit{Average\ Inheritance}$	$\overline{I_p}$	$\underline{I}_p$
Heir	Top θ	$\overline{A}$	$\overline{I}$	$(\overline{\alpha}, \overline{\lambda}\overline{\gamma}\overline{A_p})$	$(1-\overline{\alpha}, \underline{\lambda}\underline{\gamma}\underline{A}_p)$
	Bottom $1-\theta$	$\underline{A}$	$\underline{I}$	$(1-\underline{\alpha}, \overline{\gamma}\overline{A_p})$	$(\underline{\alpha}, \underline{\gamma}\underline{A}_p)$

Table 2: Parameters of the model: $(\mathit{mobility\ likelihood}, \mathit{average\ inheritance})$

inheritance if wealth ranks are persistent over life-cycle, which is empirically supported by findings in Boserup et al. (2014).

It is theoretically appealing to measure wealth of the two generations around the same age which gives the intergenerational mobility a nice interpretation (Haider and Solon, 2006). This is what we assumed so far. However, our results below hold also if the parent generation's wealth is measured at a different point in the donors life, e.g. before death (which also implies that S^I is exactly the top θ share of inheritances). This is empirically helpful since we rarely have a long enough wealth panel to observe donors' wealth at their prime age.

What turns out to matter for the result below is the following parameters:

$$\lambda \equiv 1 - \frac{\overline{\lambda}}{\underline{\lambda}} \frac{\underline{\alpha} + (1-\underline{\alpha})\,\underline{\lambda}}{1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}} \in [0,1]\,.$$

In our sample, the two λs are close, which with the help of the transition matrix of Appendix Tables 4 and 5 in the main text implies that $\lambda = .13(.08)$ for top 1% (10%). So that the simplifying assumption in the main text is plausible. More precisely, the $\overline{\lambda}$ is 2.49 (1.76) and $\underline{\lambda}$ is 2.63 (1.7) for top 1% (10%). These are calculated using the average inheritance of parents from the top 1% and the bottom 99% to heirs of top 1% being equal to 2152 and 100, to heirs of bottom 99% being 865 and 38. Exact the same numbers for top 10% are 441, 34; 251 and 20, respectively.

Lemma 1. *$\frac{\overline{A}}{\underline{A}} > \frac{\overline{I}}{\underline{I}}$ is equivalent to*

$$\left(S^W - \theta\right) > \frac{\overline{\alpha}-\theta}{1-\theta}\left(S^I - \theta\right) + \lambda\left(S^W - \overline{\alpha}\right)S^I. \tag{11}$$

In case of $\overline{\lambda} = \underline{\lambda} = 1$, then $\lambda = 0$ and the above condition is equivalent to $\frac{S^W-\theta}{S^I-\theta} > \frac{\overline{\alpha}-\theta}{1-\theta}$.

Proof. Using the definition of top wealth share, we write this share as $S^W = \left(1 + \frac{1-\theta}{\theta}\frac{\underline{A}}{\overline{A}}\right)^{-1}$.The ratio of average wealth between the two groups can be then written as:

$$\frac{\overline{A}}{\underline{A}} = \frac{S^W}{\theta} / \frac{1-S^W}{1-\theta} \tag{12}$$

In the same way, we get the ratio of inheritances as $\frac{\overline{I_p}}{\underline{I}_p} = \frac{S^I}{\theta} / \frac{1-S^I}{1-\theta}$. Using the latter, as well as (10) and (9), we get that $\frac{\overline{\gamma}\overline{A_p}}{\underline{\gamma}\underline{A}_p} = \frac{1-\theta}{\theta}\frac{\underline{\alpha}+(1-\underline{\alpha})\underline{\lambda}}{1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}}\frac{S^I}{1-S^I}$. Then we use the latter as well as equations (12), (7) and (8) to rewrite $\frac{\overline{A}}{\underline{A}} > \frac{\overline{I}}{\underline{I}}$ as

$$\frac{\theta}{1-\theta}\frac{1-S^{W}}{S^{W}} < \frac{\underline{\alpha}+(1-\underline{\alpha})\frac{1-\theta}{\theta}(1-\lambda)\frac{S^{I}}{1-S^{I}}}{(1-\overline{\alpha})+\overline{\alpha}\frac{1-\theta}{\theta}(1-\lambda)\frac{S^{I}}{1-S^{I}}}$$

After some algebra, this leads to condition (11). □

We are now equipped to tackle a generalized version of Proposition 1. We will do so in two steps.

Proposition 2. *(Part I of the extension of Proposition 1 in the main text)*

The share of wealth in the hands of the top θ of the wealth distribution is reduced upon receiving inheritance iff

$$\left(S^{W}-\theta\right) > \frac{\overline{\alpha}-\theta}{1-\theta}\left(S^{I}-\theta\right)+\lambda\left(S^{W}-\overline{\alpha}\right)S^{I}. \tag{13}$$

In particular, this is the case if one the following is true:

i - intergenerational wealth mobility is high, $S^{W} > \overline{\alpha}$, independently of the level of inheritance inequality.

ii - inheritance inequality is smaller than wealth inequality, $S^{I} < S^{W}$, independently of the degree of intergenerational wealth mobility. This is equivalent to

$$\frac{\overline{I_p}}{\underline{I_p}} = \frac{\overline{\gamma}}{\underline{\gamma}} \times \frac{\overline{A_p}}{\underline{A_p}} < \frac{\overline{A}}{\underline{A}}.$$

Proof. To simplify calculations, we define a real function $f(.)$ as $f(x) = \frac{1}{1+\frac{1-\theta}{\theta}\frac{1}{x}}$. The share of the top θ of total wealth among heirs is $S^{W} = f\left(\frac{\overline{A}}{\underline{A}}\right)$ and the share of the top-θ parents of inheritances is $S^{I} = f\left(\frac{\overline{I_p}}{\underline{I_p}}\right)$.

The share of top θ of total wealth among heirs, $S^{W} = f\left(\frac{\overline{A}}{\underline{A}}\right)$, changes to $S^{W}_{after} = f\left(\frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}\right)$ after receiving inheritances. Given that f is an increasing function, inheritances reduce wealth inequality iff the ratio of top to bottom average wealth falls, that is iff $\frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}} < \frac{\overline{A}}{\underline{A}}$. We then just apply Lemma (1) to complete the proof.

Condition i: The right hand side of inequality 13 is increasing in S^{I} iff

$$\frac{\overline{\alpha}-\theta}{1-\theta}+\lambda\left(S^{W}-\overline{\alpha}\right) > 0.$$

This condition always holds since the expression is increasing in $\overline{\alpha}$ and $\overline{\alpha} \geqslant \theta$. Since the right hand side of inequality 13 is increasing in S^{I}, then the inequality 13 always holds if it holds for the case of maximum inequality in inheritance, $S^{I} = 1$. In this case, the inequality 13 is equivalent to $S^{W} > \overline{\alpha}$. This implies that the inequality 13 holds no matter the distribution of inheritance if $S^{W} > \overline{\alpha}$.

Condition ii: Since the right hand side of inequality 13 is increasing in S^{I}, then inequality 13 holds in case of $S^{W} \geqslant S^{I}$ iff it holds when $S^{W} = S^{I}$. Under the latter, the condition 13 is equivalent to

$$\lambda\left(S^{I}\right)^{2}-\left(\frac{1-\overline{\alpha}}{1-\theta}+\lambda\overline{\alpha}\right)S^{I}+\frac{1-\overline{\alpha}}{1-\theta}\theta < 0.$$

This holds since this expression is monotonic in S^I and it holds at boundary values of S^I, namely θ and 1. If there is no mobility, then the condition 13 is equivalent to$S^W \geqslant S^I$. $\square$

Proposition 3. *(Part II of the extension of Proposition 1 in the main text)*

The share of wealth in the hands of the top θ of the wealth distribution upon receiving inheritance is increasing in inheritance inequality (keeping the average inheritance constant), and decreasing in intergenerational wealth mobility.

Proof. Using the same defintion for $f(.)$ as $f(x) = \frac{1}{1+\frac{1-\theta}{\theta}\frac{1}{x}}$, the share of top $-\theta$ of total wealth among heirs is $S^W_{after} = f\left(\frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}\right)$ after receiving inheritances. We will first investigate whether that $\frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}$ is increasing in S^I. The derivate of the former with respect to the latter has the same sign that

$$\frac{d\overline{I}}{dS^I} - \frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}\frac{d\underline{I}}{dS^I}. \tag{14}$$

Now, using the equations (10), (9), (7) and (8)

$$\overline{I} = \frac{(1-\overline{\alpha})\,\underline{\lambda}}{(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda})}I_p + \frac{\overline{\alpha}\,\overline{\lambda}}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)}\overline{I_p} \tag{15}$$

and

$$\underline{I} = \frac{\underline{\alpha}}{(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda})}I_p + \frac{(1-\underline{\alpha})}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)}\overline{I_p}, \tag{16}$$

the latter can be written as

$$\overline{I} = \frac{(1-\overline{\alpha})\,\underline{\lambda}}{(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda})}I_p\frac{1-S^I}{1-\theta} + \frac{\overline{\alpha}\,\overline{\lambda}}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)}I_p\frac{S^I}{\theta} \tag{17}$$

$$\underline{I} = \frac{\underline{\alpha}}{(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda})}I_p\frac{1-S^I}{1-\theta} + \frac{(1-\underline{\alpha})}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)}I_p\frac{S^I}{\theta} \tag{18}$$

Differentiating these with respect to the top inheritance share, we get

$$\frac{d\underline{I}}{dS^I} = I_p\left[\frac{(1-\underline{\alpha})}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)}\frac{1}{\theta} - \frac{\underline{\alpha}}{(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda})}\frac{1}{1-\theta}\right] \tag{19}$$

and

$$\frac{d\overline{I}}{dS^I} = I_p\left[\frac{\overline{\alpha}\,\overline{\lambda}}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)}\frac{1}{\theta} - \frac{(1-\overline{\alpha})\,\underline{\lambda}}{(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda})}\frac{1}{1-\theta}\right]. \tag{20}$$

Using 19 and 20 in condition 14, we get that $\frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}$ is increasing in S^I iff

$$\frac{\overline{\alpha}\,\overline{\lambda}}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)}\frac{1}{\theta} - \frac{(1-\overline{\alpha})\,\underline{\lambda}}{(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda})}\frac{1}{1-\theta} - \frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}\left[\frac{(1-\underline{\alpha})}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)}\frac{1}{\theta} - \frac{\underline{\alpha}}{(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda})}\frac{1}{1-\theta}\right] > 0.$$

Note that the left-hand side is an increasing function of two lambdas, so this condition is satisfied when lambdas reach their lowest levels, which is equvalent to

$$\frac{\overline{\alpha}}{\theta} - \frac{1-\overline{\alpha}}{1-\theta} - \frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}\left[\frac{1-\underline{\alpha}}{\theta} - \frac{\underline{\alpha}}{1-\theta}\right] > 0,$$

which holds since the lower bounds of two alphas. In a similar fashion, $\frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}$ is increasing in $\overline{\alpha}$ iff

$$\frac{d\overline{I}}{d\overline{\alpha}} - \frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}\frac{d\underline{I}}{d\overline{\alpha}} > 0. \tag{21}$$

Using the equations (18) and (17), we get

$$\frac{d\underline{I}}{d\overline{\alpha}} = \frac{\theta}{1-\theta} I_p \left[\frac{\underline{\lambda}}{\left(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda}\right)^2}\frac{1-S^I}{1-\theta} - \frac{\overline{\lambda}}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)^2}\frac{S^I}{\theta}\right]$$

and $\frac{d\overline{I}}{d\overline{\alpha}} = -\frac{d\underline{I}}{d\overline{\alpha}}\frac{1-\theta}{\theta}$. Using the latter two equations in condition 21, we get that $\frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}$ is increasing in $\overline{\alpha}$ iff

$$-\frac{d\underline{I}}{d\overline{\alpha}}\left(\frac{1-\theta}{\theta} + \frac{\overline{A}+\overline{I}}{\underline{A}+\underline{I}}\right) > 0.$$

This means that condition 21 is equivalent to saying that the higher is the mobility, the higher is the share of wealth received by poor heirs, $\frac{d\underline{I}}{d\overline{\alpha}} < 0$. This is equivalent to:

$$\frac{\underline{\lambda}}{\left(\underline{\alpha}+(1-\underline{\alpha})\,\underline{\lambda}\right)^2}\frac{1-S^I}{1-\theta} < \frac{\overline{\lambda}}{\left(1-\overline{\alpha}+\overline{\alpha}\overline{\lambda}\right)^2}\frac{S^I}{\theta}.$$

Since the left-hand side is an increasing function of two lambdas, so this condition is satisfied when lambdas reach their lowest levels, which is equvalent to $1 < \frac{1-\theta}{\theta}\frac{S^I}{1-S^I} = \frac{\overline{I}_p}{\underline{I}_p}$. □

Proposition 4. *Absolute measures of wealth inequality always increase as a result of inheritances as long as the intergenerational mobility is not perfect.*

Proof. Wealthier heirs receive more inheritance in absolute terms, $\underline{I} < \overline{I}$ or using equations 7 and 8,

$$\underline{\alpha} + (1-\underline{\alpha})\frac{\overline{\gamma}}{\underline{\gamma}}\frac{\overline{A_p}}{\underline{A}_p} < (1-\overline{\alpha}) + \overline{\alpha}\frac{\overline{\gamma}}{\underline{\gamma}}\frac{\overline{A_p}}{\underline{A}_p}$$

iff $1 < \underline{\alpha} + \overline{\alpha}$ which is the case as long as there is some degree of intergenerational immobility.

□

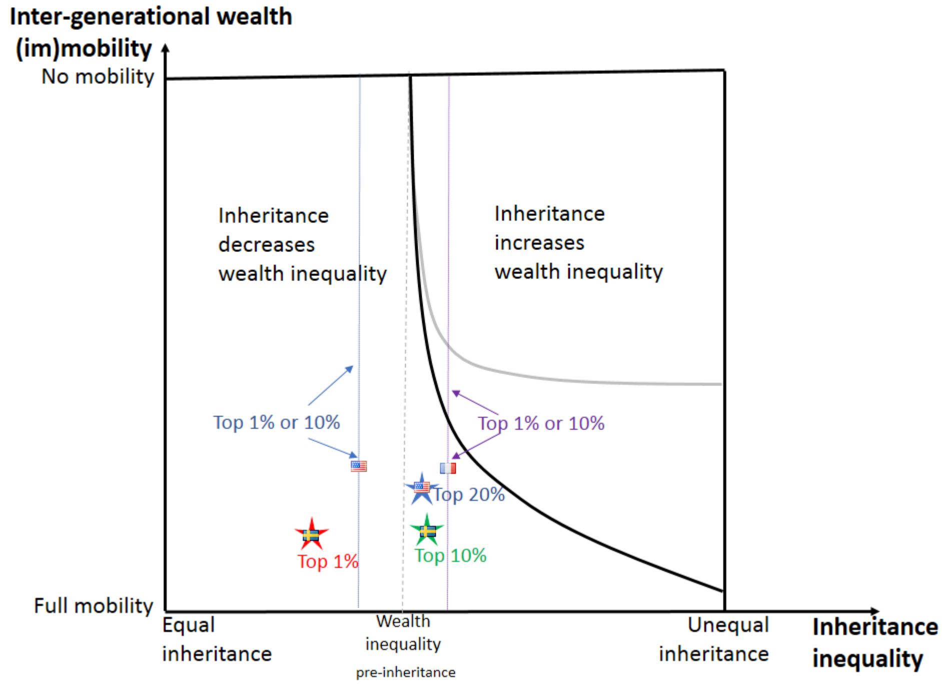


Figure D.1: The short-run effect of inheritance on wealth inequality among heirs

Note: The gray solid line represents the curve where the inheritance flow does not change the share of wealth in the hand of wealthiest heirs in the pre-inheritance period (Proposition 1). The black solid line represents the same curve once we focus on the wealth of the top wealthiest heirs in each period. Inequality in wealth or inheritances is measured in relative terms as the top 1% share. The x-axis represent S^I in the model, and the y-axis $\overline{\alpha}$. Lower and upper bounds of x and y-axises are 0 and 1. The points on both axises marked by wealth inequality correspond to the top share measure, S^W.

Predictions of the model from aggregate moments

We can predict the effect of inheritances on top shares' wealth for any economy where the three parameters – wealth mobility, inheritance and wealth inequality – can be estimated. Unfortunately, it is rare that a country keeps records of both wealth and inheritances or estates for the full population. Therefore, estimates of population wealth are often derived from estate data, relying on the estate multiplier method (Piketty, 2011). This procedure will, however, create a mechanical relationship between the two distributions. There are two non-nordic countries for which there are reliable estimates of both wealth inequality and inheritance inequality. For France, Piketty et al. (2006) and Garbinti et al. (2017) provide estimates of inheritance inequality from estate tax records and wealth inequality from capitalizing capital income. In 1994, where both estimates are available, the top share of inheritances is higher than that of wealth for both the top 1 and 10%. This suggests that inheritances in France can be wealth-inequality increasing or not depending on the level of intergenerational mobility. Unfortunately, we cannot determine the exact location of France in the figure since there are no estimates of intergenerational wealth mobility.

For the U.S., one can obtain a measure of inheritance inequality using inheritance flows for the very rich who pay the estate tax. In addition, Alvaredo et al. (2017) provide an estimate of total inheritance flows using the mortality multiplier method and survey data on wealth patterns by age.

We note that this is the economic flow and convert this to the fiscal flow with a 0.6 multiplier. Using the generalized Pareto interpolation method from Blanchet et al. (2017), we then estimate the inheritance top shares at 1, 10 and 20 percent. For wealth inequality, Saez and Zucman (2016) estimate the top wealth shares using the capitalization method. These findings suggest that in 2001 inheritance inequality was higher than wealth inequality once measured as the share in the hand of top 20 percent, but lower than wealth inequality at 1 and 10 percent. There is, however, only one estimate of intergenerational wealth mobility. Charles and Hurst (2003) report a 36-percent likelihood of a child in the top quintile having top quintile parents (interestingly, this is very close to the Swedish number for quintiles, see Table 6 of the Appendix). This is far below the top quintile's share of wealth in the U.S., which hovers around 85 percent around the year 2000 (Alvaredo et al., 2016). Using these estimates, Proposition 1 suggests that inheritances reduce the share of wealth in the hands of top 1 and 10% in the U.S. and this is true independent of the level of intergenerational wealth mobility (which we do not observe). Inheritances are also an equalizing force at the top 20%, but this is due to a high level of intergenerational mobility at that level. Figure D.1 in the Appendix illustrates these points by updating Graph 1 of the main text with the interval-estimates for the US and France.

D.2 A generalized model

Consider a population of heirs of size N where each individual has one parent. The heirs are ranked according to their wealth, and a function $w(.)$ map the rank to wealth level. So that the highest level of wealth among heir is $w(1)$. More precisely, w is a decreasing real function on $\widehat{N} = \{1, 2, ..., N\}$. Similar mapping for parent generation is denoted by $\widetilde{w}(.)$. With a slight abuse of notation, we denote the total amount of wealth in each generation with w and $\widetilde{w}$, respectively.

The intergeneration mobility of wealth is denoted by the mapping that takes the heir ranking as input and gives the parent ranking, denoted by $\pi(.)$. More precisely, π is a permutation on $\widehat{N}$, that is a bijective function from $\widehat{N}$ to $\widehat{N}$. The function π is often called cupola, but given our context here we refer to it as the mobility function.

The distribution of wealth before inheritance $\{w(r)\}$ is changed to $\{w(r) + \widetilde{w}(\pi(r))\}$ after inheritance. Let us define the wealthiest individual after inheritance by

$$m = \arg\max_{r} w(r) + \widetilde{w}(\pi(r)).$$

This means that the share of wealth in the hand of the top individual is reduced upon inheritance iff

$$\frac{w(1)}{w} > \frac{w(m) + \widetilde{w}(\pi(m))}{w + \widetilde{w}}. \tag{22}$$

If wealthiest individual remains the same person after inheritance, $m = 1$, then this condition is equivalent to $\frac{w(1)}{w} > \frac{\widetilde{w}(\pi(1))}{\widetilde{w}}$ or the share in wealth is larger than inheritance share. This is the assumption we are relaxing in this section.

There is a limit on the level of m implied by following observation: all people wealthier than m before inheritance must have less wealthy parents: $\pi(i) > \pi(m)$ for all $i < m$. This implies that a positive correlation between heir and parent wealth implies that m cannot be far from 1.

The intuition behind the theory here can be seen in the condition $\frac{w(1)}{w} > \frac{\widetilde{w}(\pi(1))}{\widetilde{w}}$. In fact, if we rewrite this as

$$\frac{w(1)}{w} > \frac{\widetilde{w}(1)}{\widetilde{w}} \frac{\widetilde{w}(\pi(1))}{\widetilde{w}(1)}$$

then the right hand side incorporate the inheritance top share and then a measure of intergenerational mobility measuring how wealthy the richest kid's parent is.

The following proposition shows that similar pattern for evolution of top wealth share depicted in the Graph 1 in the main text is true in this general setting.

Proposition 5. *Inheritance reduces the share of wealth in the hand of top wealthiest individual if either*

- $\widetilde{w} \leqslant w(1)$ *and inheritance inequality is lower than wealth inequality, or*

- $\widetilde{w} > w(1)$ *and one of the following is true:*

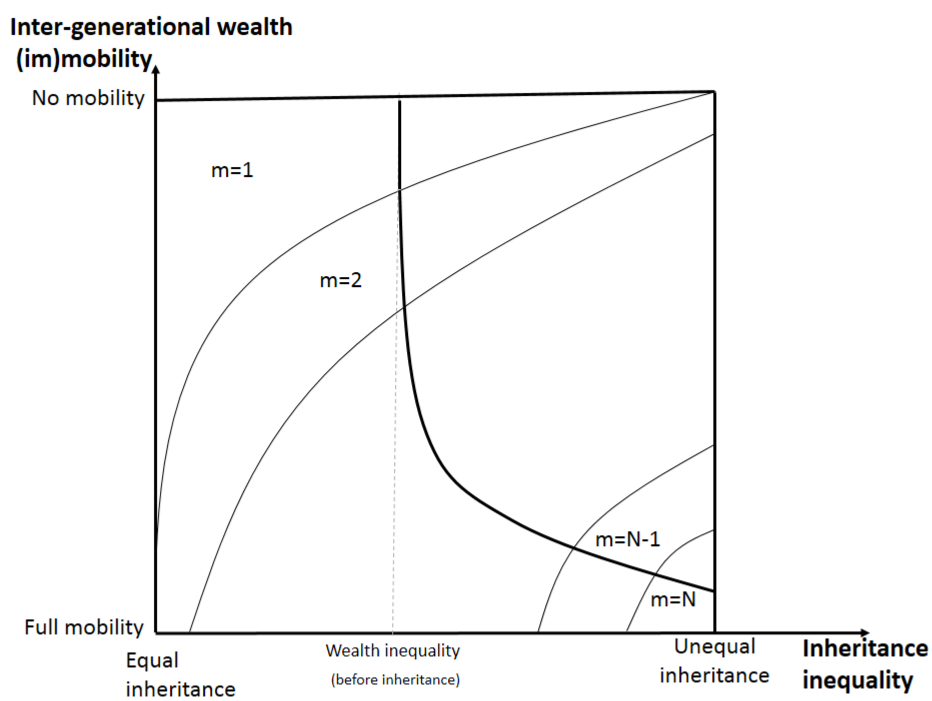
i- inheritance inequality is lower than wealth inequality

ii- inheritance inequality is higher than wealth inequality and mobility is higher than a cutoff which is a function of inheritance inequality

iii- intergeneration wealth mobility is high than a cutoff

iv- intergenerational wealth mobility $\pi(.)$ *is low and inheritance inequality is higher than a cutoff which is a function of wealth mobility*

Moreover, if inheritance reduces the share of wealth in the hand of top wealthiest individual, then it does so also if we replace the mobility to full mobility, keeping the wealth and inheritance distribution the same.



Proof. Consider the case of no mobility or inheritance equality, in these cases $m = 1$, or the wealthiest individual is unchanged by the inheritance flows. In the case of full mobility and at the same time inheritance full inequality, i.e. all inheritance in the hand of one heir, the wealthiest individual after inheritance is either the wealthiest or the poorest pre-inheritance heir. If we denote the wealthiest post-inheritance heir at full mobility and full inheritance inequality with $m_{FM,II}$, then

$$m_{FM,II} = \begin{cases} 1 & \widetilde{w} \leqslant w(1) \\ N & \widetilde{w} > w(1) \end{cases}.$$

If total amount of inheritance is smaller than the top heir wealth, then inheritance flows does not change the top wealth heir, i.e. $m_{FM,II} = 1$. In this case, inheritance flows does not change the top wealth heir no matter what, that is $m = 1$ everywhere. Given that $m = 1$, then the necessary and sufficient condition for inheritance being wealth inequality decreasing is that inheritance inequality is lower than wealth inequality. The more interesting case is when $m_{FM,II} = N$, which implies that the wealthiest post-inheritance individual can be any heir depending on the inheritance distribution and mobility function.

Consider the case where $m = N$ and there is full inheritance inequality, then inequality (22) is equivalent to

$$\frac{w(1)}{w} > \frac{1}{1 + w/\widetilde{w}}, \tag{23}$$

where we assume $w(N) = 0$.

i- Inequality (22) is equivalent to

$$\frac{w(1)}{w} > \frac{\widetilde{w}(\pi(m))}{\widetilde{w}} - \frac{w(1) - w(m)}{\widetilde{w}}. \tag{24}$$

If inheritance inequality is lower than wealth inequality, $\frac{w(1)}{w} > \frac{\widetilde{w}(1)}{\widetilde{w}}$, then condition (24) always holds no matter the wealth mobility since

$$\frac{\widetilde{w}(1)}{\widetilde{w}} \geqslant \frac{\widetilde{w}(\pi(m))}{\widetilde{w}} \geqslant \frac{\widetilde{w}(\pi(m))}{\widetilde{w}} - \frac{w(1) - w(m)}{\widetilde{w}}.$$

The equalities holds iff there is no inheritance inequality at the top-$\pi(m)$ and no wealth inequality at the top-m, respectively.

Moreover, consider a wealth and inheritance distribution for which no wealth mobility function leads to a wealth inequality increasing inheritance. The mobility that maximizes the right hand side of inequality (22) is when $\pi(1) = 1$. In this case, inequality (22) is equivalent to $\frac{w(1)}{w} > \frac{\widetilde{w}(1)}{\widetilde{w}}$. This is also the case in the world of full mobility.

ii- If inheritance inequality is higher than wealth inequality, $\frac{\widetilde{w}(1)}{\widetilde{w}} > \frac{w(1)}{w}$, then there exists a set of child-parent pair which if they are matched the post-inheritance share of wealth of the child is below the top share of pre-inheritance wealth. Let us denote that by A. More precisely

$$A \equiv \left\{ (i,j) \,|\, \frac{w(1)}{w} > \frac{w(i) + \widetilde{w}(j)}{w + \widetilde{w}} \right\}$$

This is not empty since $(N,N) \in A$, and is not complete since $(1,1) \notin A$. Important to note that this definition is independent of intergenerational wealth mobility, $\pi(.)$.

We can characterize A as

$$A = \{(i,j) \mid j > \overline{\pi}(i)\},$$

where $\overline{\pi}(i)$ is the wealthiest parent that make the child i not too wealthy so that her share of total post-inheritance wealth is smaller than pre-top share, or more precisely

$$\overline{\pi}(i) \equiv \min\left\{ j \middle| \phi(i) > \frac{\widetilde{w}(j)}{\widetilde{w}} \right\},$$

where

$$\phi(i) \equiv \frac{w(1)}{w} + \frac{w(1) - w(i)}{\widetilde{w}}.$$

$\overline{\pi}(.)$ is an decreasing function since $\phi(i)$ is increasing, and we also know that $\overline{\pi}(i) \leqslant N$ and $\overline{\pi}(1) > 1$. $\phi(i)$ is a measure of wealth inequality, and if this reaches the extreme, then $\phi(i) > 1$ and $\overline{\pi}(i) = 1$ for all $i \in \widehat{N}$ except the very top.

The condition (22) holds iff $(m, \pi(m)) \in A$. This is equivalent to $(i, \pi(i)) \in A$ for all $i \in \widehat{N}$. Or $\pi(i) > \overline{\pi}(i)$ for all $i \in \widehat{N}$. This is equivalent to having a mobility level high enough so that each individual have parent with lower rank than certain cutoff.

The necessary and sufficient condition for the existence of such a mobility function is that for all n there are at least n heirs with lower bar of smaller than n. That is $N - n + 1 > \overline{\pi}(n)$, for all n. This is equivalent to

$$\frac{w(1)}{w} + \frac{w(1) - w(n)}{\widetilde{w}} > \frac{\widetilde{w}(N - n + 1)}{\widetilde{w}}, \tag{25}$$

So if in an economy inheritance is wealth inequality decreasing, then this most also be the case if there is full mobility. In particular, a necessary condition for the existence of such a mobility function is $1 > \overline{\pi}(N)$, that is equivalent to

$$\frac{w(1) - w(N)}{w}\frac{w}{\widetilde{w}} > \frac{\widetilde{w}(1)}{\widetilde{w}} - \frac{w(1)}{w}, \tag{26}$$

which implies under the condition that wealth inequality is low enough, $\frac{w(1)}{w} < \frac{1}{1+\frac{w}{\widetilde{w}}}$, then there is a cutoff where for the inheritance inequality higher than cutoff, then no matter the mobility level the inheritance is inequality increasing. So under these circumstances, the high inheritance inequality is enough for assuring wealth inequality increasing inheritances.

If this is not the case, that is wealth inequality is relatively high, $\frac{w(1)}{w} > \frac{1}{1+\frac{w}{\widetilde{w}}}$, we will show below that for each mobility level, there is at least one inheritance distribution, where inheritance is not wealth inequality decreasing.

As a side note, the condition (26) is also can be seen as restricting the aggregate size of inheritance flows. This means that if inheritance inequality is higher than wealth inequality, then a large enough inheritance flow will be inequality increasing. But this not the question of interest here.

More generally, A is well-defined unless there is no inequality neither in wealth nor in inheritance, $\frac{\widetilde{w}(N)}{\widetilde{w}} = \frac{w(1)}{w} = \frac{1}{N}$. A high level of mobility so that $(i, \pi(i)) \in A$ implies a reduction in top share of wealth after inheritance. In case where inheritance inequality is lower than wealth inequality, i.e. $\frac{w(1)}{w} > \frac{\widetilde{w}(1)}{\widetilde{w}}$, then A cover the whole space and thus any mobility level leads to equalizing force of inheritance.

iii- The proof of this part is by construction. The distribution of inheritance that leads to an increase in wealth inequality should maximize the right hand side of equation (22). That is to maximize $w(m) + \widetilde{w}(\pi(m))$. This can be achieved conditional on m by placing all inheritance equally among the top $\pi(m)$ parents, which leaves them each with $\frac{\widetilde{w}}{\pi(m)}$ inheritance. This is only feasible if all heirs wealthier than heir rank m have poorer parent than her, that is

$$\left\{i \,|\, i \in \widehat{N}\; i < m \,\&\, \pi(i) < \pi(m)\right\} = \emptyset.$$

We will denote the left-hand subset by $\Omega(m)$ from now on. We will discuss below how one can formally drive this optimum inheritance distribution (See optimization (28)).

So an inheritance distribution that leads to a wealth inequality increase exists iff there exists an heir ranked m so that

$$\frac{w(1)}{w} + \frac{w(1) - w(m)}{\widetilde{w}} < \frac{\widetilde{w}(\pi(m))}{\widetilde{w}} = \frac{1}{\pi(m)}$$

and $\Omega(m) = \emptyset$. Inheritances flow reduce wealth inequality independently of inheritance distribution iff mobility is high, or more precisely iff for all $i \in \widehat{N}$, so that $\Omega(i) = \emptyset$, $\pi(i)$ is higher than $\phi(i)^{-1}$.

These conditions imply that the parent rank of wealthiest heir must be higher than the inverse of her wealth share,$\pi(1) > 1/\frac{w(1)}{w}$. If the second wealthiest heir has a wealthier parent than the wealthiest heir, $\pi(2) < \pi(1)$, then they also imply that the rank of wealthiest heir must be higher than a cutoff,$\pi(2) > \left[\frac{w(1)}{w} + \frac{w(1)-w(2)}{\widetilde{w}}\right]^{-1}$. And so on.

This also reveals that the level of mobility needed to make inheritance wealth inequality increasing factor is increasing in wealth inequality. For example, condition $\pi(1) > 1/\frac{w(1)}{w}$ says that the parent of wealthiest heir required to be less wealthy the higher is the wealth inequality.

If there is no wealth inequality, then these conditions can never hold since $\phi(i)^{-1} = N$. If there is no intergenerational wealth mobility then these conditions do not hold since $l = 1$ and $\pi(1) = 1 < \phi(i)^{-1} = \frac{w}{w(1)}$. The full mobility is difficult concept in this discrete framework.

These conditions imply that there must at least exist one heir so that $\phi(i) > 1$. This provides us with an upper limit on inheritance flows relative to total wealth: $\frac{\frac{w(1)}{w}}{1-\frac{w(1)}{w}} > \frac{\widetilde{w}}{w}$. Empirically, such a condition holds in our data.

A less intuitive proof for this part, part iii, is based on the idea of the proof of part ii. We know that by definition, $\frac{1}{j} \geqslant \frac{\widetilde{w}(j)}{\widetilde{w}}$, so $\overline{\pi}(i)$ is max $\phi(i)^{-1}$ which is achieved if inheritance is equally distributed among the top j parents. Now if the mobility is such that $\pi(i)$ is higher than $\phi(i)^{-1}$, this implies that $\pi(i)$ is higher than any level of $\overline{\pi}(i)$. This is equivalent to $(i, \pi(i)) \in A$ for all i and implies that the condition (22) holds no matter the inheritance distribution.

iv- We first consider the two extreme cases of inheritance inequality. First, in the case where there is no inheritance inequality, inheritance is always wealth inequality decreasing.

Second case of extreme inheritance inequality is characterized by $\widetilde{w}(1) = \widetilde{w}$. Let us denote with l the lucky heir who receive this inheritance $\pi(l) = 1$. Given that $\widetilde{w} > w(1)$ then the wealthiest heir post inheritance is the lucky heir, $m_{II} = l$ and condition (22) is equivalent to

$$w(1) - w(l) > \widetilde{w}\left(1 - \frac{w(1)}{w}\right),$$

which is equivalent to $\phi(l) > 1$. We define

$$\bar{l} = \max_{i}\left\{i \in \widehat{N} | 1 > \phi(i)\right\},$$

which is well-defined and $\bar{l} > 1$.

Then we conclude that as long as mobility is high, $l \geqslant \bar{l}$, then inheritance is wealth inequality decreasing in the presence of extreme inheritance inequality. No mobility can satisfy this condition when $\bar{l} = N$ that is the case iff $1 > \phi(N)$. The latter is equivalent to condition (23).

Two observations worth mentioning here. First, $\bar{l}$ is increasing in wealth inequality, which means that mobility needs to be higher so that inheritances reduce inequality. Second, this condition is equivalent to the condition of part ii of the proof, $\overline{\pi}(i) \leqslant \pi(i)$, in case of extreme inheritance inequality, $\widetilde{w}(1) = \widetilde{w}$.

Now consider an arbitrary inheritance distribution. Inheritance is wealth inequality increasing iff there exists $i \in \widehat{N}$ so that $(i, \pi(i)) \notin A$. This is equivalent to $\frac{\widetilde{w}(\pi(i))}{\widetilde{w}} > \phi(i)$ for $i \in \widehat{N}$ or

$$\frac{\widetilde{w}(j)}{\widetilde{w}} > \phi\left(\pi^{-1}(j)\right), \tag{27}$$

for $j \in \widehat{N}$.

There are two implications of this results:

(i) since we know that by definition $\frac{1}{j} \geqslant \frac{\widetilde{w}(j)}{\widetilde{w}}$, wealth inequality is putting an upper bound on the level of $j \in \widehat{N}$ that satisfies the condition (27), namely $\frac{1}{w(1)/w} > j$.

(ii) if there exists a J so that the share of wealth in the hand of top J donors is above certain cutoff, $\Phi(J) = \sum_{1 \leqslant j \leqslant J} \phi\left(\pi^{-1}(j)\right)$, then inheritance becomes wealth inequality increasing since there exists a j so that $1 \leqslant j \leqslant J$ for which the condition (27) holds. So we showed that if inequality is increasing in this series that is the top share of inheritance is increasing, then there is a cutoff where inheritance becomes wealth inequality increasing. □

The former representation of the problem of finding the inheritance distribution that maximizes the post-inheritance inequality given a wealth distribution and intergenerational mobility mapping is as follows:

$$\max_{m} \max_{\{\widetilde{s}(i)\}} w(m) + \widetilde{w}(\pi(m)) \tag{28}$$

where the inner optimization is under the following constraints

$$\sum \widetilde{s}(i) = 1$$
$$\widetilde{s}(i) \geqslant \widetilde{s}(i+1) \quad \forall_{i \in \widehat{N}}$$
$$\widetilde{s}(N+1) = 0$$
$$w(m) + \widetilde{w}\widetilde{s}(\pi(m)) \geqslant w(i) + \widetilde{w}\widetilde{s}(\pi(i)) \quad \forall_{i \in \widehat{N}}$$

Proposition 6. *Inheritance reduces a top-bottom Kuznets ratio - the ratio of the wealth of the wealthiest over the poorest individual- keeping wealth distribution $w(.)$ constant, if one of the following is true*

i- inheritance inequality is lower than wealth inequality

ii- inheritance inequality is higher than wealth inequality and mobility is higher than a cutoff which is a function of inheritance inequality

iii- intergenerational wealth mobility $\pi(.)$ is high

iv- intergenerational wealth mobility $\pi(.)$ is low and inheritance inequality is higher than a cutoff which is a function of wealth mobility

Proof. The top-bottom kuznets ratio is reduced if

$$\frac{w(1)}{w(N)} > \frac{w(m) + \widetilde{w}(\pi(m))}{w(m') + \widetilde{w}(\pi(m'))}, \tag{29}$$

where

$$m' = \arg\min_{r} w(r) + \widetilde{w}(\pi(r)).$$

i- If inheritance inequality is lower than wealth inequality, $\frac{w(1)}{w(N)} > \frac{\widetilde{w}(1)}{\widetilde{w}(N)}$, then condition (29) always holds no matter the wealth mobility since

$$\frac{\widetilde{w}(1)}{\widetilde{w}(N)} \geqslant \frac{\widetilde{w}(i)}{\widetilde{w}(j)} \forall i, j \in .$$

Moreover, consider a wealth and inheritance distribution for which no wealth mobility function leads to a wealth inequality increasing inheritance. The mobility that maximizes the right hand side of inequality (29) is when $\pi(1) = 1$ and$\pi(N) = N$. In this case, inequality (29) is equivalent to $\frac{w(1)}{w(N)} > \frac{\widetilde{w}(1)}{\widetilde{w}(N)}$.

ii- If inheritance inequality is higher than wealth inequality, $\frac{w(1)}{w(N)} < \frac{\widetilde{w}(1)}{\widetilde{w}(N)}$, then there exists two child-parent pairs which if they are matched the post-inheritance Kuznets ratio is below the pre-inheritance one. Let us denote that by A. More precisely

$$A \equiv \left\{ (i, j, i', j') \,|\, \frac{w(1)}{w(N)} > \frac{w(i) + \widetilde{w}(j)}{w(i') + \widetilde{w}(j')} \right\}$$

This is not empty since $(N, N, 1, 1) \in A$, and is not complete since $(1, 1, N, N) \notin A$. Important to note that this definition is independent of intergenerational wealth mobility, $\pi(.)$.

We can characterize A as

$$A = \left\{ \left(i, j, i', j'\right) | j > \overline{\pi}\left(i|i', j'\right) \right\},$$

where $\overline{\pi}_1(i)$ is the wealthiest parent that make the child i not too wealthy so that her post-inheritance $(i, j) - ratio$ is smaller than pre-top top-bottom kuznets ratio. More precisely

$$\overline{\pi}\left(i|i', j'\right) \equiv \min\{j|\phi(i) > \widetilde{w}(j)\},$$

where

$$\phi\left(i|i', j'\right) \equiv \frac{w(1)}{w(N)}\left(w\left(i'\right) + \widetilde{w}\left(j'\right)\right) - w(i).$$

$\overline{\pi}(.)$ is an decreasing function since $\phi(i)$ is increasing. The condition (29) holds iff $(m, \pi(m), m', \pi(m')) \in A$. This is equivalent to $(i, \pi(i), i', \pi(i')) \in A$ for all $i, i' \in \widehat{N}$. Or $\pi(i) > \overline{\pi}(i|i', j')$ for all $i, i', j' \in \widehat{N}$. This is equivalent to having a mobility level high enough so that each individual have parent with lower rank than certain cutoff.

iii- The proof of this part is by construction. The distribution of inheritance that leads to an increase in wealth inequality should maximize the right hand side of equation (29).

If $\pi(N) > \pi(1)$, that is the parent of poorest heir has less wealth than parent of wealthiest heir, then the inheritance distribution that divide the estate equally among the top $\pi(1)$ heirs maximize the right hand side of equation (29). Under this inheritance distribution, inheritance flows increases wealth inequality, as:

$$\frac{w(1)}{w(N)} < \frac{w(1) + \widetilde{w}/\pi(1)}{w(N)} = \frac{w(m) + \widetilde{w}(\pi(m))}{w(m') + \widetilde{w}(\pi(m'))}, \tag{30}$$

If $\pi(N) < \pi(1)$ and no inheritance distribution lead to inequality reduction, then we need that

1) for all k so that $\pi(k) < \pi(N)$, we have $w(k) + \frac{\widetilde{w}}{\pi(k)} < w(1)$, that is $w(k) < w(1) - \frac{\widetilde{w}}{\pi(k)}$

2) for all k so that $\pi(1) < \pi(k)$, we have $\frac{w(1) + \frac{\widetilde{w}}{\pi(1)}}{w(k)} < \frac{w(1)}{w(N)}$, that is $\left(1 + \frac{\widetilde{w}}{w(1)}\frac{1}{\pi(1)}\right) w(N) < w(k)$.

These conditions require high mobility level, more precisely that heirs with parent who are more (less) wealthy than certain level are relatively poor (wealthy). In particular, they hold when there is high mobility, i.e. when $\pi(N) = 1$ and $\pi(1) = N$. $\square$

Finally, we will visit the case where inequality is measured as the coefficient of variation. This measure is a less appealing than the previously discussed measures, Kuznets ratio and top shares, since wealth and inheritance distribution are very skewed. This is why the prior literature is not using this measure of inequality for wealth. However, we prove similar proposition than Proposition 1 for the coefficient of variation, for sake of completeness.

Proposition 7. *The coefficient of variation of the wealth distribution is reduced upon receiving inheritance iff*

$$\left(\frac{S_I}{S_W}\right)^2 + 2\alpha\frac{\mu}{1-\mu}\frac{S_I}{S_W} < \frac{1+\mu}{1-\mu}$$

where W and I denotes the distribution of heirs and parent wealth (inheritance), $\alpha$is the correlation between them, and $\mu$is the share of total wealth in the hand of heirs, i.e. the non-inherited share of post-inheritance wealth, $\mu = \frac{E(W)}{E(W+I)}$.

In particular, this implies that

The coefficient of variation of the wealth distribution is reduced upon receiving inheritance if inheritance inequality is smaller than wealth inequality, $S^I < S^W$, independently of the degree of intergenerational wealth mobility.

The coefficient of variation of the wealth distribution is increased upon receiving inheritance if inheritance inequality is large than a constant multiplier of wealth inequality, $S^I > \left(\frac{1+\mu}{1-\mu}\right)^{1/2} S^W$, independently of the degree of intergenerational wealth mobility.

Proof. The coefficient of variation of sum of two random variables can be written as

$$cv\,(x+y)^2 = cv\,(x)^2\,\mu\,(x)^2 + cv\,(y)^2\,\mu\,(y)^2 + 2cor\,(x,y)\,cv\,(x)\,cv\,(y)\,\mu\,(x)\,\mu\,(y)$$

where $\mu\,(x) = \frac{E(x)}{E(x+y)}$ and $\mu\,(x) + \mu\,(y) = 1$. We are interested at $S^W_{after} < S^W$ or $cv\,(W+I) < cv\,(W)$. Rearranging the terms, this is equivalent to

$$\left(\frac{S_I}{S_W}\right)^2 + 2\alpha\frac{\mu}{1-\mu}\frac{S_I}{S_W} < \frac{1+\mu}{1-\mu}$$

This condition holds iff

$$\frac{S_I}{S_W} < \overline{S} = \frac{1}{1+\mu}\left[\alpha\mu + \left(1-\left(1-\alpha^2\right)\mu^2\right)^{1/2}\right]$$

In two extreme cases of mobility, we have:

$$\alpha = 0 \Rightarrow \overline{S} = \left(\frac{1+\mu}{1-\mu}\right)^{1/2},$$

and

$$\alpha = 1 \Rightarrow \overline{S} = 1.$$

If there is perfect mobility, the correlation between two generations wealth is zero, then inheritance inequality needs to be higher than a multiplier of wealth inequality. The multiplier depends on the relative size of total wealth in two generations. In one extreme case, when the total inherited wealth is tiny, $\mu = 1$, then $\overline{S} = \infty$.

In case of no mobility, the threshold is at one. □

D.3 Empirical evidence on inequality

D.3.1 Short-term inequality

Figure D.2 displays the joint rank-rank distribution of wealth and inheritances in the heat-map (the copula). The marginal distributions of inheritance and wealth are almost uniform below the 85th percentiles, but there is a strong concentration at the top of the joint distribution from those ranks and upwards. The y-axis starts at 0.55 as 55% of parents leaves no inheritances for their heirs, which implies that the conditional density would have been 1/45=.022 if the joint distribution had been uniform (perfect intergenerational mobility).

One useful metric of the importance of inheritances for the wealth distribution is the minimum rank of parents' wealth (inheritance rank) that a child of a certain wealth rank requires to be moved to the top of the distribution. The first white, solid line in Figure D.2 (from the left) plots the minimum rank of parents' wealth needed to reach the top 10% (the second white corresponds to the top 5%; then 1% and 0.5%) against the child's wealth rank. The line is declining in child's rank, reaching the lower-bound of no inheritance at the 92nd percentile: a child above the 92nd percentile of the pre-inheritance wealth distribution will always end up at the top 10% after inheritances even if she does not receive any inheritance.

Figure D.2 also describes the composition of wealthy heirs post inheritances as a function of their initial wealth and their inheritances. For example, the top 10% of the wealth distribution after inheritances consists of children who located at the 85th percentile but had a top 1% parent, heirs at the 90th percentile with top 15% parents, and heirs in the top 8% irrespective of their inheritances. This means that the 90th percentile of the wealth distribution after inheritances locates at the 92nd percentile of the pre-inheritance distribution.

The lowest inheritance rank that a child needs to keep her pre-inheritance wealth rank in the post-inheritance wealth distribution is rising steadily with own rank. As mentioned above, a parent of rank 86 is necessary to stay among the top 10% for a child in the top 10%. The equivalent ranks for remaining among the top 5%, 1%, 0.5% and 0.1% are 89, 95, 98.2, and 99.46, respectively (see Panel A of Figure D.3 in the Appendix). Interestingly, for all children, even those with negative wealth, there exist a parent that would move them as high as the top 0.5% of the wealth distribution, even though this probability falls as we move down the ranks.

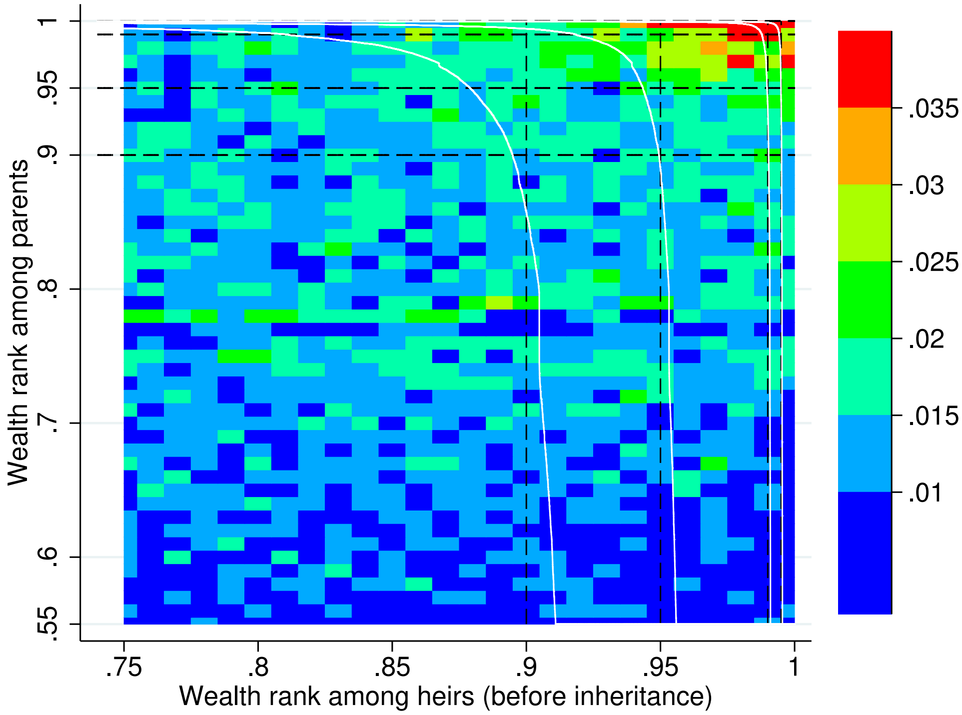


Figure D.2: Who makes it to the top with the help of inheritance

Note: This figure displays a heat-map of the frequency of inheritance rank against heir-wealth rank (the copula), as well as white indifference curves showing the minimum inheritance rank needed for an heir to reach the top 10, 5, 1 and 0.1 percent of post-inheritance wealth distribution. Warmer colors of the heat-map represent a higher likelihood. The graph includes all heirs losing a parent in the year 2003, where we have access to the matched inheritance and wealth registers for the full population. The y-axis starts at .55 since 55 percent of heirs receive no inheritance in this group, so that if the distribution was uniform the share would have been 1/45 in each pixel.

Table 3: Intergenerational wealth mobility

		Parents			
		Top 1%	Bottom 99%	Share wealth	Average wealth
	Panel A:	**Measured as inheritance**			
Children	Top 1%	9.87	90.13	30.02	22019
	Bottom 99%	0.91	99.09	69.98	445
	Share wealth	23.78	76.22		
	Average inheritance	1410	46		
	Panel B:	**Measured one year before death**			
Children	Top 1%	10.45	89.55	30.02	22016
	Bottom 99%	0.90	99.10	69.98	445
	Share wealth	25.46	74.54		
	Average imputed inh.	2358	70		
	Panel C:	**Measured in 1991**			
Children	Top 1%	10.45	89.55	30.02	22016
	Bottom 99%	0.90	99.10	69.98	445
	Share wealth	20.34	79.66		
	Average wealth	685	27		
	Panel D:	**Measured in 1991-1993**			
Children	Top 1%	10.77	89.23	30.02	22016
	Bottom 99%	0.90	99.10	69.98	445
	Share wealth	20.61	79.39		
	Average wealth	736	29		

Note: This table presents the intergenerational wealth mobility measured as the probability that a parent's wealth belongs to the top 1% or the bottom 99% of the wealth distribution conditional on the child's wealth belonging to the top 1% and the bottom 99%, respectively. In addition, the columns marked Share wealth and Average wealth denote the share of wealth held by children in the the top 1% and the bottom 99%, respectively, as well as the average wealth in kSEK. The rows labelled Share wealth and Average inheritance denote the shares of inheritance held among the top 1% (bottom 99%) and averages within those groups. The population is defined as children who lose a parent in 2002-2004 and are in the Inheritance and estate register. Within this population, we construct wealth ranks of children in the year before losing a parent, within each year-of-death cohort. The difference across panels is when we measure the parents' wealth. Panel A ranks the inheritance (gross of inheritance tax). In Panel B, we calculate the inheritance of each child using the last wealth report of parents before death. We do this by multiplying the total wealth with the share of inheritances transferred to children (obtained from the Inheritance and estate register and measured for each parent), dividing by the number of children to arrive at an imputed inheritance. We in addition set negative inheritances to zero as one cannot inherit net liabilities. Panels C and D instead use wealth in 1991 and the avereage wealth over 1991-1993 to rank children with. These are the only years prior to 1999 when we have wealth measures that encompass the population.

Table 4: Intergenerational wealth mobility

		Parents: Top 10%	Parents: Bottom 90%	Share wealth	Average wealth
	Panel A:	**Measured as inheritance**			
Children	Top 10%	22.13	77.87	63.99	4342
	Bottom 90%	8.65	91.35	36.01	252
	Share wealth	68.03	31.97		
	Average inheritance	404	21		
	Panel B:	**Measured one year before death**			
Children	Top 10%	22.36	77.64	63.99	4342
	Bottom 90%	8.63	91.37	36.01	252
	Share wealth	71.40	28.60		
	Average imputed inh.	660	30		
	Panel C:	**Measured in 1991**			
Children	Top 10%	24.74	75.26	63.99	4342
	Bottom 90%	8.36	91.64	36.01	252
	Share wealth	66.38	33.62		
	Average wealth	224	13		
	Panel D:	**Measured in 1991-1993**			
Children	Top 10%	25.28	74.72	63.99	4342
	Bottom 90%	8.30	91.70	36.01	252
	Share wealth	66.21	33.79		
	Average wealth	237	14		

Note: This table replicates Table 3 for the top 10% and the bottom 90% instead.

Table 5: Intergenerational wealth mobility

		Parents			
		Top 20%	Bottom 80%	Share wealth	Average wealth
	Panel A:	**Measured as inheritance**			
Children	Top 20%	32.35	67.65	81.90	2735
	Bottom 80%	16.91	83.09	18.10	143
	Share wealth	85.25	14.75		
	Average inheritance	253	11		
	Panel B:	**Measured one year before death**			
Children	Top 20%	32.12	67.88	81.90	2735
	Bottom 80%	16.97	83.03	18.10	143
	Share wealth	88.67	11.33		
	Average imputed inh.	410	13		
	Panel C:	**Measured in 1991**			
Children	Top 20%	35.60	64.40	81.90	2735
	Bottom 80%	16.10	83.90	18.10	143
	Share wealth	86.29	13.71		
	Average wealth	146	6		
	Panel D:	**Measured in 1991-1993**			
Children	Top 20%	35.98	64.02	81.90	2735
	Bottom 80%	16.00	84.00	18.10	143
	Share wealth	86.01	13.99		
	Average wealth	154	6		

Note: This table replicates Table 3 for the top 20% and the bottom 80% instead.

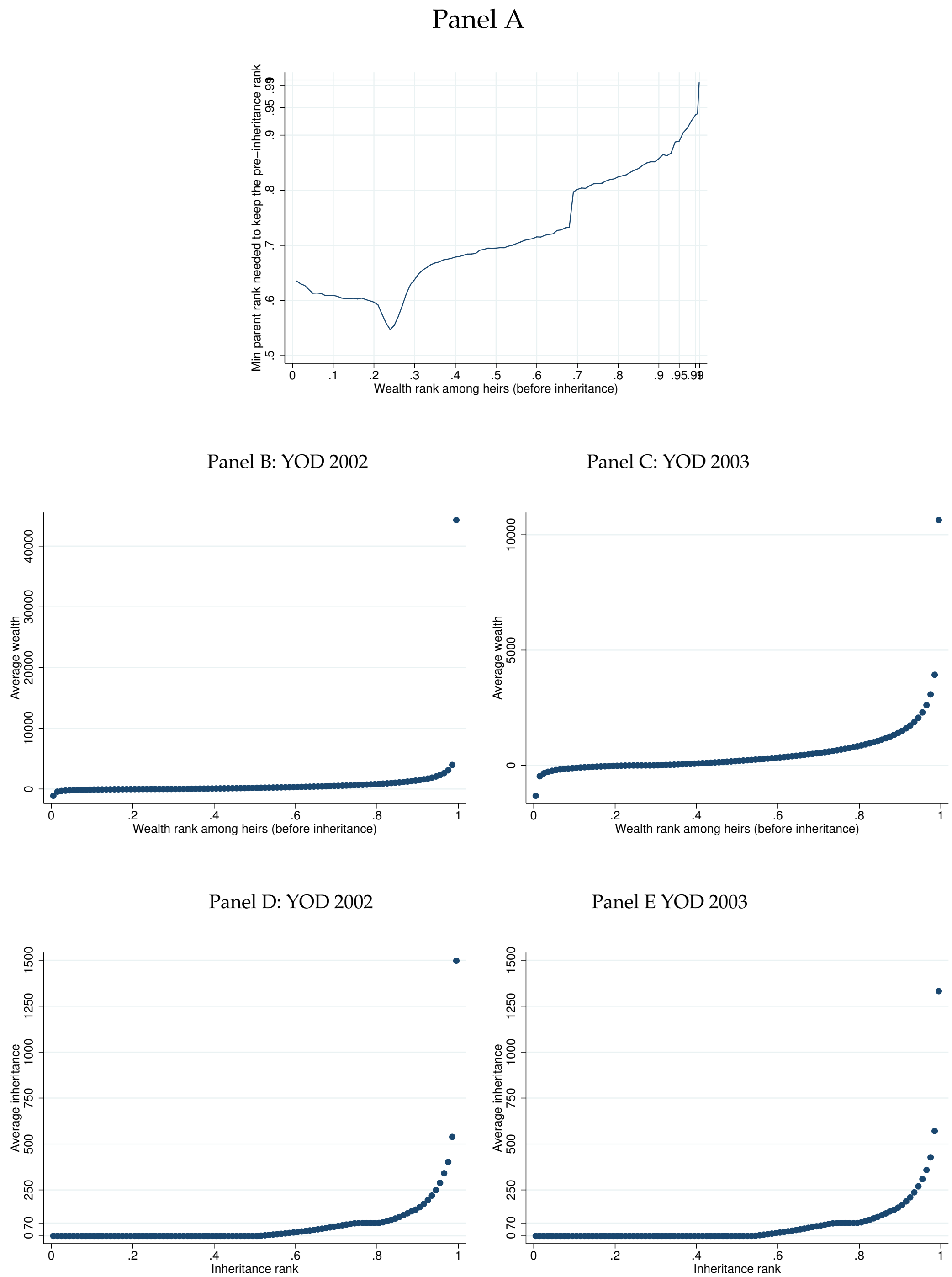


Figure D.3: Relation between inheritances and wealth

Note: Panel A of this figure shows the minimum inheritance rank needed to keep the heir's pre-inheritance wealth rank in the post-inheritance wealth distribution, against wealth rank for heirs who lose a parent, in 2003. In Panel B and C, we show average wealth in thousand Swedish kroner (kSEK) against wealth rank (percentiles) among heirs before receiving inheritances for heirs receiving inheritances in 2002 and 2003, respectively. The values on the y-axis represent the average value in each percentile. Panels D and E display average inheritances in kSEK against inheritance ranks.

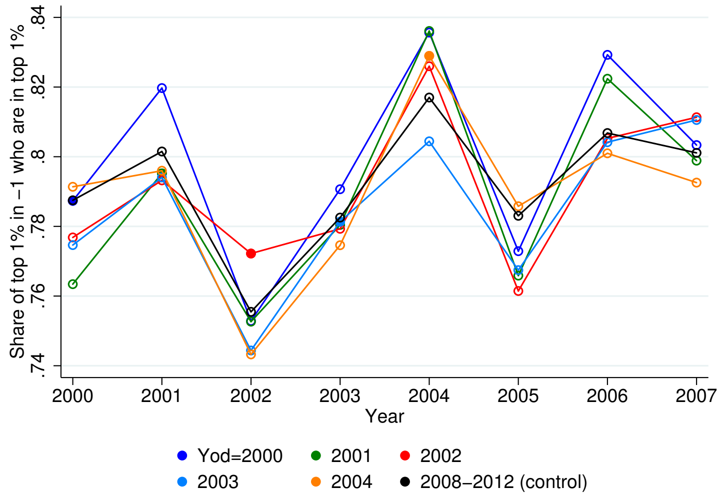


Figure D.4: Stability of wealth rank and the inheritance effect on it

Note: This figure displays the likelihood of staying in the top 1% of the distribution of wealth, measured within birth cohort, conditional on being among the top 1% in the year before. We plot this figure for children in our sample who lose a parent at different points in time (year of death), indicated by the legends.

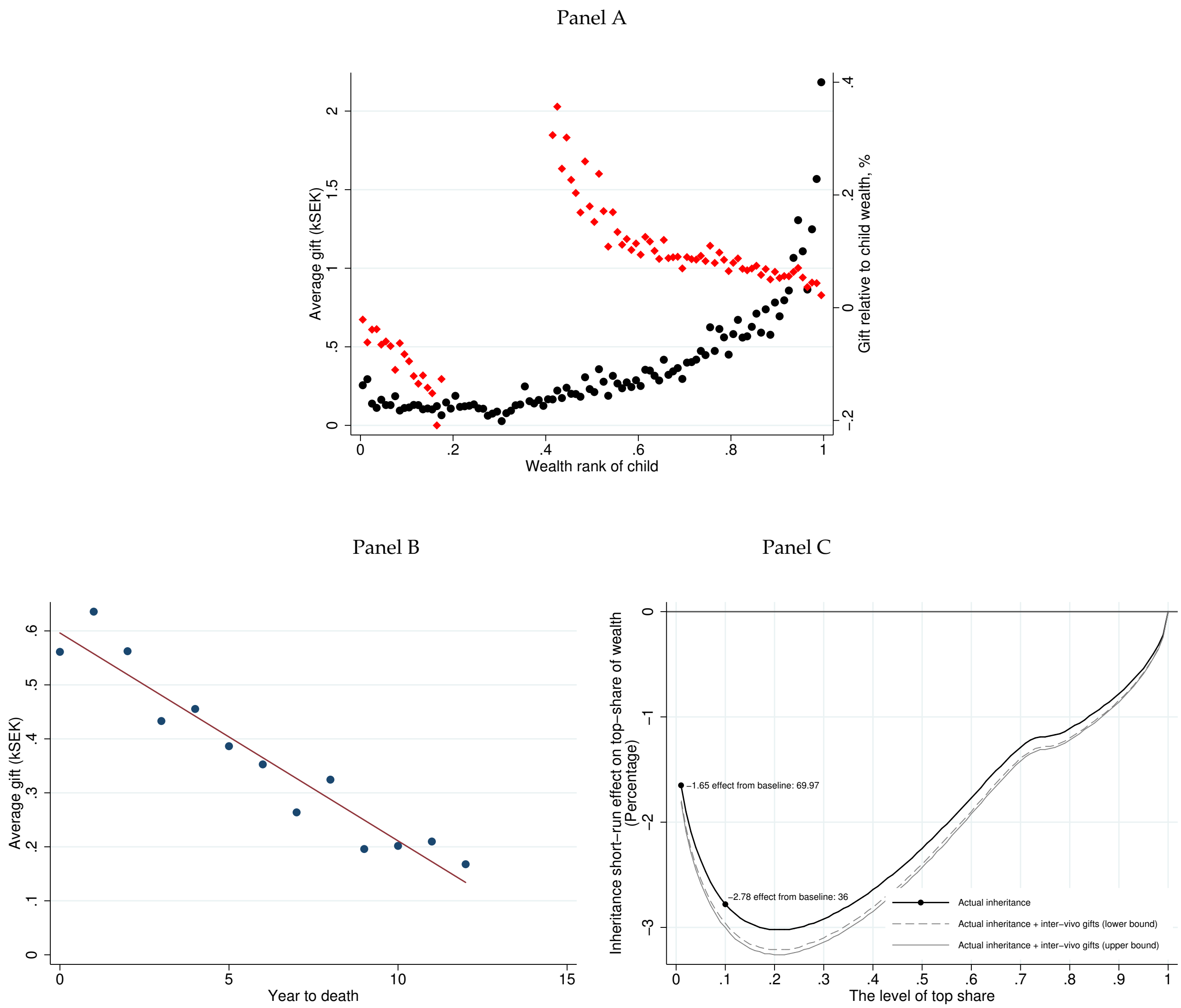
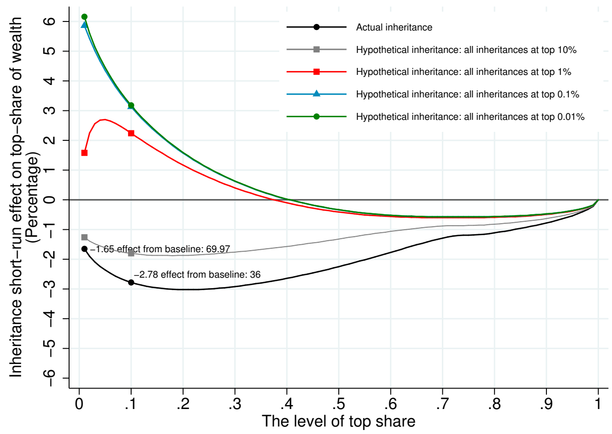


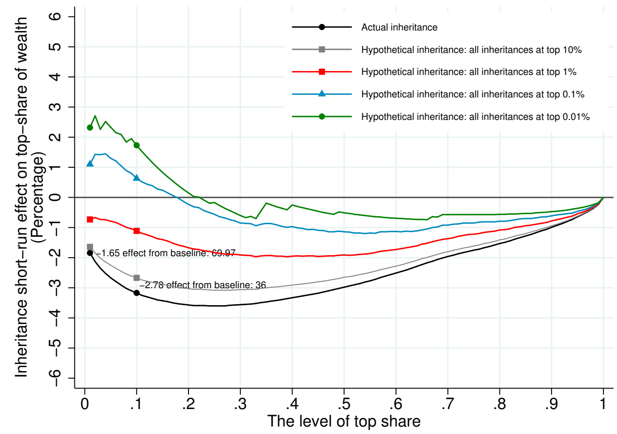
Figure D.5: Inter-vivo transfers

Note: Panel A in this figure presents the average gifts in thousand Swedish kroner (kSEK) in 2003 to children of parents who die during 2003-2015 against the children's wealth rank in 2002 in the black circled series. To be precise, the figure shows the average gift within each percentile. The red, diamond-shaped series instead depict the average ratio of gifts over wealth against the ranks. In Panel B, we display average gifts in 2003 across parents' year of death. In Panel C, we show how the Lorenz-curve difference is affected by gifts. The lower bound augments inheritances using the average gift over the twelve years before death within each percentile. The upper bound instead assumes that the average gift over this period is received during sixteen years before death.

Panel A



Panel B



Panel C

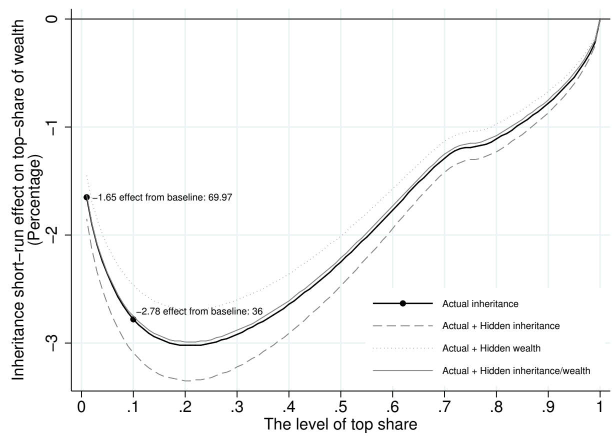
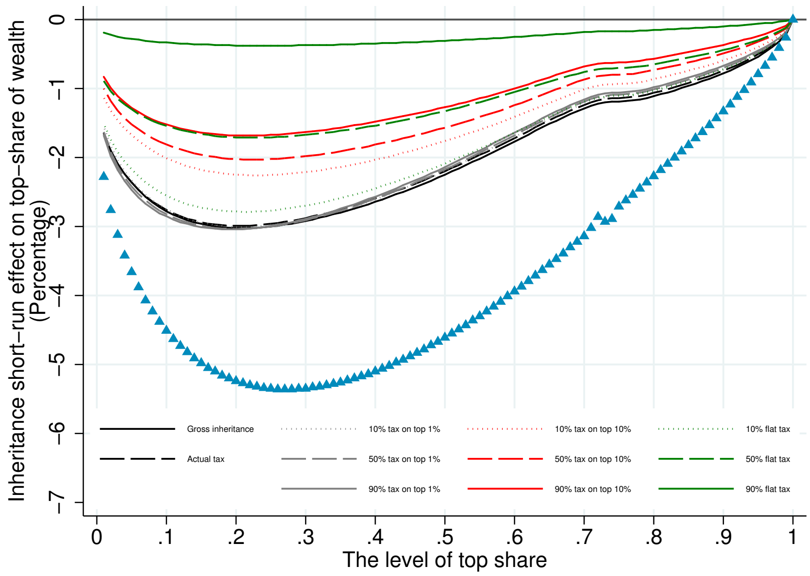


Figure D.6: The short-run effect of inheritance on wealth inequality

Note: This figure replicates Figure 1, but considers different cases of extreme inheritance inequality in each panel. Panel A shows the effect on top shares, when assuming that the top 10%, 1%, 0.1% or 0.01% of the inheritance distribution receive all inheritances in proportion to their actual inheritances. Panel B is similar to panel A but focuses on on the effect of inheritances on the wealth share of the wealthiest heirs defined before inheritances, i.e. the rank on the x-axis is fixed for all curves and is the pre-inheritance wealth rank. Panel C shows the inheritance effects in cases where we take into account hidden wealth of donor and/or heir generations.

Panel A: Taxing w/o redistributing



Panel B: Taxing with redistribution

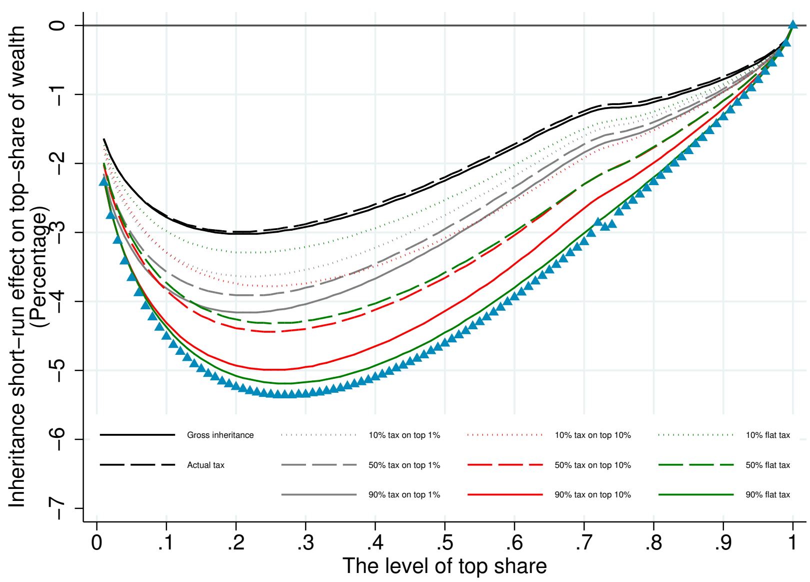
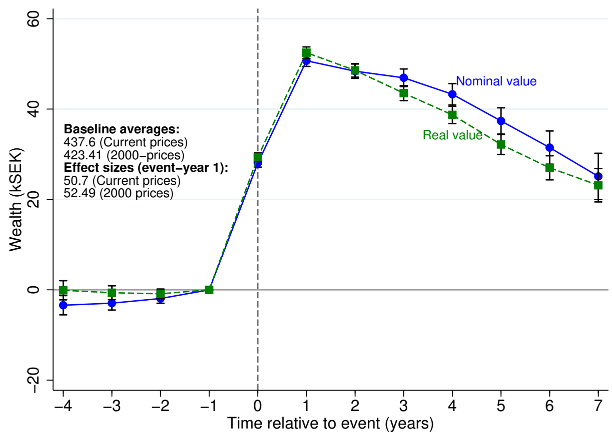


Figure D.7: The role of unexpected tax on inheritance short-run effect on wealth inequality

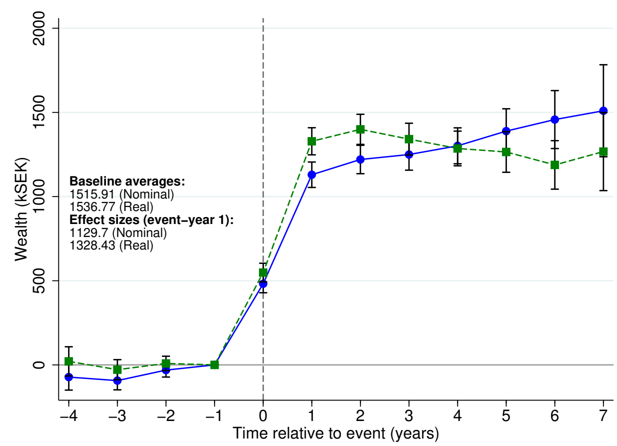
Note: This figure plots the inheritance short-run effect on top wealth share among heirs in cases with different inheritance tax systems. This should be interpreted as unexpected tases: cases are constructed w/o taking into account the behavioral responses, so it only shows the mechanical effect. The blue triangular series represent the hypothetical case of inheritance equality, borrowed from Figure D.5.

D.3.2 Long-term inequality

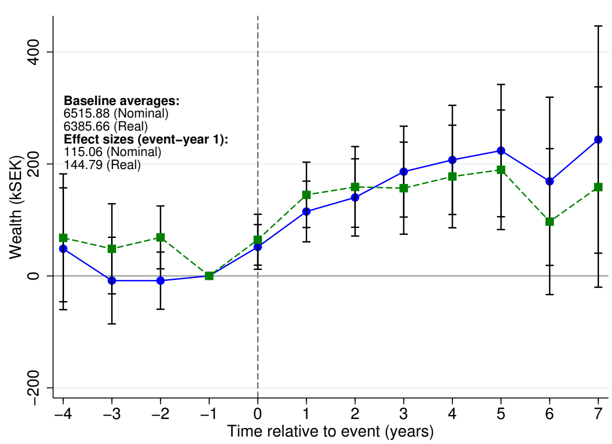
Heirs: Bottom 99%; Inheritance: bottom 99%



Heirs: Bottom 99%; Inheritance: Top 1%



Heirs: Top 1%; Inheritance: bottom 99%



Heirs: Top 1%; Inheritance: Top 1%

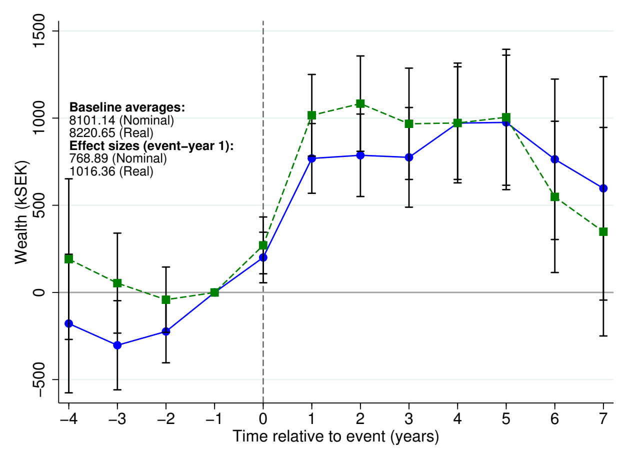


Figure D.8: The effect of inheritance on wealth by heir and parents' wealth

Note: This figure shows effects of inheritances on wealth in thousand Swedish kroner (kSEK) for subsamples. In the top left, we focus on children who belong to the bottom 95% of the wealth distribution in the year 1999 with an expected inheritance within the bottom 95% of the inheritance distribution. These estimates are based on the fixed-control method where our treatment group comprises children who receive inheritances in 2000-2004. We computed expected inheritances as follows. We take parent's wealth in 1999, multiply it with the share of the estate that goes to children and divide by the number of children. For 2002-2004 when we know the actual inheritances, we compute the child-share directly at the individual level, but for the other inheritance cohorts (2000-2001 and 2008-2012), we impute the child-share from the 2002-2004 generation as the average child-share within cells defined by wealth quantile and the indicator of having a surviving spouse. The top right graph focuses on heirs in the bottom 95% of the wealth distribution with inheritances among the top 5% and so on. The fraction of heirs in the different categories are, reading from the top left, 98.47%; 0.54%; 0.87% and 0.0012%. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

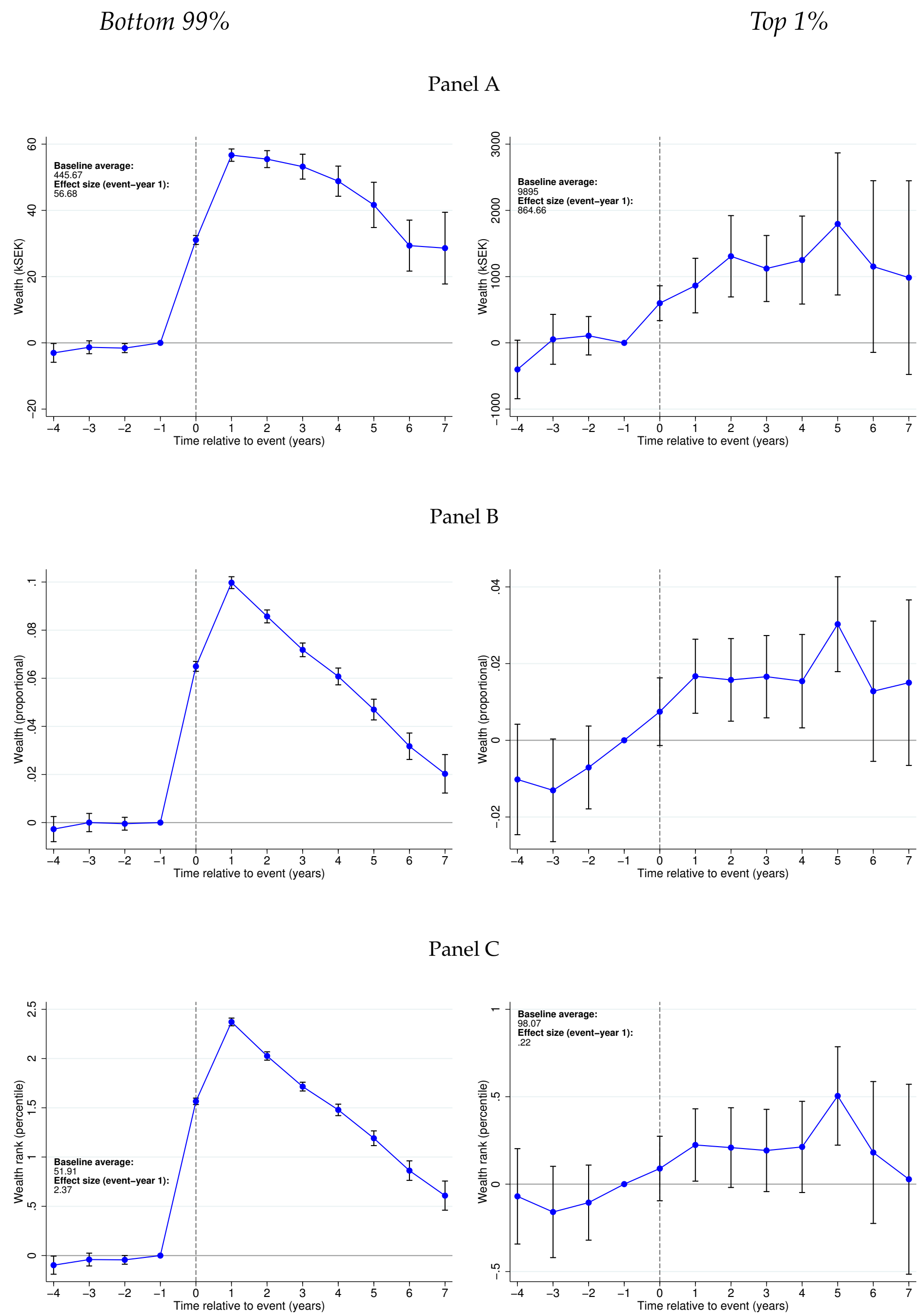


Figure D.9: The effect of inheritance on wealth by heir wealth

Note: This figure shows the effect of inheritance on market-level wealth in thousand Swedish kroner (kSEK) (Panel A), proportional wealth (arcsinh) (Panel B) and wealth ranks (Panel C) for two groups, defined by the heirs' wealth. In Panel A, we adjust the Pareto tail of the wealth distribution of the treatment years (2000-2004) to match that of the control group. The left graphs depict coefficients for heirs within the bottom 99% of the wealth distribution in calendar year 1999 while the right graph focuses on heirs within the top 1% of the wealth distribution. We use the fixed-control group method with children who lose a parent in 2008-2012 to demean outcomes while our treatment group comprise children of parents who die during 2000-2004 and demeaning is done within each group separately. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

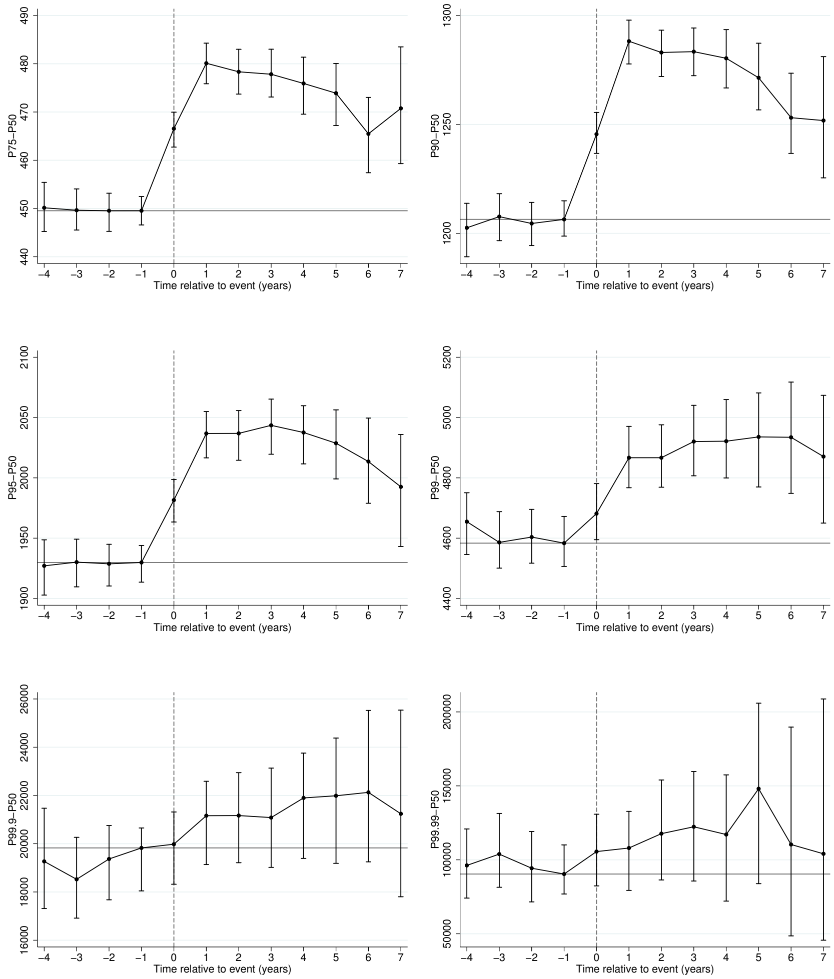


Figure D.10: Inheritance effect on wealth dispersion

Note: This figure plots the effect of inheritances on wealth dispersion, defined as the difference between different percentiles of the distribution. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. Standard errors are from 1000 bootstraps and the figures display 95%-confidence intervals.

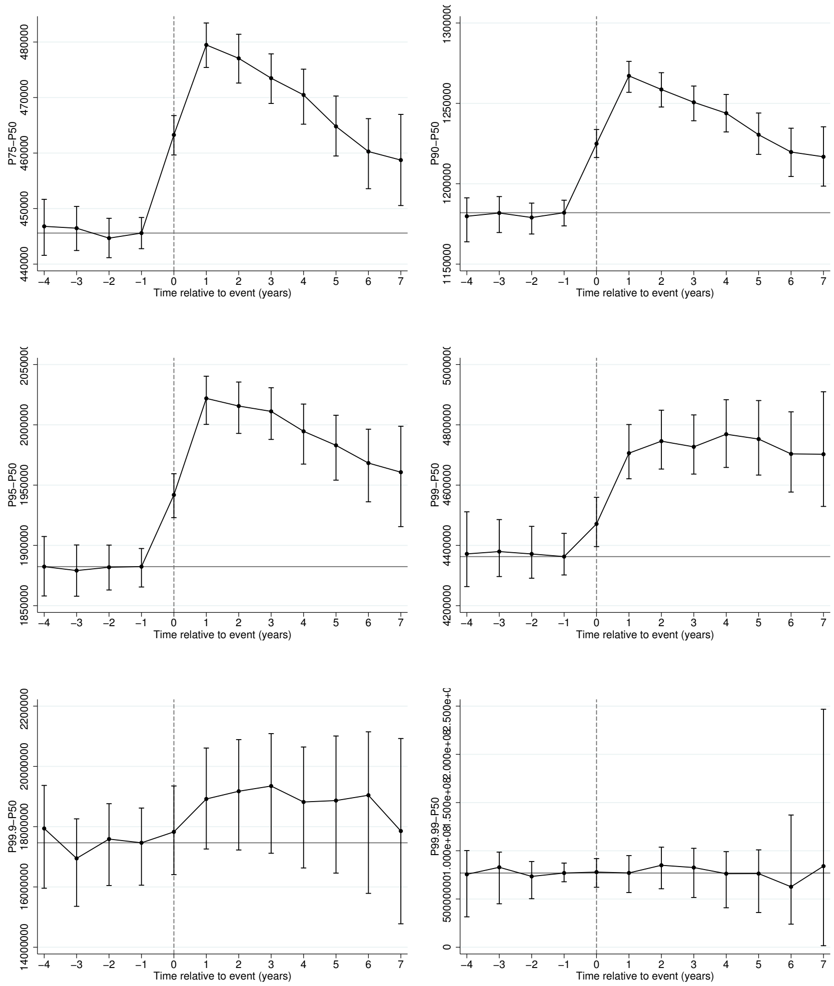


Figure D.11: Inheritance effect on ***real*** *wealth dispersion*

Note: This figure replicates Figure D.10, plotting the effect of inheritances on wealth dispersion where asset prices are fixed in 2000. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. Standard errors are from 1000 bootstraps and the figures display 95%-confidence intervals.

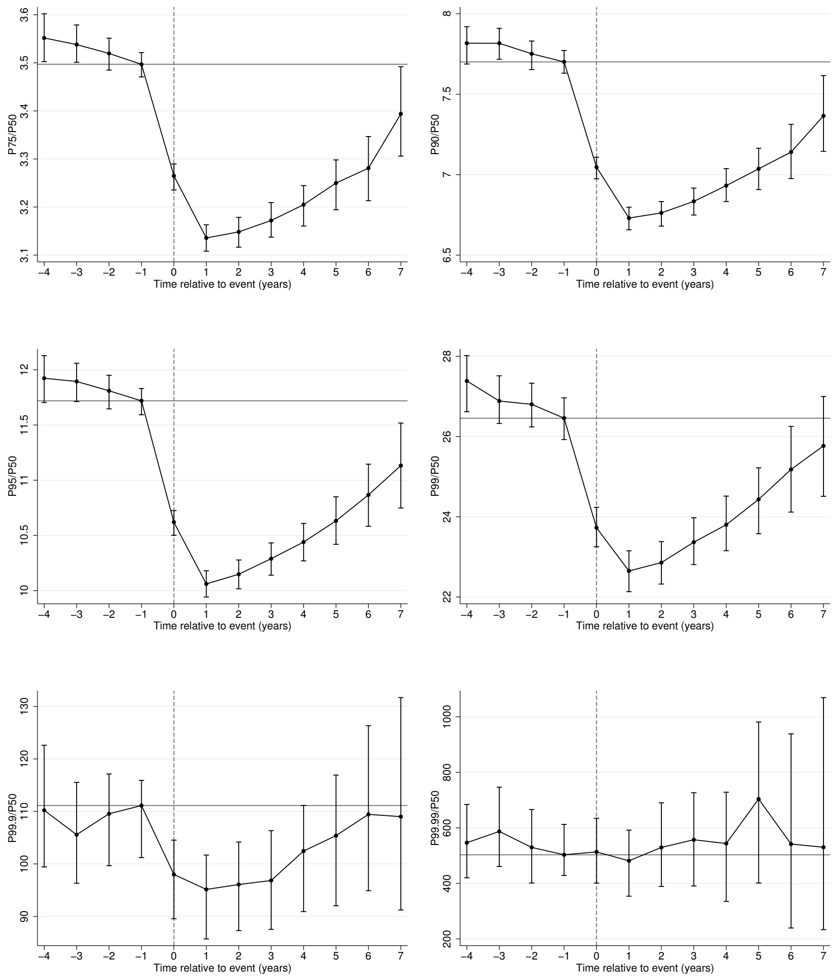


Figure D.12: The effect of inheritance on Kuznets ratios

Note: This figure plots inheritance effects on different Kuznets ratios, defined by the y-axes. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. Standard errors are from 1000 bootstraps and the figures display 95%-confidence intervals.

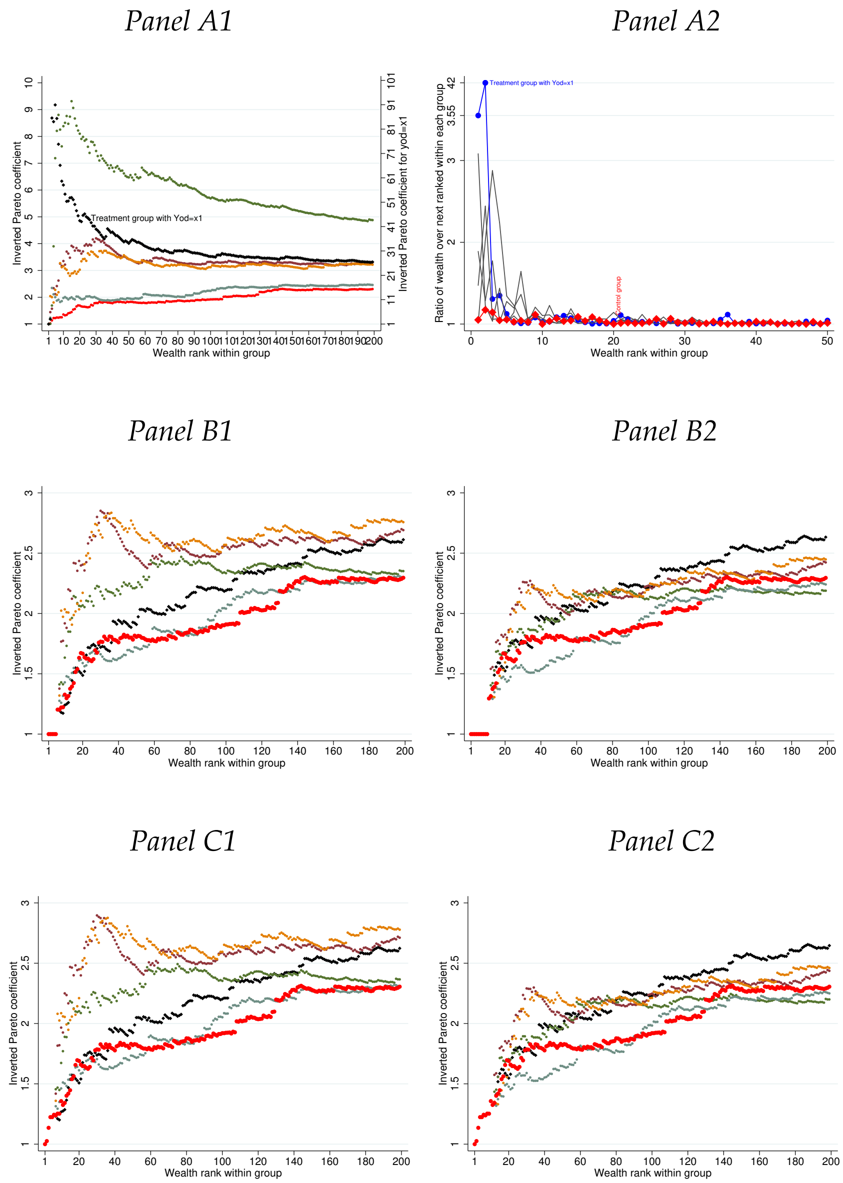
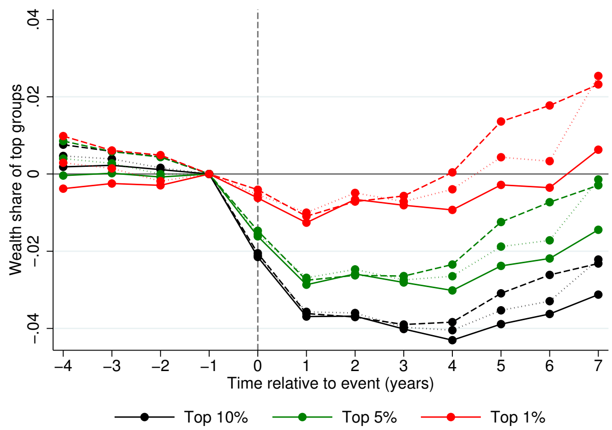


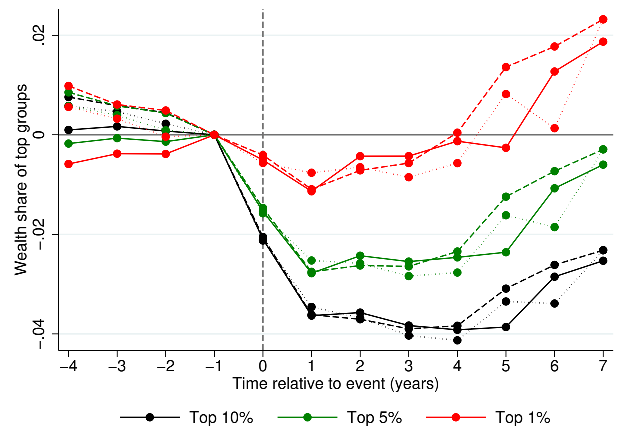
Figure D.13: Pareto tail of wealth distribution

Note: Panels A1 and A2 present the anomalies in the tail of the wealth distribution in the treatment groups (2000-2004) and the control group, while the other panels show how we solve them. In order to respect the confidentiality of our data, we do not provide any legends. "Treatment group with yod=x1" helps the reader to see the connection between Panel A1 and A2 in the absence of the legend. Panel A1 displays inverted Pareto coefficients for the five treatment groups and the control group. The inverted Pareto coefficient is defined as the ratio of average wealth of individuals with wealth above a certain level to that level of wealth (Atkinson et al., 2011). Panels B1 and B2 do the same but after replacing the wealth of top 5 and 10 people, respectively, with a fixed amount. Panels C1 and C2 adjust the wealth level of the top 5 and 10 individuals in the treatment groups, respectively, so that they obtain the same Pareto coefficient as the control group. We apply this correction procedure when analyzing long-run inequality effects (see Section 6)..

Panel A



Panel B



Panel C

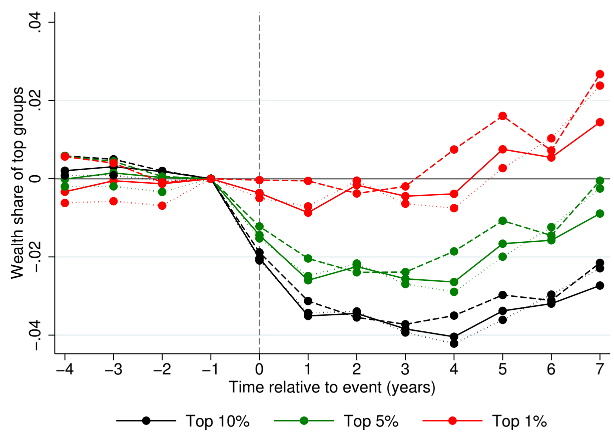
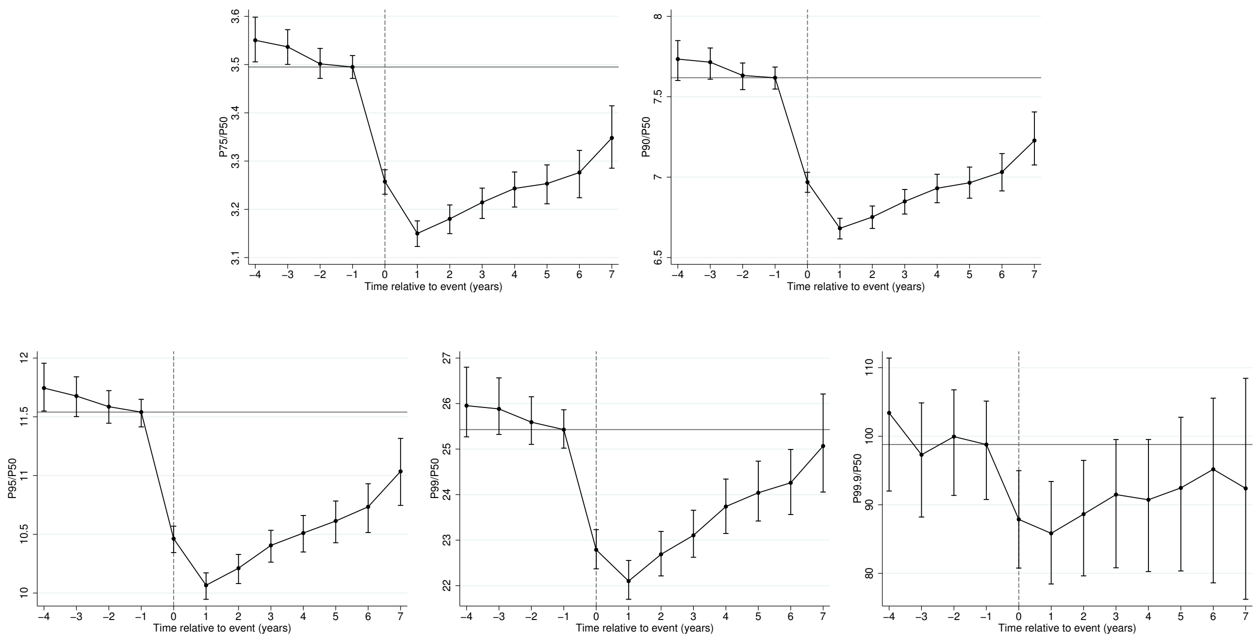


Figure D.14: Robustness of long-run inequality effect

Note: This figure shows effects of inheritances on long-run wealth inequality when adjusting top-individuals wealth in different ways. Panel A shows the effects when we replace the wealth of top individuals by an equal amount (as in Panel B of Figure D.13). The adjustment is done in three levels: for top 10/5/2 individuals demarcated by the solid/dotted and dashed lines, respectively. In Panel B, we instead drop those top individuals altogether. Panel C instead corrects the Pareto tail using the control group as benchmark (similar to Panel C in Figure D.13).

Panel A



Panel B

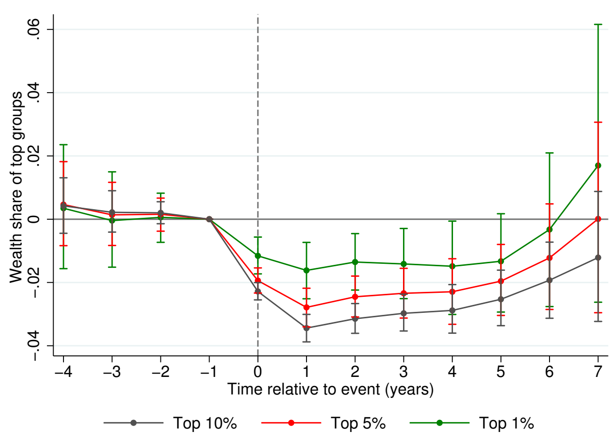


*Figure D.15: The effect of inheritance on long-run **real** wealth inequality*

Note: This figure replicates Figure D.14 for real wealth, i.e. wealth denominated in 2000-prices. See the notes to Figure 3 for an explanation of this procedure.

Panel A *Panel B*

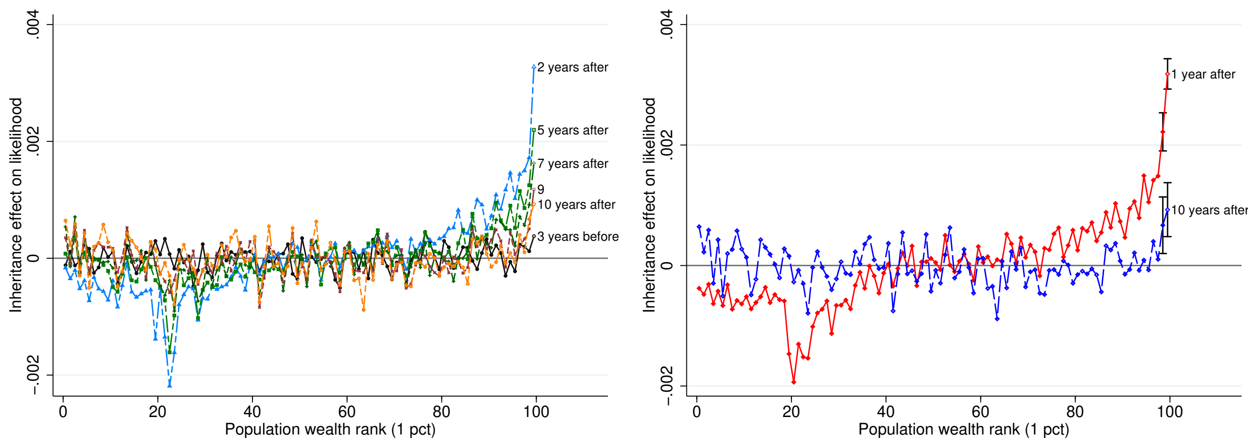
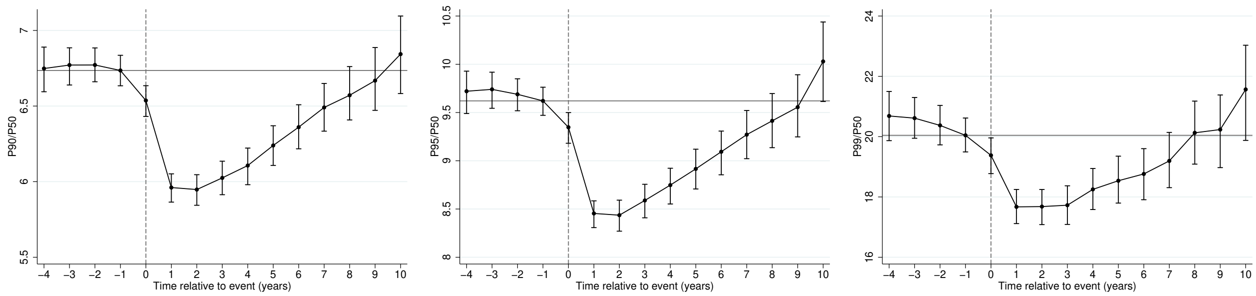


Figure D.16: The inheritance effect on the likelihood of being in each percentile of the population wealth distribution, ***capitalized wealth***

Note: This figure replicates Figure 5 but using capitalized wealth instead of wealth records, allowing us to estimate the effect 10 years after inheritance receipt. Panel A plots the effect of inheritance on the likelihood of heirs being in each percentile bin of population capitalized wealth distribution in 2,5,7,9 and 10 years after receipt and in 3 years before inheritance receipt as a placebo. Panel B only focuses on the effect one and ten years after. For illustrative purposes, we show confidence intervals for the effects of the top two percentiles only. We apply the fixed-control-group method with cohorts who lose a parent in 2011-2015 as a control group.

Panel A



Panel B

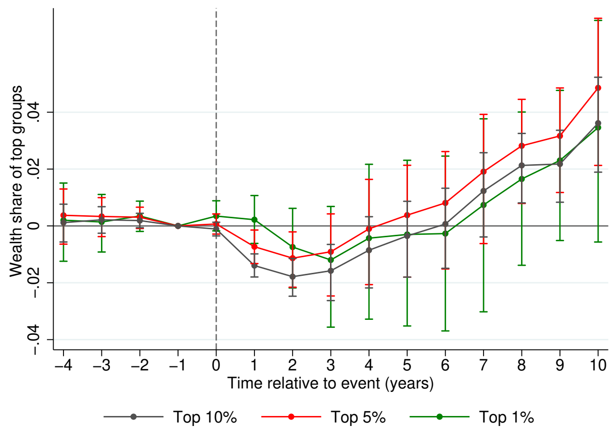


Figure D.17: The effect of inheritance on long-run wealth inequality, ***capitalized wealth***

Note: This figure replicates Figure 6 using capitalized wealth instead of wealth records. Panel A plots the effect of inheritance on Kuznets (percentile) ratios. Panel B focuses on the share of wealth in the hand of the wealthiest individuals. All estimates reweigh the birth-year distribution (1-year-intervals) as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of birth-years of children who lose a parent in 2000. We omit event-time minus one as the reference period. The figures display 95%-confidence intervals from 1000 bootstraps.

D.4 Inter-vivo gifts

Our empirical design – using the randomness of the timing of death – does not allow us to measure the impact of inter-vivo transfers. This section sheds some light on the importance of gifts by investigating their overall magnitude and heterogenous importance across the wealth and age distribution. We use the Inheritance and estate tax register, which includes information on the reported gifts over the 2002-2004 period.[79]

Appendix Figure D.18, Panels A and B present descriptive statistics on gifts over the wealth distribution from the donors' and the recipients' side, respectively. Within the total Swedish population, annual gifts amount to only around 261 SEK on average (demarcated by the solid horizontal lines in Panels A and B), which corresponds to about 0.06% of average wealth.[80] The distribution of gifts is

[79]See Section 3.1 for the institutions related to inter-vivo gift taxation.

[80]These numbers may seem at odds with the tax revenues reported in Section 3.1. There we report government revenues of 2,643/332 million SEK from the inheritance/inter-vivo gift tax, which implies that gift tax revenue amounts to 12.6% of inheritance tax revenue. There are two points here. First, the average tax rate on gifts (14%) is higher than on inheritances (8%) due to a lower exemption threshold,. Otherwise, in a given year the share of total inter-vivo transfers over inheritances is around 8.5%. Second, in a given year the emitted inter-vivo transfers stem from a younger generation than inheritances bequeathed. Since the younger generations are relatively more wealthy, this mechanically creates a lower share than the share of gifts over inheritances within the same generation.

skewed, with the top wealth decile transferring about four times as much wealth compared to the second highest decile. In fact, its skewness is similar to that of the distribution of wealth so that the relative importance of gifts (the ratio of gifts over donor wealth) is fairly constant across the distribution.

In parallel to the case for donors, gifts are disproportionately falling into the hands of the very wealthy in nominal terms. However, relative to baseline wealth, more affluent individuals receive *less*.[81] This pattern is similar to that of inheritances (see Appendix Figure E.3), suggesting that gifts, like inheritances, have an equalizing short-run effect on the wealth distribution. We also document that emitted gifts are low until the age of 60, and rising in importance with age after that (Panel C).

This analysis augments that of Figure D.5, where we only focus on gifts from parents to children within our population. The patterns are consistent, with gifts increasing nominally in wealth for children, but decreasing relatively. We also find that most gifts occur close to death, which is consistent with Panel C below, where we find that gifts rise in importance with age.

These pieces of evidence should be interpreted as a lower bound on the importance of gifts because of tax evasion and avoidance. Nevertheless, since the evidence on inter-vivo gifts is scarce, these facts comprise a contribution to the literature.

[81] There is a slight increase in gifts over wealth for the top deciles of the wealth distribution before inheritances, suggesting that the effect of gifts on wealth inequality within the total population may be different depending on which top shares that one considers. Nevertheless, this slighly increasing pattern is much less pronounced than the declining pattern between the third and the seventh percentile.

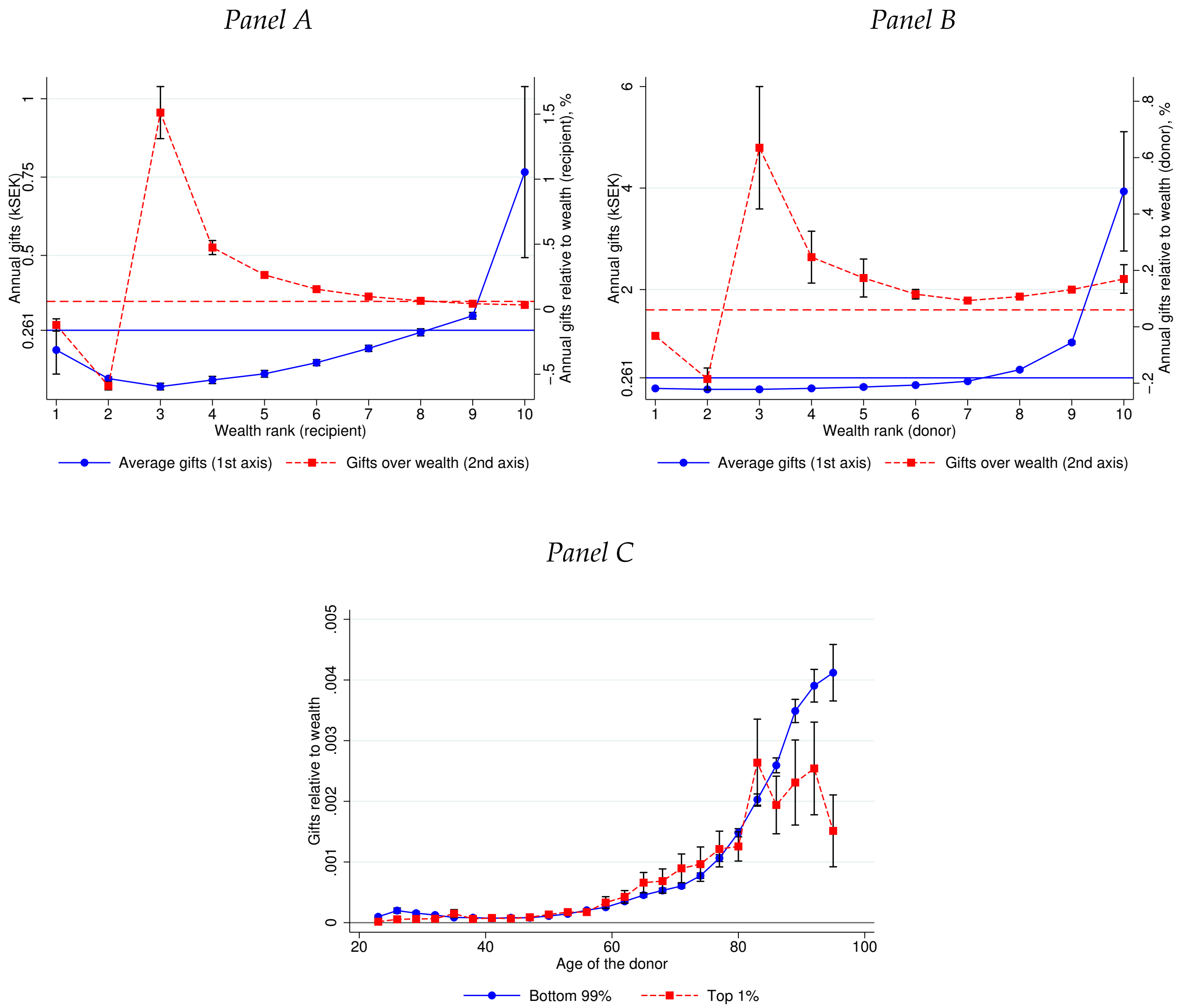


Figure D.18 Gifts emitted and received

Note: Panel A shows average annual gifts (averaged over 2002-2004) in kSEK emitted (solid circled series) against wealth population rank of the donor (measured as deciles of average wealth over 1999-2001). This figure uses the entire Swedish population, and not the parent-child population as in the rest of the paper. The horizontal solid line shows the population-average. The same panel also shows average annual gifts as a share of average wealth on the second y-axis (measured as mean wealth during 2002-2004) (squared dashed series). This share can be negative because wealth can be negative. The horizontal dashed line shows the population-wide ratio of those averages. We omit individuals with an absolute value of wealth of 50 kSEK or less to avoid that these ratios become sensitive to individuals with very low wealth. Panel B shows an analogous picture but here we focus on gift recipients instead. Finally, Panel C shows average annual gifts emitted within 3-year age-intervals against age. We split the sample by donor's wealth belonging to the bottom 99% (circled solid series) and top 1% (squared dashed series), measured using average wealth over 1999-2001 and within each birth cohort.

E Additional empirical results

Table 6: Summary Statistics, Means

Year of death	2000	2001	2002	2003	2004	2008-2012
Parents						
Age	77.27	77.02	76.79	76.47	76.17	74.45
Age at death	78.27	79.02	79.79	80.47	81.17	85.38
Number of children	2.94	2.94	2.93	2.95	2.93	2.90
Average labor income 1991-1999	20.44	21.38	21.91	22.44	23.58	27.32
Wealth	431.33	486.12	507.65	508.86	511.29	551.27
Wealth rank	41.15	43.57	44.17	44.86	45.45	47.46
Wealth rank, year before death	41.15	42.40	42.10	42.48	42.44	41.58
Wealth per child	203.15	237.11	235.53	231.47	233.42	253.25
Wealth per child, year before death	203.15	229.21	208.36	188.76	213.38	328.84
Average taxable wealth 1991-1993	167.45	163.40	170.24	172.79	174.97	178.74
Observations	65619	66727	68367	67507	66361	345463
Children						
Age	46.50	46.50	46.50	46.50	46.50	46.50
Age at death	47.50	48.50	49.50	50.50	51.50	57.43
Sibling order	1.97	1.96	1.93	1.93	1.90	1.77
Highest education						
Unknown or primary school	0.31	0.31	0.31	0.31	0.31	0.31
High school	0.40	0.40	0.40	0.40	0.40	0.40
Short tertiary (vocational)	0.13	0.13	0.13	0.12	0.13	0.13
Longer tertiary	0.15	0.15	0.15	0.15	0.15	0.15
Labor income	181.01	180.74	181.54	182.35	181.72	184.37
Labor income (cond. on positive)	208.11	207.89	208.61	209.11	208.49	211.08
Share with positive income	0.87	0.87	0.87	0.87	0.87	0.88
Wealth	496.98	532.93	943.82	488.82	482.42	479.30
Wealth rank	52.25	52.15	52.25	52.21	52.11	52.24
Wealth rank, year before death	52.25	52.23	52.43	52.77	52.46	53.48
Wealth, year before death	496.98	580.38	907.81	574.38	629.34	1213.57
Average taxable wealth 1991-1993	167.45	163.40	170.24	172.79	174.97	178.74
Observations	137642	140624	144332	144236	141810	751481

Note: This table presents descriptive statistics for our main estimation sample. The columns marked 2000-2004 present variable means for each of our treatment cohorts, respectively and the last column presents the means for the control group, i.e. parental death years 2008-2012. All variables are measured in 1999, unless differently stated. Monetary variables are measured in current 1000 SEKs. Labor income is measured gross of taxes and transfers. Wealth percentile ranks are created within the total Swedish population and cohort. For ties, we take the average rank. We weight the distribution of birth-year and education (4 categories) of each year-of-death-cohort non-parametrically to match the distribution of birth-years of children receiving inheritance in 2000.

Table 7: Summary Statistics, Medians

Year of death	2000	2001	2002	2003	2004	2008-2012
Parents						
Age	79	79	79	79	78	77
Age at death	80	81	82	83	83	87
Number of children	3	3	3	3	3	3
Average taxable wealth 1991-1993	87.87	88.17	89.40	90.10	90.97	96.80
Wealth	107.86	136.54	144.53	154.10	164.12	196.83
Wealth rank	36.61	40.12	41.02	42.12	43.17	46.28
Wealth rank, year before death	36.61	38.27	37.55	38.30	38.14	35.55
Wealth per child	41.31	51.08	54.97	58.78	62.13	75.27
Wealth per child, year before death	41.31	53.43	55.31	49.65	57.78	79.71
Average labor income 1991-1999	0	0	0	0	0	0
Observations	65619	66727	68367	67507	66361	345463
Children						
Age	48	48	48	48	48	48
Age at death	49	50	51	52	53	59
Sibling order	2	2	2	2	2	1
Labor income	183.70	183.70	184.20	184.90	183.90	186.00
Labor income (cond. on positive)	199.50	199.40	199.90	200.20	199.70	201.20
Wealth	142.79	140.59	144.08	141.97	140.44	144.41
Wealth rank	53.83	53.51	53.86	53.73	53.59	53.90
Wealth rank, year before death	53.83	53.65	53.82	54.29	53.84	55.36
Wealth, year before death	142.79	176.38	202.81	222.84	239.54	560.72
Average taxable wealth 1991-1993	87.87	88.17	89.40	90.10	90.97	96.80
Observations	137642	140624	144332	144236	141810	751481

Note: This table replicates Table 6 for **median** values. The columns marked 2000-2004 present median values for each of our treatment cohorts, respectively and the last column presents the median for the control group, i.e. parental death years 2008-2012. All variables are measured in 1999, unless differently stated. Monetary variables are measured in current 1000 SEKs. Labor income is measured gross of taxes and transfers. Wealth percentile ranks are created within the total Swedish population and cohort. For ties, we take the average rank. We weight the distribution of birth-year and education (4 categories) of each year-of-death-cohort non-parametrically to match the distribution of birth-years of children receiving inheritance in 2000.

Table 8: Regression Coefficients

Event year	Wealth	Unearned income	Net consumption	Labor earnings
-4	-0.0840			0.0260
	(0.047)			(0.024)
-3	-0.0410	0.053	0.149	-0.0240
	(0.033)	(0.069)	(0.062)	(0.021)
-2	-0.0420	-0.076	-0.003	-0.0160
	(0.022)	(0.061)	(0.053)	(0.016)
-1	0	0	0	0
0	1.547	1.886	0.710	-0.350
	(0.016)	(0.056)	(0.048)	(0.016)
1	2.343	2.692	1.214	-0.449
	(0.020)	(0.055)	(0.048)	(0.021)
2	2	2.135	1.269	-0.417
	(0.021)	(0.054)	(0.047)	(0.024)
3	1.693	1.956	1.287	-0.340
	(0.023)	(0.054)	(0.047)	(0.026)
4	1.455	1.809	1.253	-0.254
	(0.030)	(0.057)	(0.051)	(0.028)
5	1.174	1.755	1.232	-0.166
	(0.038)	(0.061)	(0.057)	(0.029)
6	0.854	1.500	1.069	-0.0660
	(0.050)	(0.070)	(0.066)	(0.031)
7	0.596	1.386	0.985	0.00100
	(0.076)	(0.090)	(0.089)	(0.032)
Treated individuals	712,270	712,270	712,270	712,270
Observations	6,376,500	5,603,060	5,603,060	14,469,717

Note: This table presents regression coefficients of Equation 2 for the outcomes wealth (current market values), unearned income, consumption of goods and labor earnings, all measured as **rank** in the birth cohort. The treatment group is defined as individuals losing a parent in the years 2000-2004. Each row denotes an event-time year where -1 is the omitted category. For wealth, unearned income and consumption, we apply the fixed-control method while labor earnings employs the fixed-delta method. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. Standard errors are clustered at the heir-level.

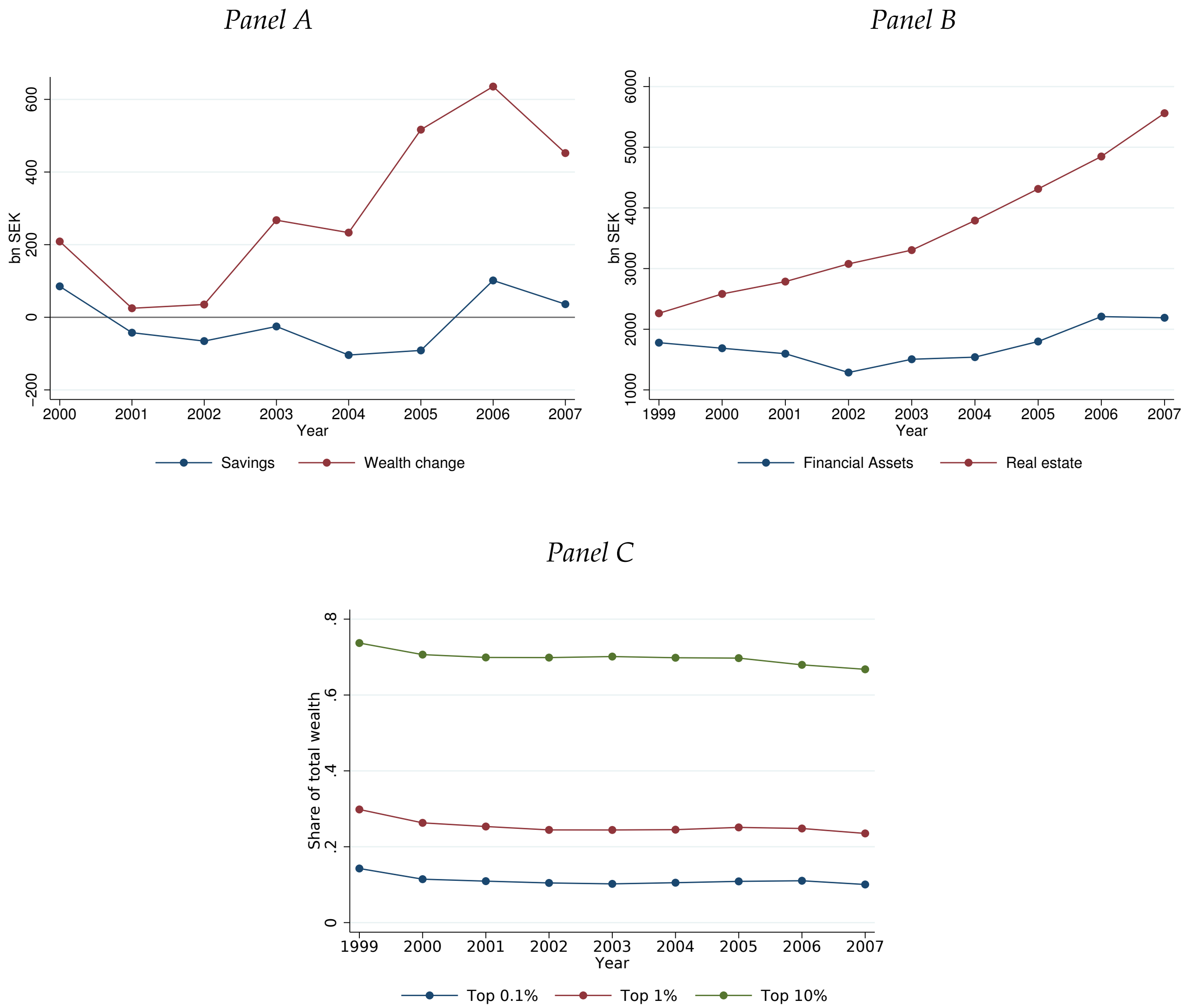


Figure E.1: Aggregate patterns

Note: Panel A depicts households' total wealth change in red and the change in wealth due to savings in blue, expressed in billion SEK for the Swedish population. We describe the savings measure in Section 7.2 and in Appendix Section C. However, note that the underlying wealth definition is slightly different from the baseline definition. We exclude capital insurance products here, as we only know the balance at the end of each year and not the composition. The increase in savings in 2006 is mainly due to the change in the reporting of bank account values, see Appendix Section A.2. Panel B displays total real estate values, including owner- and tenant-occupied housing assets as well as land, and total financial asset values, including banks, bonds, listed equity, funds, options and capital insurance. All series are denoted at market values. Panel C shows the share of total wealth in the hands of top quantiles over time.

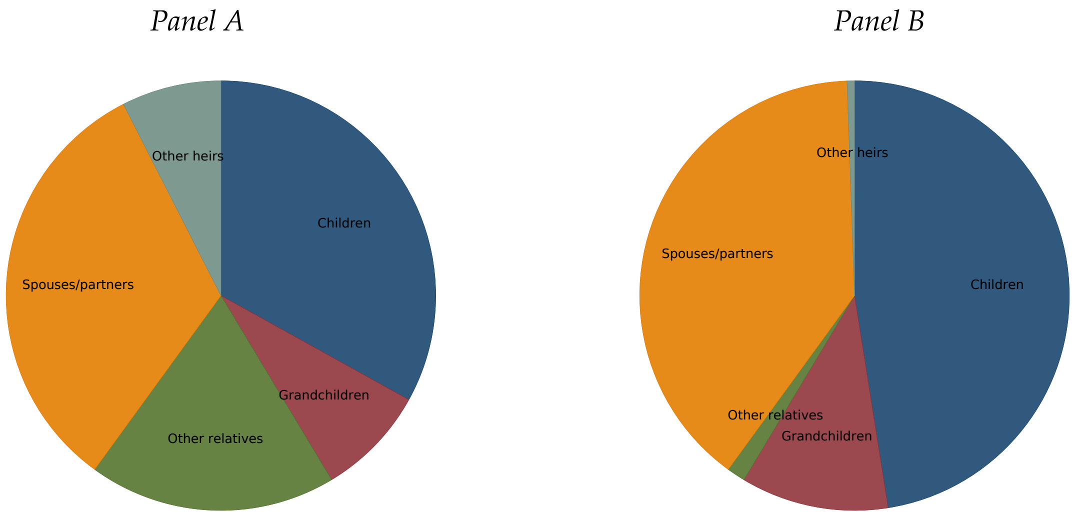


Figure E.2: Share of bequest flows to different groups

Note: Panel A depicts the share of total bequest flows allocated to different individuals, grouped into five categories, calculated using the data on taxable inheritances over time for individuals who die during 2002-2004. *Children* covers biological and adopted children, while step- and foster-children are included in the *Other relatives* category. *Spouses/partners* include married, cohabiting as well as registered partners. The bequest flow includes inheritance and taxable insurance, gross of the inheritance tax. Inter vivo gifts are not included. Panel B replicates Panel A, but focuses on deceased individuals with children, i.e. our analysis population.

Panel A *Panel B*

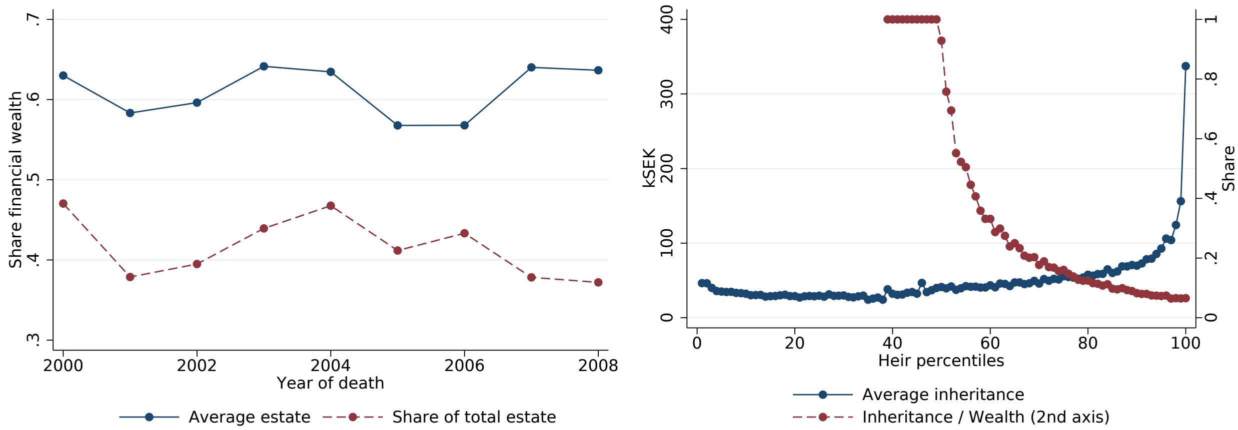


Figure E.3: Inheritance composition and distribution

Note: Panel A displays the composition of our population's parents estates in two, complementary, ways. To construct the solid blue series, we first compute total financial and real assets, net of liabilities of each parent one year before death. Liabilities are subtracted from each asset type in proportion to asset shares. Negative net wealth are set to zero as debt can not be inherited. The series show the average share financial (net) assets against year of death for the period 2000-2008. The dashed red series show the share of total (net) assets that are represented by financial wealth against time. The solid blue series in Panel B show average inheritance against wealth percentiles, computed one year before parental death, at the child-level. The dashed red series represent the average share of inheritance out of total wealth within each percentile. Average shares are censored at 1 and are only constructed for positive wealth-bins.

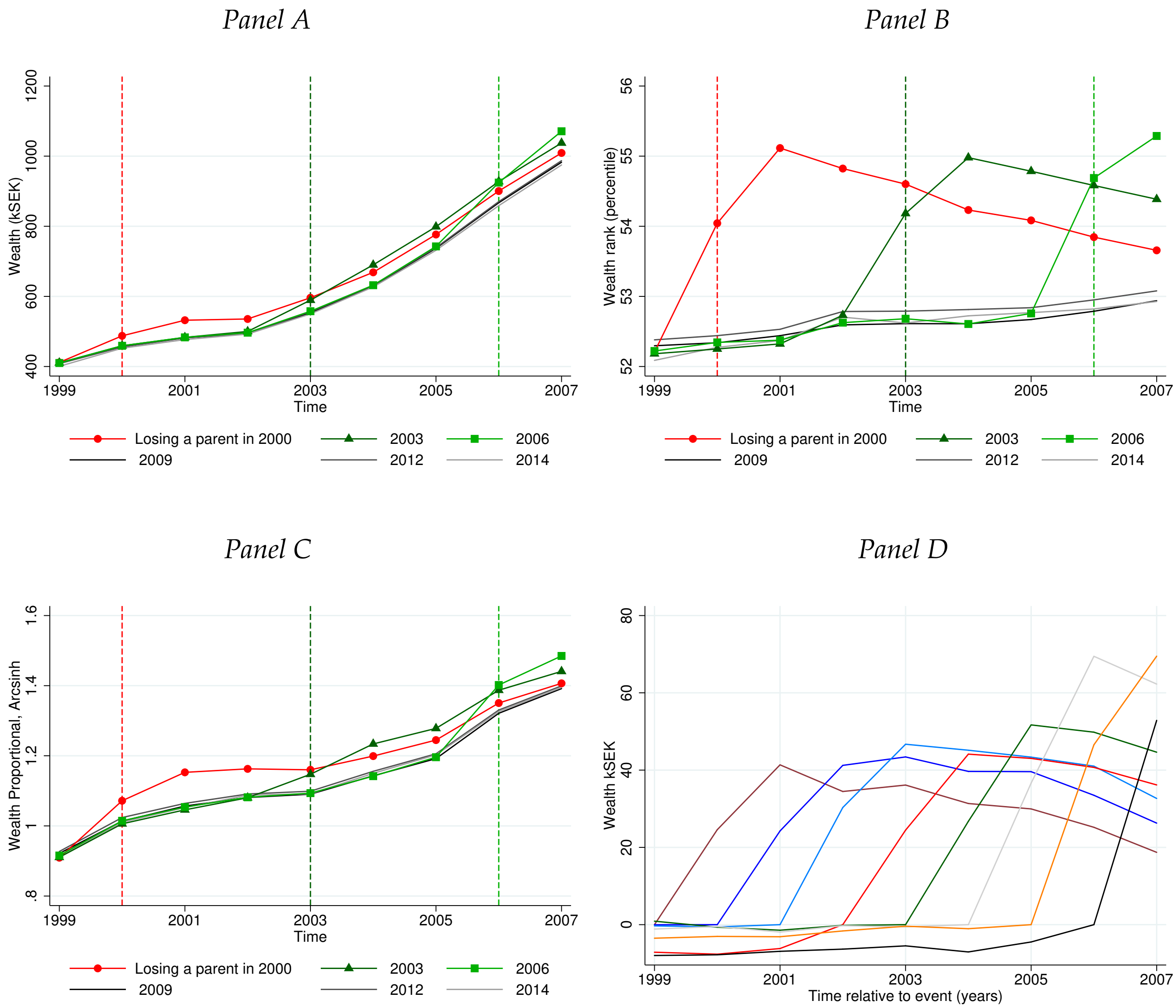


Figure E.4: Empirical design

Note: Panel A shows the average wealth in thousand Swedish kroner (kSEK) for children whose parents die in 2000, 2003, 2006, 2009, 2012 and 2014, respectively. In Panel B, we present the time series of within-cohort percentile ranks for the same population. Finally, Panel C shows the time-series of the mean of the inverse hyperbolic sine function. We reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. Panel D shows the normalized difference between median treatment and control groups but varies the treatment group. The control group is always children losing a parent during 2008-2012, the main control group for the rest of the paper.

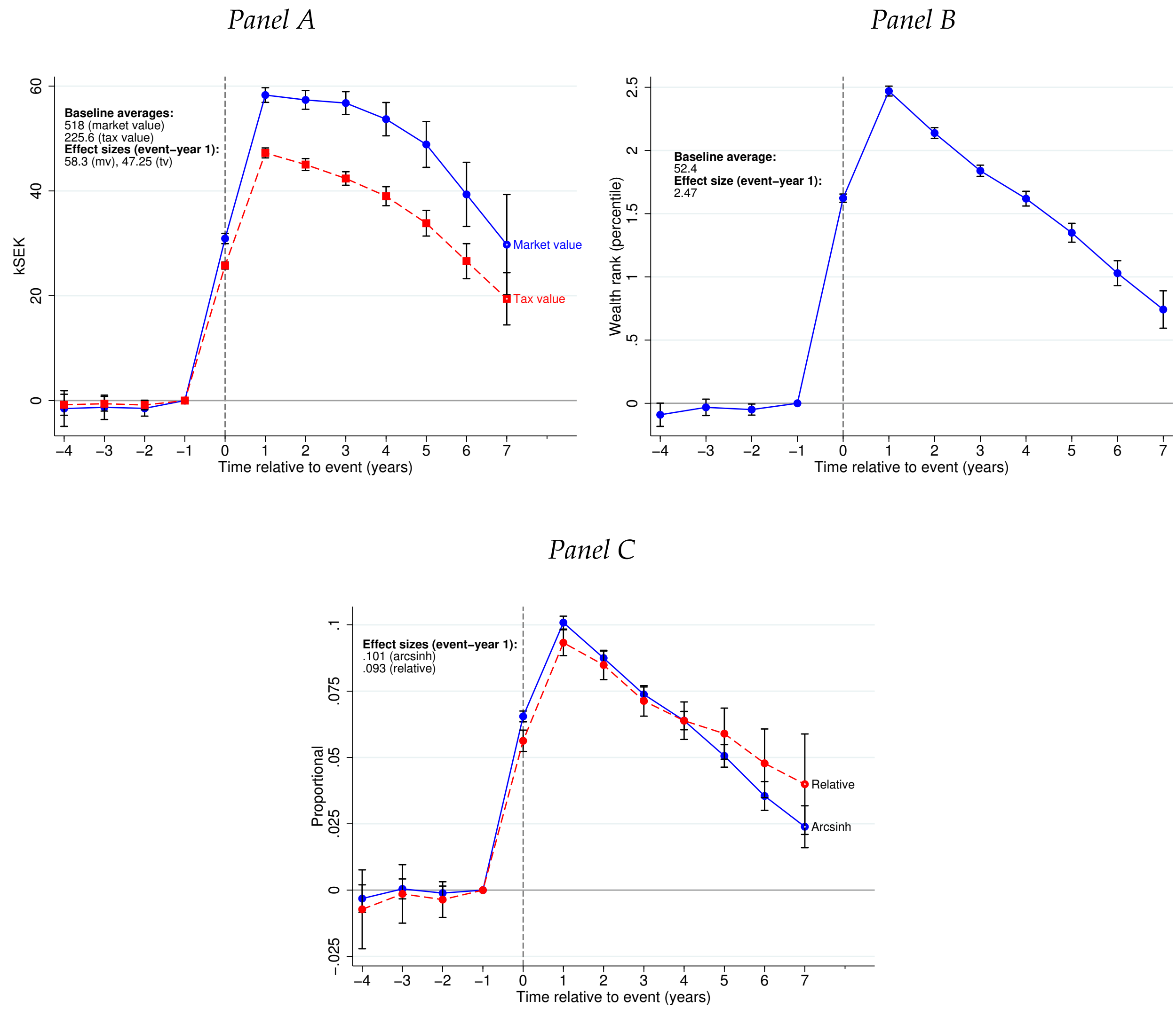


Figure E.5: The effect of inheritance on children's wealth, alternative specification

Note: This figure replicates the estimations presented in Figure 3 and Panel D of Figure E.8, but instead of using a fixed control group (children who lose a parent in 2008-2012), we here apply the fixed-delta method, as explained in 5.1. Our treatment group comprise individuals losing a parent in 2000-2004. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

Panel A *Panel B*

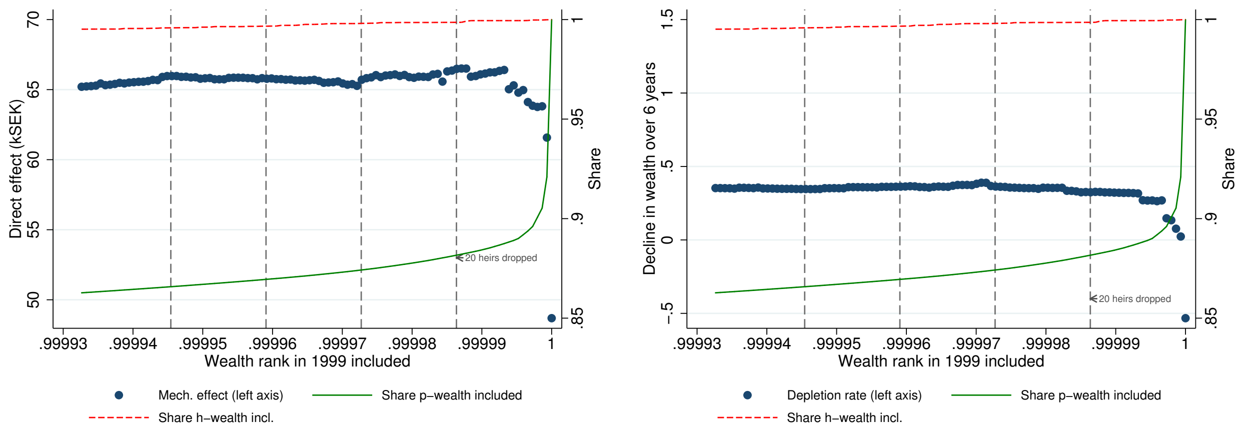


Figure E.6: Sensitivity to outliers

Note: This figure displays estimated direct effects in thousand Swedish kroner (kSEK) (Panel A) and depletion rates of wealth over six years (Panel B) when excluding top-wealth individuals in the analysis sample according to their wealth in 1999. For Panel A, the y-axis represents the direct effect (measured in event-time 1) of inheritance on wealth. In Panel B, the y-axis displays the difference between the mechanical inheritance effect on wealth (coefficient of event-time 1), obtained from the estimates of Equation 2, minus the coefficient for event-time 6, divided by the mechanical effect. In words, here the y-axis represents the depletion rate, or the fraction of the mechanical effect that disappears over six years. We show the direct effect and the depletion rate against the fraction of children included. To be precise, each dot represents the depletion rate and the share of children included when dropping wealthy heirs. The first dot from the right is the estimated depletion when including all children. The next dot from the right represents the depletion rate and the share of children included when dropping the wealthiest heir in 1999 and so on. The graphs also displays the fraction of parental and heir-wealth measured in 1999 that we include (in the solid line).

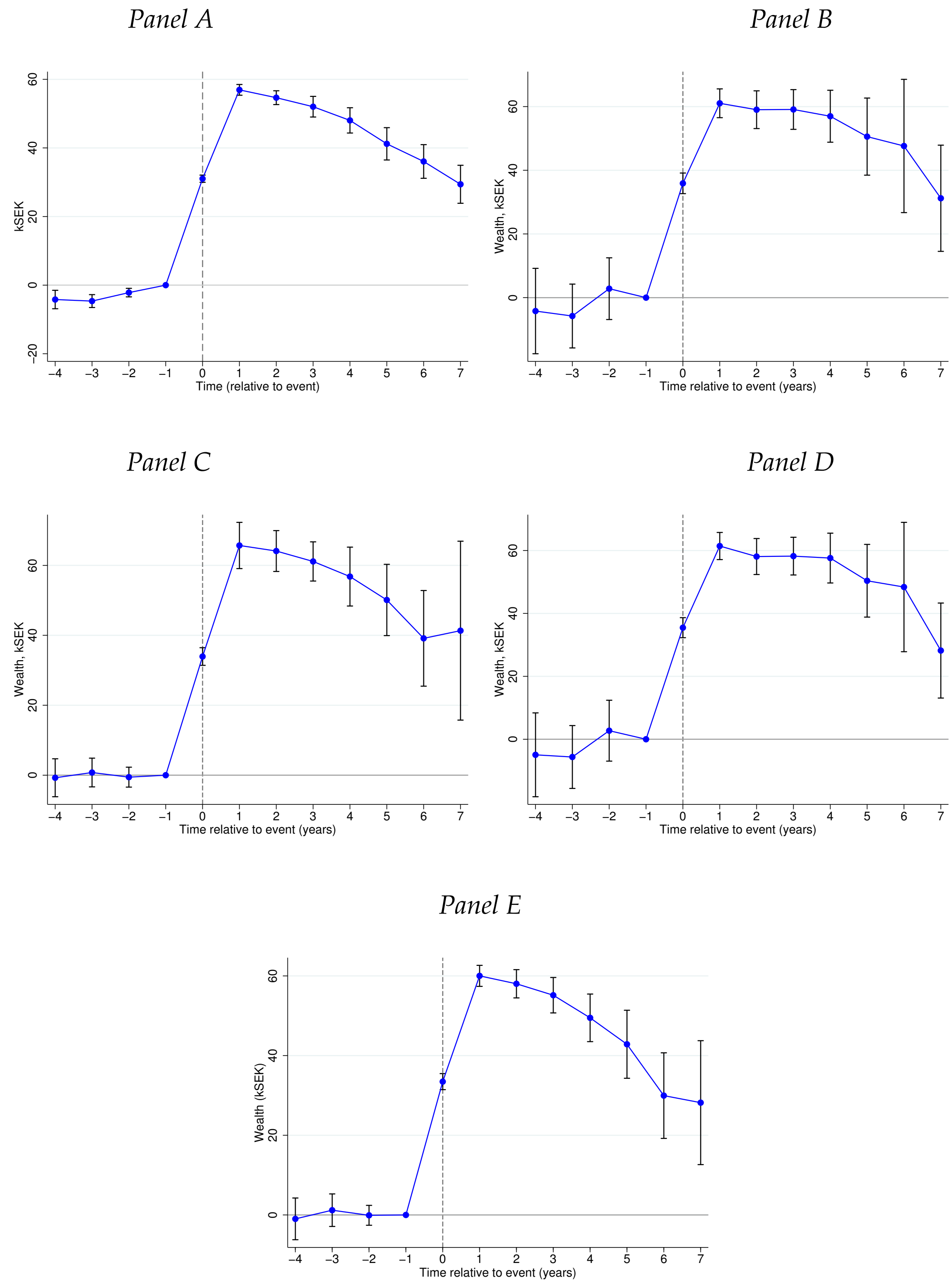


Figure E.7: The effect of inheritance on children's wealth, different subsamples

Note: This figure shows coefficient estimates when estimating Equation 2 on wealth in thousand Swedish kroner (kSEK) for different subsamples, which adjust the outliers of the wealth distribution in different ways. These graphs display effects of inheritance on wealth when excluding or adjusting a select few from the top of the wealth distribution. In Panel A, we restrict attention to heirs whose wealth is never winsorized in the main winsorization in the paper, which is at the 0.1 and 99.9th percentiles, by year. In Panel B, we drop the 100 heirs with the largest wealth growth during 1999-2007. To construct Panel C, we rank heirs according to their 1999-wealth and drop the 100 wealthiest heirs in 1999, irrespective of when they receive inheritance. To account for the fact that heirs whose parents die in different years during the 2000-2012 period may be differently wealthy in 1999, Panel D ranks heirs according to their 1999-wealth within parental year of death, and drops the 20 wealthiest heirs within each parental-death year. In Panel E, we adjust the wealth of the 10 wealthiest individuals wealth so that the distribution of wealth in each treatment year matches that of the control group. We illustrate this pattern in more detail in Appendix Figure D.13.

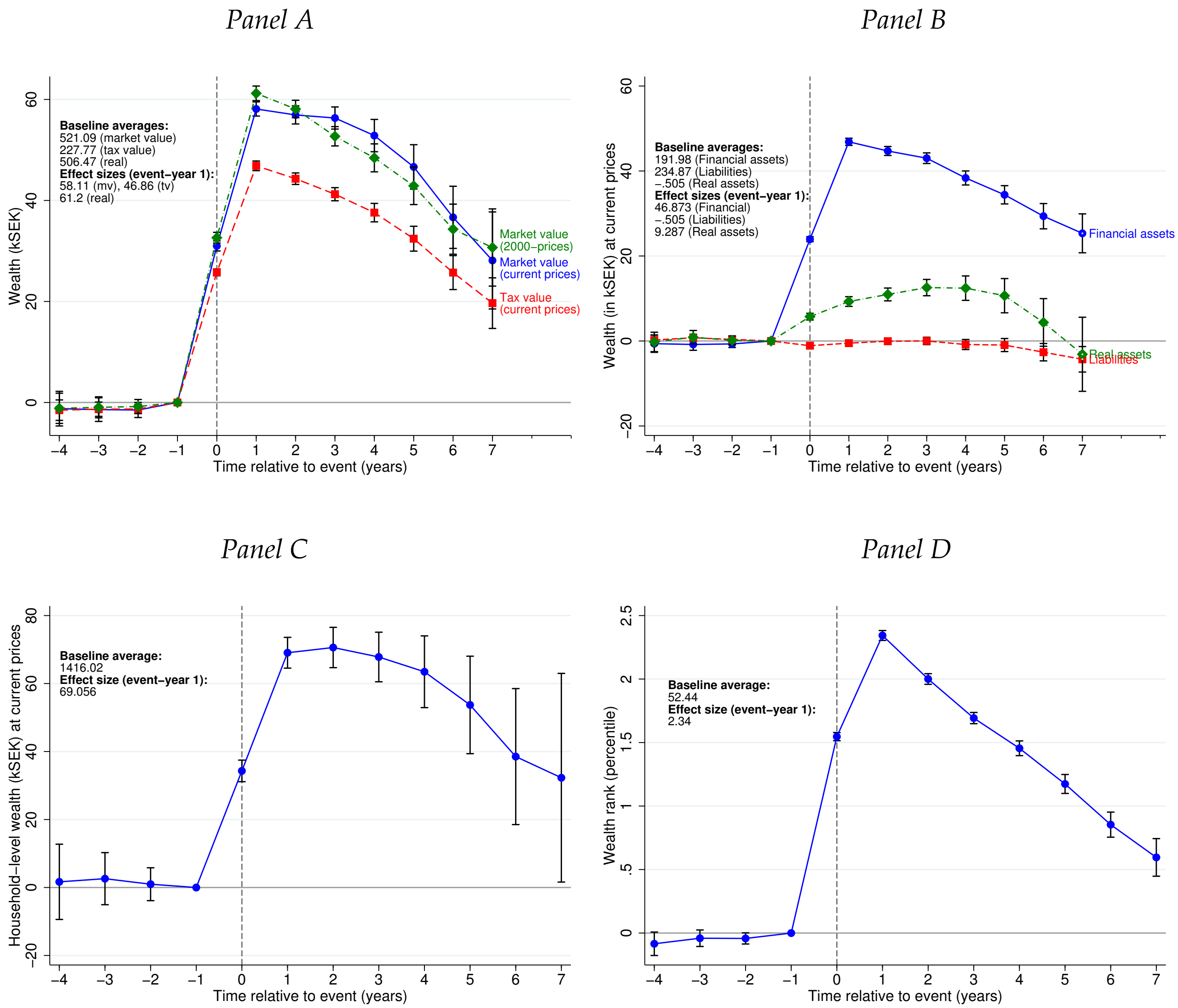


Figure E.8: The effect of inheritance on children's household-level wealth and wealth components

Note: This figure shows coefficient estimates when estimating Equation 2 on different outcomes. In Panel A we replicate Figure 3, but add effects on wealth at tax prices. Panel B presents estimates on child's wealth by subcomponents. In Panel C, we show effects on household-level wealth. The unit is thousand Swedish kroner (kSEK). The household is defined as the child's children and spouse (by marriage or by cohabitation, in case they have common children). In Panel D, we estimate the effect on the population wealth rank within the birth cohort. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level.

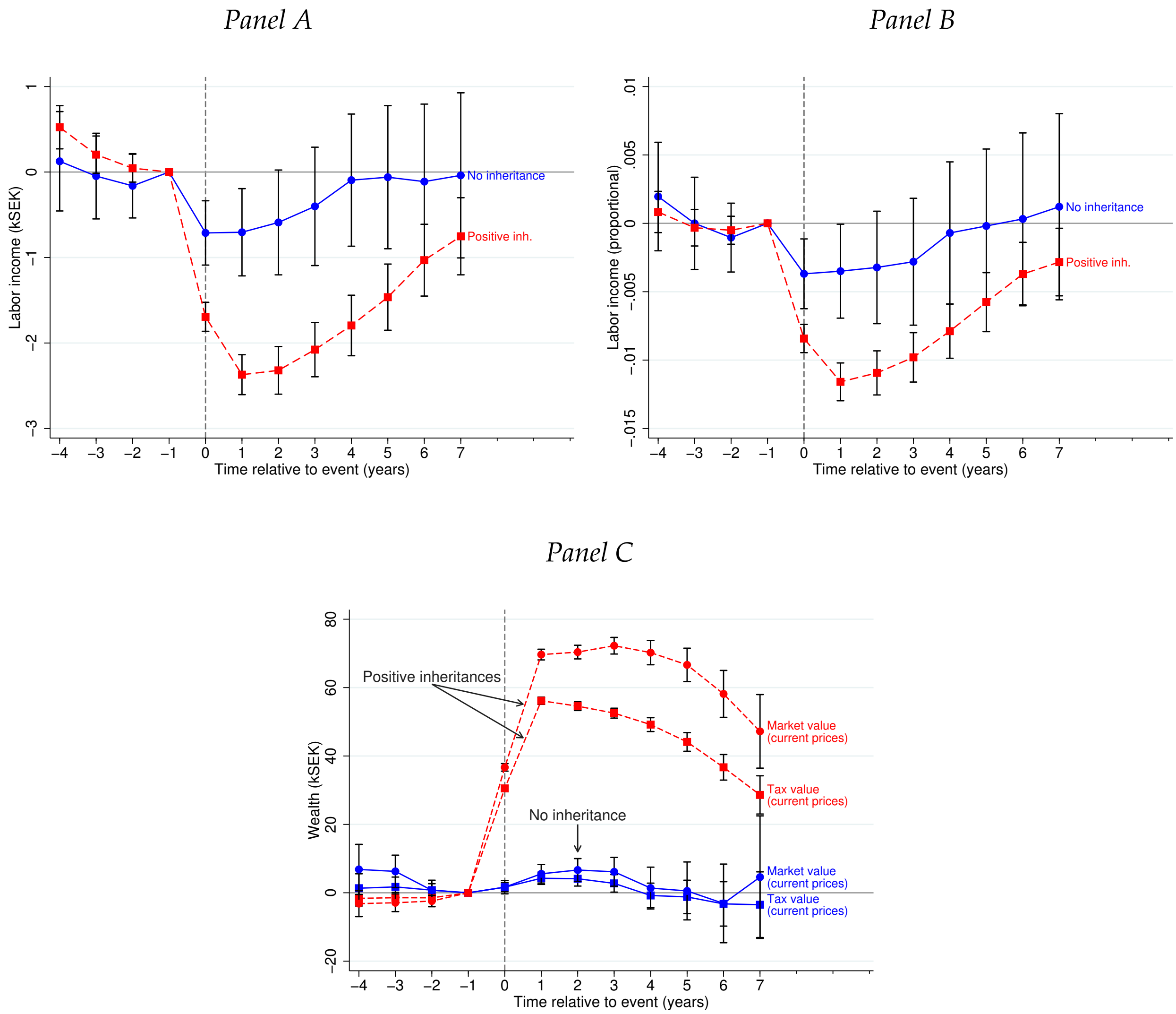
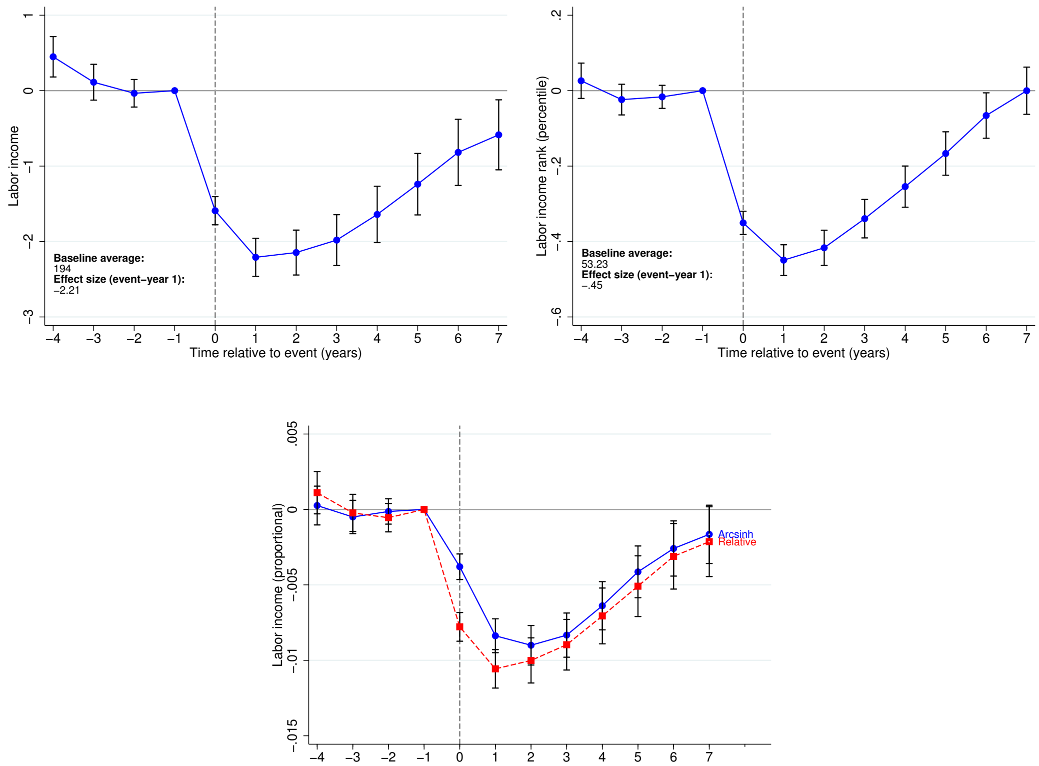


Figure E.9: The effect of inheritance on labor supply of heirs, by parents wealth

Note: This figure shows the effect of inheritance on labor income for heirs who receive no inheritances (14% of all heirs) and heirs who receive positive inheritances. In Panel A, we show the effect on labor income in thousand Swedish kroner (kSEK) while panel B shows the proportional effect, constructed by dividing the outcomes with the control group averages. Panel C shows wealth effects for the two groups. We employ the fixed-delta method and define heirs by parents' wealth in event-year -1 (for both treatment and control) as having zero wealth in the wealth registers. The treatment group comprises children of parents who die during 2000-2004. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of birth-years of children who lose a parent in 2000. We reweigh control to treatment separately within each parental wealth group. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

Panel A



Panel B

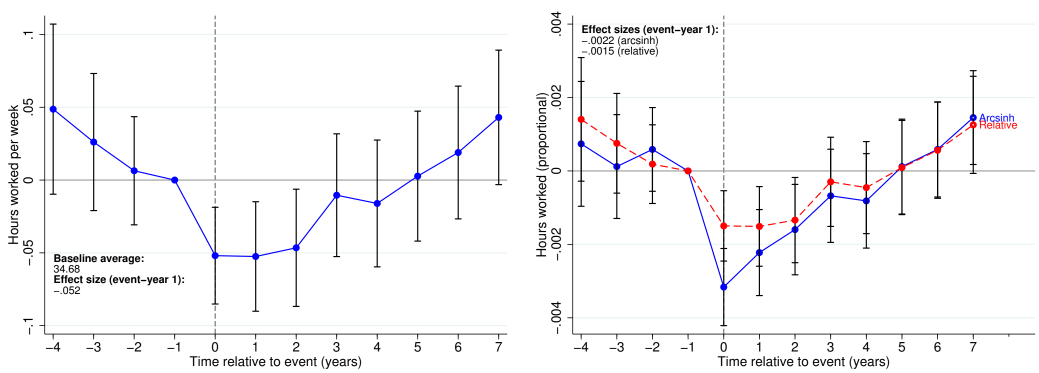


Figure E.10: The effect of inheritance on labor supply of heirs

Note: This figure shows the effect of inheritance on labor income in thousand Swedish kroner (kSEK); labor income rank in the cohort and the relative measures of labor income in Panel A. Panel B focuses on hours worked per week and relative measures of hours worked.The arcsinh is the inverse hyperbolic sine function, defined as in Section 5.1. The relative effects are constructed by dividing outcomes by the control group average. All regressions use the fixed-delta method. The treatment group comprises children of parents who die during 2000-2004. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

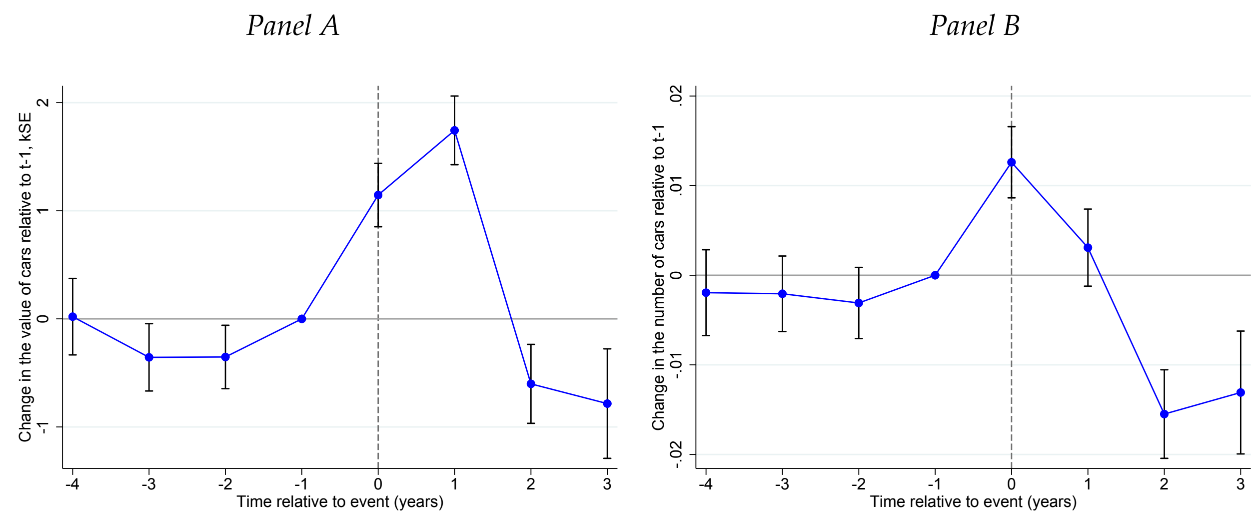
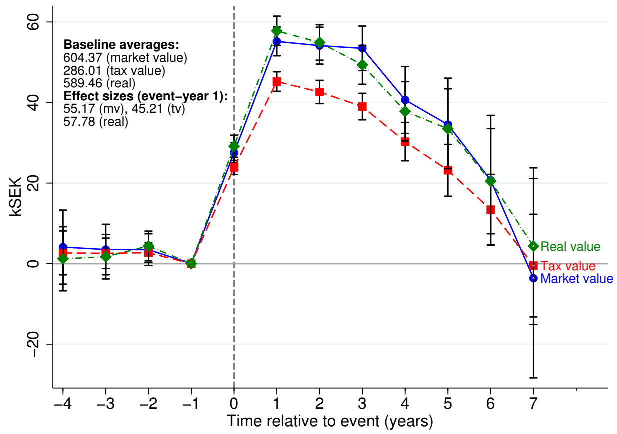


Figure E.11: The effect of inheritance on children's car purchases

Note: These graphs illustrate the effect of receiving inheritance on car acquisitions, estimating Equation 2 using inheritance cohorts 2001-2004 as treatments and 2005 as control. We match the Inheritance and Estate tax register to the Car Registry at the heir level. The former dataset includes roughly 99% of all children who lose a parent during 2002-2005 and about 70% of all children who lose a parent in 2001. For all children in this data set, we observe the number and value of the cars they own (see Seim, 2017 for a description of the valuation of these cars). Panel A shows the effect of losing a parent on the change in the value of cars in thousand Swedish kroner (kSE) whereas Panel B depicts the effect on the change in the number. To isolate the consumption-effect, these graphs are constructed using a subsample of our data where the parent owns no cars during the period 1997-2000. We can not estimate effects for a longer period than three years post-death since we only have five death cohorts for this exercise.

Panel A

Unexpected deaths



Panel B

The rest

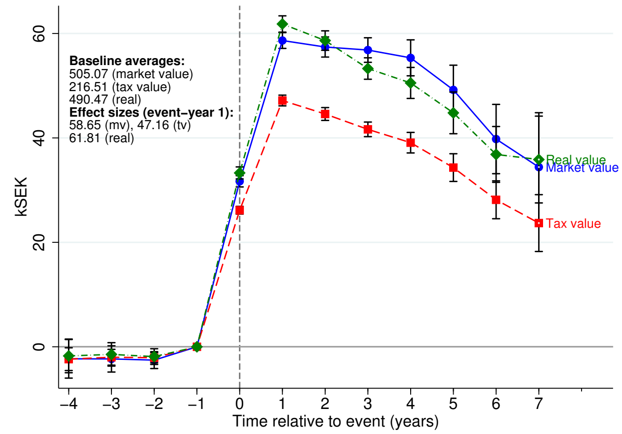


Figure E.12: The effect of inheritance on wealth, unexpected deaths

Note: This graph shows the effects of inheritance on wealth in thousand Swedish kroner (kSEK) for the subsample of children who lose a parent unexpectedly. We follow Andersen and Nielsen (2011) in defining unexpected deaths based on WHO's ICD-10 codes that we observe for each deceased parent. These conditions include natural deaths (such as acute myocardial infarction, stroke and cardiac arrest) as well as unnatural deaths (such as accidents and violence). 15% of all heirs lose a parent unexpectedly according to this definition. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of birth-years of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

Panel A

Unconstrained heirs

Panel B

Constrained heirs

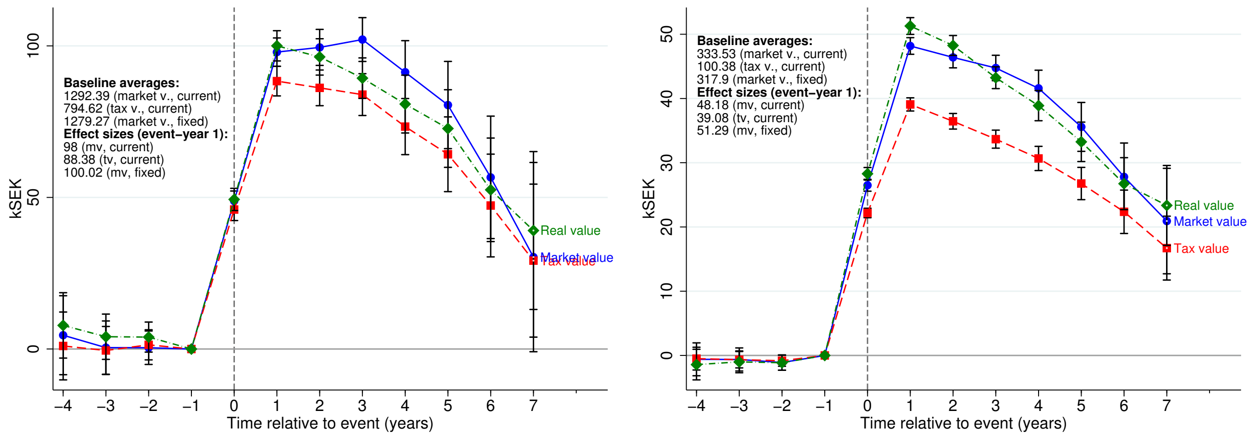


Figure E.13: The effect of inheritance on wealth, by liquidity constraints

Note: This figure shows coefficient estimates when estimating Equation 2 on wealth in thousand Swedish kroner (kSEK) by liquidity constraints. An individual is unconstrained if the value in her bank accounts exceeds 58 kSEK, the direct inheritance effect, in year 1999. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level.

Panel A: Average *Panel B: Median*

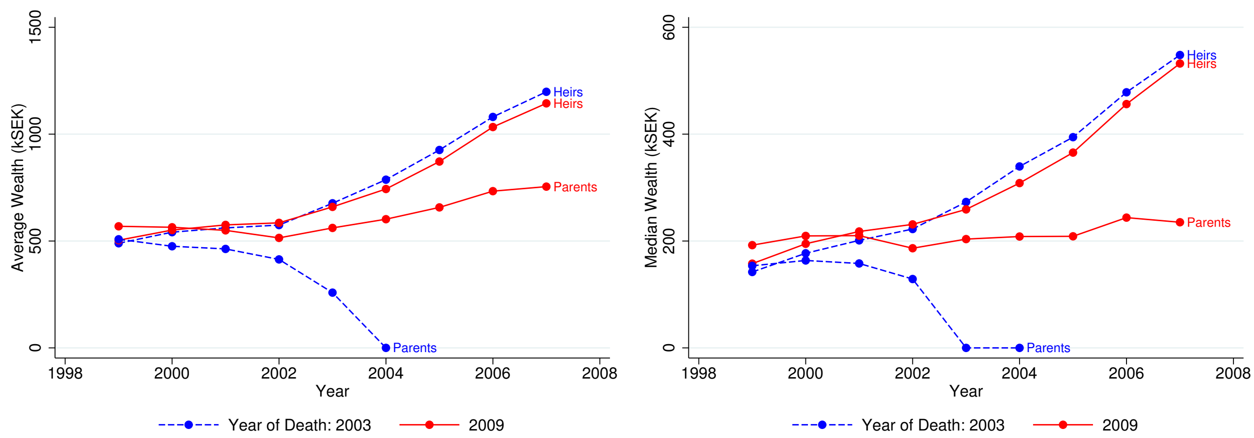


Figure E.14: Wealth patterns at the end of life

Note: This figure shows average (Panel A) and median (Panel B) wealth of parents and children by death year of the parents. The unit is thousand Swedish kroner (kSEK). We reweigh the birth-year distribution as well as education level (4-categories) of both year-of-death-cohorts non-parametrically to match the distribution of children who lose a parent in 2000.

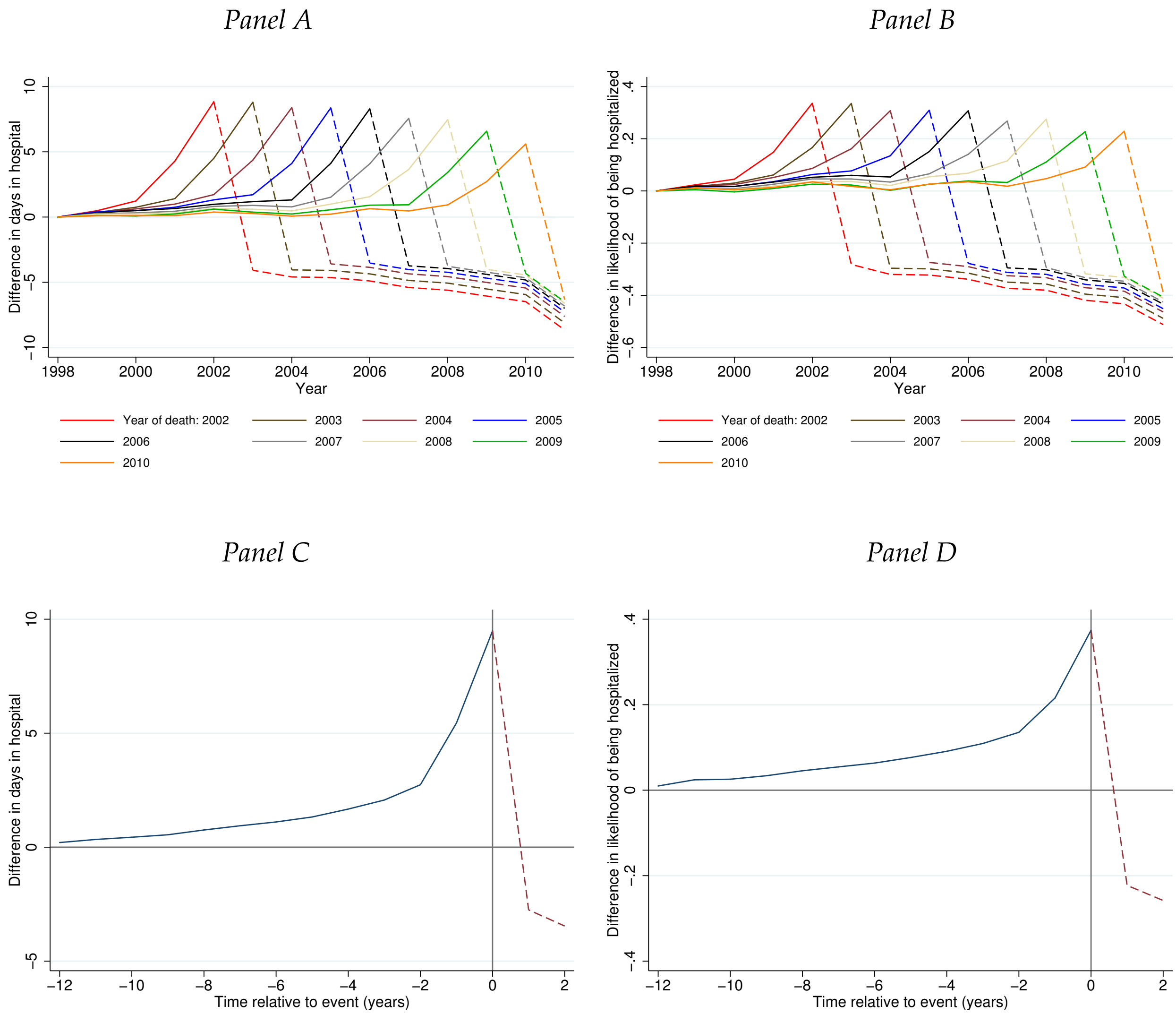


Figure E.15: Hospitalizations at the end of life

Note: Panel A shows the difference in average days in hospital per year between various parent-cohorts defined by year of death and parents who die in 2012. A hospital day is defined as a hospital visit that includes an overnight stay. The data include stays for all treatments. We reweigh the year-of-birth distribution of parents to match that of those parents who die in 2000. The dashed series indicate the difference for the period after death, which is the same as the negative of the level of days in hospital for the death cohort 2012. Panel B shows instead the difference in the likelihood of being hospitalized across years depending on the death year. Panels C and D show the same differences, but pooling all parents together. The control group is still 2012.

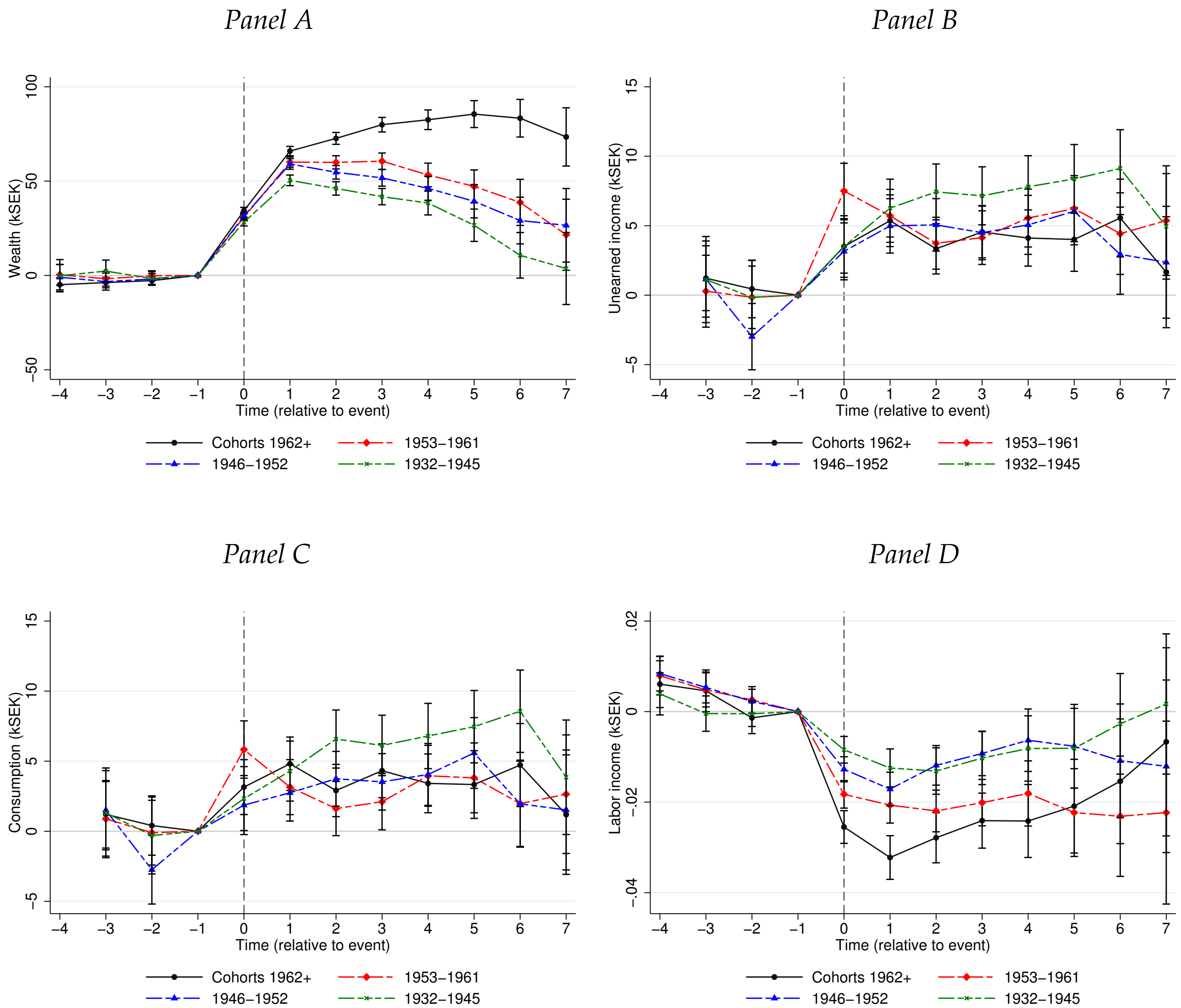


Figure E.16 The effect of inheritance by age, levels

Note: This graph shows the effects of inheritance on wealth (Panel A), unearned income (Panel B), consumption (Panel C) and labor income (Panel D) by the heirs' birth cohorts. The unit is thousand Swedish kroner (kSEK). We apply the fixed-control group method and use children who lose a parent in 2008-2012 to demean outcomes while our treatment group comprise children of parents who die during 2000-2004. The age groups are constructed to form four equally sized groups. Treatment-heirs in the 1962+-group lose their parent at ages 42 and less. All regressions reweigh the birth-year distribution as well as education level (4-categories) of each year-of-death-cohort non-parametrically to match the distribution of children who lose a parent in 2000, within each age group. We omit event-time minus one as the reference period. Standard errors are clustered at the heir-level and the figures display 95%-confidence intervals.

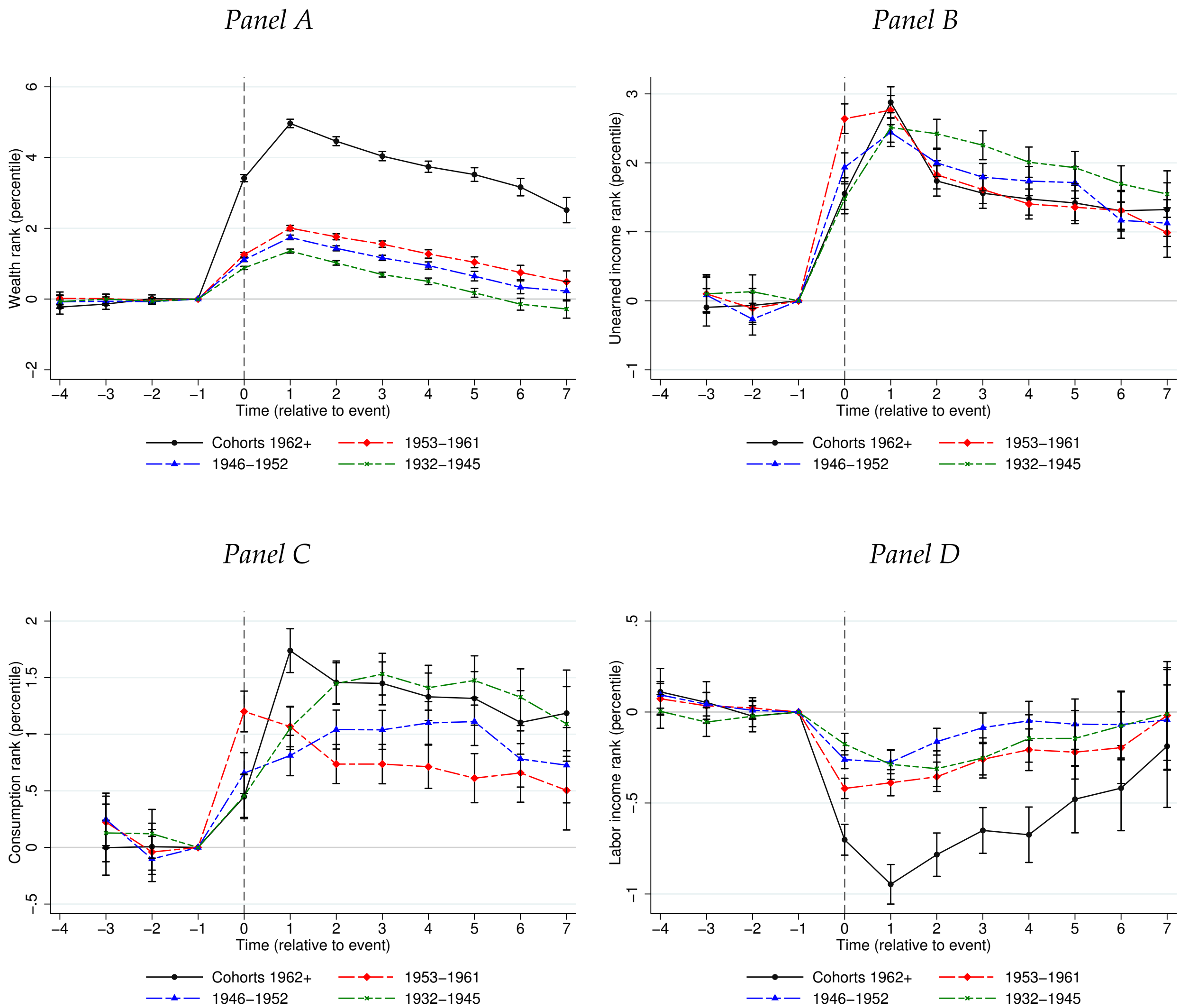


Figure E.17: The effect of inheritance by age, ranks

Note: This figure replicates Figure E.15, but shows coefficients for ranks instead.

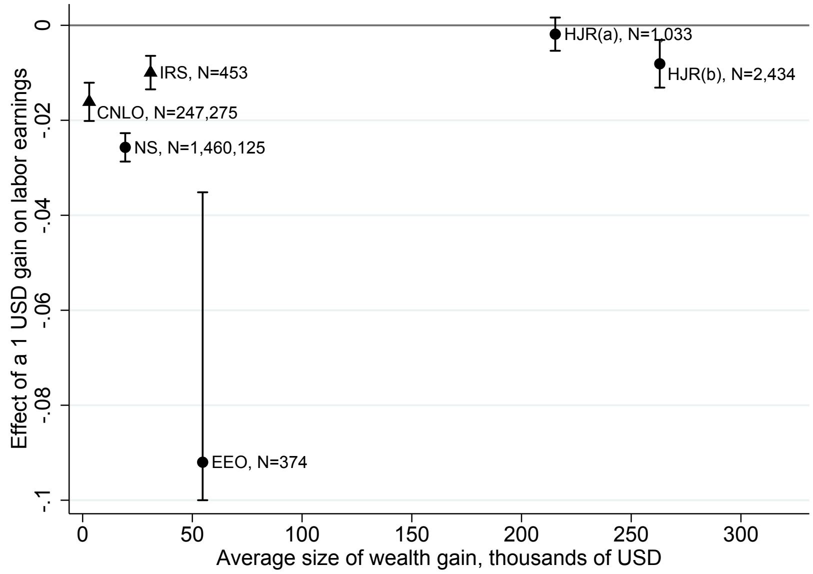


Figure E.18: The effect of wealth gains on short-run labor earnings, across different studies

Note: This figure displays a meta-analysis of the short-run labor earnings response to a wealth gain. The y-axis exposes the effect of a unit of wealth-gain on labor earnings shortly after the wealth receipt. This is sometime interpreted as marginal propensity to earn (MPE), but a better term is "dynamic MPE" as we argue in this paper (See Section 7.1). The x-axis measures the average size of the wealth gain in 2018 USD. The three estimates from Sweden (CNLO, EEO and NS) are converted to US dollars with an exchange rate that corresponds to the time of treatment. 95% confidence intervals are presented, and bottom-coded at -.1 for expositional reason Our choices of studies follows Chetty et al. (2013), Cheng and French (2000) and Chetty (2006). Labels refers to the initials of authors names and also include the sample sizes used in each study. CNLO refers to the estimate of a 1.61 SEK reduction for a 100 SEK lottery price in the second year after receipt, representing the coefficient in Figure 1 of Cesarini et al. (2017). EEO is obtained from Table 2, Column 1 on page 17, in Elinder et al. (2012). IRS marks the estimated drop in labor earnings of 0.094 one year after the wealth gain, obtained from Table 4, Specification VII (VIII), page 789 in Imbens et al. (2001). We convert this estimate to a MPE, by translating the twenty annual lottery installments into its net present value, using a discount rate of 10%. HJR refers to Holtz-Eakin et al. (1993)'s estimates. Table V, Columns (2) and (4) on page 432 provides labor supply elasticity estimates (obtained with controls) with respect to inheritances for singles (denoted (a) in the figure) and joint tax filers (denoted (b)) in the US, separately. Average inheritances are computed using the averages in different subgroups in Table 1 and Table 2 (page 419 and 421 for singles and joint filers respectivel). Average earnings are computed using the average earnings of each subgroup, reported on page 429 (text for joint returns and footnote 16 for singles) together with the relative size of each group (obtained from Table and Table 2). NS refers to our estiamte. Standard errors are converted from the original studies using the delta-method.