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INHERITANCE AND WEALTH INEQUALITY: EVIDENCE FROM POPULATION REGISTERS

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# Inheritance and wealth inequality

## Evidence from population registers\*

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### Abstract

This study estimates the effect of inheriting wealth on inequality and mobility in the wealth distribution. Using new population-wide register data on inheritances in Sweden, we find that inheritances reduce inequality and increase mobility among heirs. Richer heirs indeed inherit larger amounts, but less affluent heirs receive substantially larger inheritances relative to their pre-inheritance wealth than do richer heirs. The Swedish inheritance tax had a small overall impact but appears to have mitigated the equalizing effect of inheritances. We also investigate the potentially confounding role of pre-inheritance gifts and behavioral responses to expectations about future inheritances, but neither of them change the main finding that inheritances reduce wealth inequality.

**JEL:** H24, D63, E21

**Keywords:** bequest, estate, net worth, inheritance taxation, wealth distribution

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## 1. Introduction

How do inheritances influence the distribution of wealth among heirs? The answer to this question plays a key role for the bigger questions about the economic and social consequences of inherited wealth in society. Several studies on the long-term evolution of the wealth distribution, both in Europe and in the United States, document how the postwar equalization of personal wealth halted around the 1980s and that wealth thereafter appears to have become more unequally distributed.<sup>1</sup> Interestingly, this pattern coincides with a similar evolution of the annual flows of inherited wealth (Piketty, 2011; Ohlsson, Roine and Waldenström, 2014) which highlights the need to understand the role of inheritances for the distribution of wealth.

From a theoretical perspective, it is unclear whether inheritances propagate or reduce wealth inequality. Some models suggest that inheritances can be equalizing (e.g., Stiglitz, 1969; Laitner, 1979a,b; Gokhale et al., 2001), while other models instead emphasize the disequalizing forces of bequests (e.g., Atkinson 1971; Blinder, 1973; Davies, 1982; De Nardi, 2004).<sup>2</sup>

In this study, we wish to contribute to the understanding of the distributional consequences of inheritances by empirically investigating how inheriting wealth affects the distribution of wealth among heirs. We exploit a new database containing detailed information on the estates and bequests of all Swedes who passed away during the period 2002–2005, altogether about 360,000 individuals, and all family and non-family heirs, encompassing almost 1.2 million individuals. Using annual register data we follow the heirs and the development of their personal marketable net worth (which we, for simplicity, hereafter refer to as wealth) for several years both before and after the decedent passed away. To our knowledge this is the first attempt to study the effects of inheritances on the wealth distribution using register-based microdata.

Our identification strategy exploits the fact that we can follow the evolution of the wealth distribution among yearly cohorts of heirs and compare the pre-inheritance inequality and mobility with the post-inheritance inequality across the cohorts. In this way, we observe four treatment periods when heirs sequentially inherit (some heirs inherit zero wealth). Using a

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<sup>1</sup> See Roine and Waldenström (2015) for an overview of the long-run trends in wealth concentration around the Western world. There is currently a debate about the trends in wealth inequality in the United States since 1980 and it is fair to say that inequality seems to have increased but, by how much is still an open question (see Saez and Zucman, 2014; Kopczuk, 2015; Bricker et al., 2015).

<sup>2</sup> For overviews of the theoretical models, see Kessler and Masson (1988), Davies and Shorrocks (2000), Piketty (2011) and Wolff (2015).

difference-in-differences specification with almost perfectly parallel trends across the cohorts before and after treatment, we are confident in our interpretation of the estimated effects as causal.

Several important findings come out of the analysis. Our main finding is that inheritances at death reduce wealth inequality. For instance, the Gini coefficient for the distribution of wealth falls by 4.4 percent. As a point of reference, the inheritance effect on the Gini coefficient is about as large as the equalization caused by the stock market crash in 2000 when stock prices of internet companies plummeted causing a large blow to the values of financial assets held by the rich.

We also find that richer heirs inherit larger amounts than less affluent heirs which leads to an increase in the absolute dispersion of wealth across heirs. This result reflects the overall positive correlation in wealth between parents and their offspring. However, while richer heirs inherit larger amounts, the less affluent heirs receive much larger inheritances relative to their pre-inheritance wealth, which explains why inequality decreases. Looking closer at the different tails of the wealth distribution of the heirs, we find that the top percentile's wealth share decreases by about one eighth, the top deciles by one twentieth, whereas the share of the bottom half increases from negative to a positive share.

Many countries tax inheritances or estates in an attempt to reduce inequality. We evaluate the distributional impact of the Swedish inheritance tax, which was fairly small and mildly progressive at the time of study. The overall effect of the tax is quite small because of its low level, but it actually seems to have reduced the equalizing role of inheritances somewhat. The explanation for this, perhaps counterintuitive, finding is that a fraction of the less wealthy heirs inherit relatively large amounts and thus pay taxes amounting to a substantial share of their wealth while wealthier heirs, on average, pay more inheritance taxes but, their tax payments are typically negligible in relation to their wealth.

We, furthermore, show that the equalizing effect of inheritances is robust in several dimensions. First, we find similar results for several different well-known inequality measures. Second, we show evidence indicating that our results are not driven by wealthy decedents giving large *inter vivos* gifts. Third, our results are robust to adjustments for potential measurement errors in asset values. Fourth, analyzing only inheritances from parents to their children, thus neglecting a

third of all heirs, leads to the same conclusion that inheritances reduce wealth inequality.

A potential concern with our focus on post-inheritance responses is that it may miss important pre-inheritance responses that affect the wealth distribution of heirs. This would, for example, be the case if heirs have adjusted their savings decisions in response to expectations about future inheritances and thus, have a smaller wealth than they otherwise would have. We test whether heirs have adjusted their savings to changes in parent wealth during the years before the demise in order to get a flavor of the importance of this concern. Throughout, the results do not indicate any such responses among the heirs, which makes us confident in that we identify the most relevant distributional consequence of inheritances.

We also examine whether wealth mobility is affected by inheritances. The welfare interpretation of our inequality results could actually depend on whether heirs switch places in the wealth distribution, as a result of receiving an inheritance, or if all heirs retain their ranks. We compute transition probability matrices for the immediate pre- and post-inheritance years and compare those with “placebo” transition matrices computed for two years within the pre- or post-inheritance periods. The results suggest that overall mobility increases as a result of inheritances, with heirs being about 20 percent likelier than non-heirs to switch ranks. This effect appears to be the same throughout the distribution, with richer and less affluent heirs thus being about as likely to move in the distribution when inheriting.

Our study complements the existing literature on the distributional consequences of inherited wealth.<sup>3</sup> One group of studies uses survey evidence on people’s current wealth status and reported receipts of gifts and inheritances to estimate the distributional consequences of inheritances. In the seminal paper Wolff (2002), and later in Wolff (2003), Wolff and Gittleman (2014), and Wolff (2015), data from the Survey of Consumer Finances are used to estimate how gifts and inheritances influence the distribution of wealth in the United States. The finding is that inheritances have an equalizing effect for exactly the same reasons that we find; Inheritances are larger in relation to pre-inheritance wealth for heirs in the bottom and middle of the wealth distribution, than for the wealthiest heirs. A similar pattern of wealth equalization as a result of inheritances has also been found in survey data from the United Kingdom (Karagiannaki, 2011; Hills and Karagiannaki, 2013; Crawford and Hood, 2015), Japan

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<sup>3</sup> See Davies and Shorrocks (2000) and Wolff (2015, chapter 2) for reviews of this literature.

(Horioka, 2009) and Sweden (Klevmarcken, 2004). Another group of studies uses computer simulations to model people's savings and giving behavior and from this calibrate synthetic wealth and inheritance distributions (Atkinson, 1971; Oulton, 1976; Davies and Shorrocks, 1978; Wolfson, 1980; Davies, 1982; Greenwood and Wolff, 1992; De Nardi, 2004). Although the findings are less comparable across studies, they generally tend to find that inheritances constitute a major source of wealth inequality in the investigated contexts.

In contrast to these studies, our use of population-wide microdata registers allows us to address several of the methodological concerns that are associated with survey data and simulation studies. Importantly, our data makes it possible to more credibly identify the causal effect of inheriting on wealth inequality and mobility. They, moreover, allow us to show, in detail, why inheritances reduce wealth inequality as well as to assess how the progressive Swedish inheritance tax affected the wealth distribution among heirs.

The remainder of the paper is organized as follows. Section 2 provides an overview of the institutional context and the data used. Section 3 presents our empirical method to identify the causal effect of inheritances on wealth inequality and mobility among heirs. In Section 4 we present our main findings. Section 5 discusses the mechanisms that explain the equalizing effect. Section 6 presents an analysis of how wealth mobility is influenced by inheritances and, in Section 7, we provide some concluding remarks.

## **2. Data and institutional context**

This section briefly reviews the institutional details concerning inheritances in Sweden and the data used for the analyses. For more comprehensive descriptions of the data see Elinder et al (2014), the inheritance law in Sweden see Brattström and Singer (2011), and the Swedish inheritance tax see Ohlsson (2011) or Henrekson and Waldenström (2014).

### **2.1 The inheritance law and taxation**

When a person passes away in Sweden, the law stipulates that an estate inventory report should be set up and filed with the tax authority. The decedent's assets and debts are listed and their values are reported. To the extent that there is a positive net worth in the estate, this will be distributed to the heirs. The default succession scheme in Sweden is based on the genetic relationship between the heir and the decedent. The deceased's relatives are classified into three

groups of legal heirs: children and their offspring, parents and their descendants (the deceased's siblings, nephews and nieces), and grandparents and their children (i.e., aunts and uncles).<sup>4</sup> Heirs in the second (third) group inherit only if there are no heirs in first (first or second) group. If the deceased has a spouse the estate is transferred to the spouse, unless the deceased has a will stipulating differently or if the spouse is not parent to the deceased's children. Common children receive the inheritance from the first deceased parent when the second parent to passes away. The default of the succession scheme can be set aside by a will. Children are, however, always entitled to half of what they would have inherited in the absence of the will.

Inheritance and gift taxes have existed in Sweden for centuries, but after a process of gradual downgrading it was abolished in December 17, 2004. The tax schedule was at this point based on three tax brackets with marginal tax rates ranging from 10 percent in the first bracket (paid by roughly the 70th to the 90th percentiles in the inheritance distribution) up to 30 percent in the highest bracket (paid by heirs with inheritances around the 98th inheritance percentile and above). In principle, all inherited assets were taxable but in reality there were important concessions made to keep the effective tax down on certain assets, especially firm equity. While setting up trust funds for inheritance tax purposes were never as common in Sweden as it has been in other countries (especially the United States), there were opportunities to legally avoid inheritance taxes also in Sweden. For example, substantial discounts on the tax-assessed value of closely held family firms were installed in the 1970s (Henrekson and Waldenström, 2014) and another possibility was systematic uses of cedes that skipped over a generation (Ohlsson 2007).

## **2.2 Data on inheritances and wealth**

Our main data source is a Swedish population-wide register denoted Belinda, which covers detailed accounts of bequests and inheritances of all Swedes who passed away in 2002–2005 and links to all their biological and non-biological heirs.<sup>5</sup> To the Belinda data we have added data from administrative registers on personal wealth and other economic and individual characteristics for both decedents and heirs.

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<sup>4</sup> If there are no legal heirs in any of the three groups, no spouse, and no will, the estate will go to a public fund, The Swedish Inheritance Fund.

<sup>5</sup> The time frame is dictated by the fact that the tax authorities were obliged from July 2001 to electronically codify all estate reports in the country and this stopped in 2005 when the inheritance tax had been abolished.

The information in Belinda about the *decedents* include personal details (identity number, marital status, date of death etc.), special rules (will, prenuptial agreement, life insurance policy), a list of heirs and information about the value of the estate and its main components (non-financial and financial assets, consumer durables, private insurances, etc.).

The information about *heirs* in Belinda includes personal details (e.g. identity number, relationship with the deceased), value of inheritances, inheritance tax payments (if any), taxable gifts received during the last ten years, and receipts of life insurance payments from the deceased. Inheritances from a previous decedent, which the currently deceased have possessed with free disposal, are divided between the previously deceased's heirs and the amounts are listed separately in the database. Specifically, we define as inheritance the total amount of inheritances and any insurances received from the donor, net-of-tax (unless it is explicitly stated to be the before-tax inheritance). For heirs receiving two inheritances when the deceased passes away (typically, a child receiving one inheritance from the currently deceased parent and one from a previously deceased parent) we define the inheritance as total sum of these transfers (plus any insurances from the two decedents).

Heirs are defined as those individuals who receive an inheritance through the succession order, are beneficiary of a will, or are named as beneficiary of a life insurance. It happens that the decedent passes away with some positive amount, but after funeral costs have been covered there is nothing of value to be divided among the heirs. Heirs can thus receive an inheritance with a positive or zero value, but they never inherit negative amounts (i.e. debts). We only consider heirs of decedents who were not married when they passed away since we want to focus on cases where a conventional estate division has taken place. Consequently, we do not consider spousal bequests in the analysis. Furthermore, we restrict attention to heirs aged at least 18 years the year when the decedent passed away. This is because inheritances received by minors are under the protection of a guardian.<sup>6</sup>

A key feature of our analysis is that we classify heirs into inheritance cohorts according to the year when the deceased passed away. This gives us four inheritance cohorts: 2002, 2003, 2004 and 2005, covering a total of 622,827 heirs. The 2005 cohort will, however, only be used when

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<sup>6</sup> We, moreover, require that the heir has a person identity number reported in estate report to be considered for the analysis since we otherwise cannot link information on wealth (and other economic and demographic characteristics) to the individual. See Appendix A for details about the selection of the study population.

we investigate the role of the inheritance tax. For the 2005 cohort, we cannot observe estate or inheritance values, but observe who the decedents and their heirs are as well as their wealth and other variables from other registers. This is an effect of the inheritance tax being removed (See footnote 5).

Although, some heirs received the inheritance in the year following the decedent's demise (especially if the decedent passed away late in the year), we will denote the year when the decedent passed away as the year of inheritance (irrespective of whether or not the heir receive a positive amount). We consider this the most reasonable classification given that we do not have information about the date of the estate division.

Wealth data come from Statistics Sweden's Wealth Register, which is available during the period 1999–2007. The Wealth Register contains detailed individual accounts of real and financial assets and debts, all recorded in current market values at the end of the year. A particularly advantageous aspect of the Wealth Register is that its records are not self-reported but instead emanate from third-party sources either as tax assessments or from financial institutions reporting directly to the tax agency.<sup>7</sup> We focus primarily on net worth, which is defined as the market value of real and financial assets less all debts. This variable is observed for all heirs for each year during the period 1999–2007, i.e., both before and after the inheritance year. As pointed out in the introduction we refer to the heir's net worth as his or her wealth.

### 2.3 Descriptives

Figure 1 shows four distributional graphs. Panel a shows the distribution of the decedents' estates, which is highly skewed with most of the mass being located in the left tail and 17 percent of the estates having zero value. The median value is slightly below SEK 80,000 and thus, only about one third of the mean (at roughly SEK 230,000).<sup>8</sup> It is also apparent that very few decedents leave behind large fortunes. Only about one percent of the estates amounts to more than SEK 2 Million. The top percentile accounts for almost 18 percent of the total estate wealth and the top decile accounts for more than 55 percent. These indicators of wealth

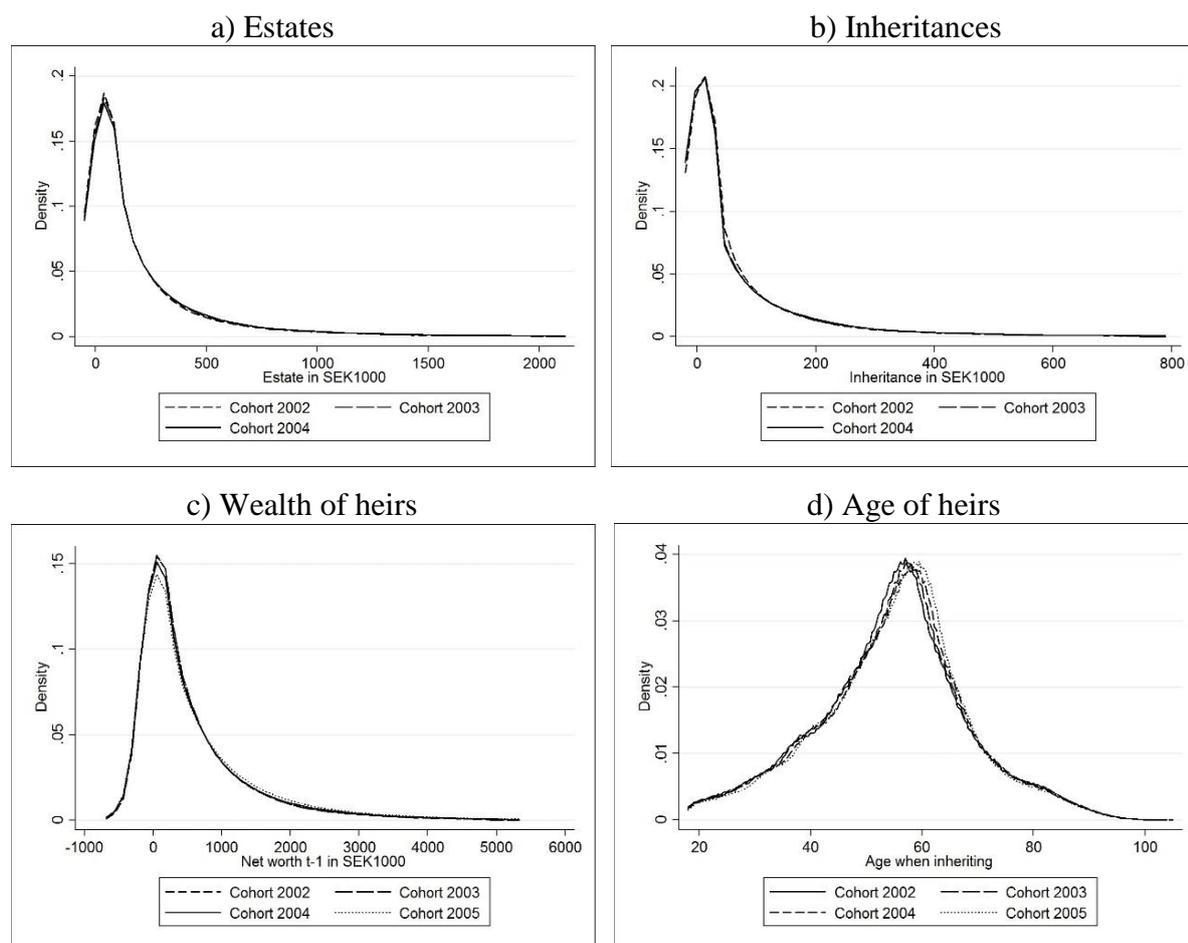
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<sup>7</sup> Having said this, the Wealth Register has very limited information about closely held corporations and occupational pension assets. While these assets are notoriously difficult to value (and are not even fully marketable, at least in the case of pension funds) and are also typically missing from individual wealth databases in most countries, they still represent a relatively large share of total private wealth.

<sup>8</sup> The exchange rates of the SEK against the Euro was around 9.2 and against the U.S. dollar between 7 and 10 at during the study period.

dispersions among decedents are largely consistent with previous reports for estate data (Davies and Shorrocks, 2000; Roine and Waldenström, 2009). Panel b shows the distribution of net-of-tax inheritances (including insurance payments). Similar to the estates, inheritances are unevenly distributed with 39 percent amounting to zero and 50 percent amounting to less than SEK 13,000. The mean value (74,897) is almost six times that of the median and less than one percent of the heirs receive an inheritance in excess of SEK 1 Million. It is thus evident that the inheritance distribution is extremely skewed with only a small fraction of heirs receiving substantial amounts. One (ten) percent of the heirs receive about 18 (60) percent of the total inherited wealth. Panel c shows the distributions of wealth in the year before the inheritance ( $t - 1$ ) for each of the four inheritance cohorts. We see that the distributions are highly skewed and nearly identical across the cohorts. Finally, panel d shows the age distribution of heirs. It can be seen that most heirs are between 50 and 70 years old. Note that older relatives sometimes receive an inheritance from younger relatives, which explains why we have some heirs that are rather old.

Figure 1: Distribution of estates including insurances with named beneficiary



*Notes:* Estate, inheritance and wealth are measured in 2003 prices. The distribution graphs of estates and inheritances are calculated for decedents (161,060) and heirs (472,413) of the 2002–2004 cohorts. The top 1 percent are excluded in distribution graphs of estates and inheritances. The top and bottom 1 percent are excluded in the distribution graph for wealth. The bandwidths used in the estate, inheritance, and wealth graphs are 50, 20 and 150 thousand SEK, respectively. The reported densities are scaled with the bandwidths.

Table 1 presents some additional statistics for the heirs in the Belinda database. It can be noted that the cohorts are nearly identical in most dimensions. This is something we exploit when we estimate the impact of inheritances on wealth inequality. A direct consequence of the classification of heirs into inheritance cohorts is that the earlier cohorts contain heirs of younger birth-cohorts than more recent ones. Regarding demographics it can be seen that there are only small differences in the fraction of women and fraction of children heirs, across the cohorts. The differences that do exist are primarily in age, fraction of married and fraction with upper secondary or post-graduate education. These differences are, however, quantitatively small and can be explained by the disparity in birth-year between the inheritance cohorts. It is generally acknowledged that younger cohorts tend to have higher education, be married to a lower degree, and receive inheritance later in life (as younger generations produce heirs at older ages), than older cohorts. Concerning variables measured in monetary values, there is a general increase

between 2002 and 2005. For example, taxable labor income increases with one to three percent across each cohort, which roughly corresponds to the real growth rate. The average wealth of heirs (one year prior to the inheritance year) varies somewhat across the cohorts but this can largely be explained by differences in macroeconomic conditions. The lower panel of the table presents the statistics for the decedents of the four inheritance cohorts. The differences in decedent characteristics across the cohorts are, similarly to the heir characteristics, small and the conclusion is that the cohorts are similar also in this dimension.

Table 1: Comparison of sample means of economic and demographic variables.

	Inheritance cohort:			
	2002	2003	2004	2005
<i>Characteristics of heirs</i>				
Age at inheritance	54.5	54.6	54.9	55.1
Child of the decedent (%)	56.7	57.1	55.6	59.4
Woman (%)	50.7	50.5	50.7	50.6
Married (%)	53.8	53.2	52.7	52.3
Upper secondary or post-graduate degree (%)	24.6	25.4	25.7	26.2
Taxable labor income $t - 1$ (SEK)	220,041	224,993	227,687	234,903
Wealth $t - 1$ (SEK)	638,967	590,612	625,364	691,191
Gross inheritance (SEK)	82,520	83,430	88,791	n.a.
Net inheritance (SEK)	73,025	73,737	78,131	n.a.
Paying inheritance tax (%)	32.9	33.0	34.2	n.a.
Have received taxable gifts (%)	1.9	1.9	2.0	n.a.
Taxable gifts (SEK)	2,683	2,796	2,866	n.a.
<i>Characteristics of decedents</i>				
Age	81.6	81.4	81.6	81.6
Woman (%)	64.1	63.2	63.5	63.1
<i>Marital status</i>				
Widow/widower (%)	65.4	64.7	64.7	64.2
Never married (%)	17.5	17.7	17.5	17.3
Divorced (%)	17.0	17.7	17.7	18.5
Number of heirs	2.91	2.92	2.98	2.83
Number of children	1.65	1.66	1.65	1.67
Estate incl. insurances (SEK)	224,270	226,783	243,215	n.a.
Number of decedents	55,760	54,641	50,659	53,184
Number of heirs	162,207	159,292	150,914	150,414

*Notes:* All monetary values are measured in the year before the inheritance and expressed in 2003 year's prices. Other variables are expressed in percent. The means of decedent characteristics are calculated over the number of decedents.

## 2.4 Wealth inequality

Measuring wealth inequality is somewhat more complex than measuring income inequality because a number of individuals have negative wealth (because the debts exceed the assets) and several common inequality measures, such as the Theil and Atkinson measures, are undefined for negative values. We will therefore use indices that are able to handle data like these, most prominently the Gini coefficient.<sup>9</sup> While the statistical properties of the Gini coefficient are clear-cut for characterizing the skewness of a distribution containing negative values, the normative implications of such exercise are somewhat less straightforward; how should a negative share of a pie, or an increased negative share, be interpreted? Rather than offering a solution to this issue we extend the analysis with additional unidimensional measures of inequality, such as the coefficient of variation, top (and bottom) wealth shares and percentile ratios. Moreover, we visualize the effect of inheritances on the wealth distribution graphically. By doing so it becomes clear exactly in which way the distribution changes as a consequence of inheritances.

## 3. Methodological framework

This section outlines the empirical strategy used to estimate the effect of inheriting on the wealth distribution of heirs. We will face essentially the same empirical challenges when estimating the effects on both inequality and mobility. For this reason, we use the same methodological approach when analyzing both outcomes.

Our target population consists of the heirs of all individuals who pass away in a given year. This may, at first sight, seem restrictive but given that basically everyone inherits at some point in life, whether it may be a tiny amount (perhaps even zero) or a larger sum, this is the natural starting point for a study of the distributional consequences of inheritances. An alternative approach, which has been the dominant one in the past literature, is to examine how inheritances affects the distribution of wealth in the overall population, consisting both of those who have inherited and those who are yet to inherit. The obvious problem with that approach is the fact that the estimated inheritance effect will reflect not only the true treatment effect but also a set of unobserved life-cycle heterogeneities that determine why some people have selected

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<sup>9</sup> For more detailed discussions of how inequality measures can handle negative values, and in particular in the context of analyzing personal wealth, see Amiel, Cowell and Polovin (1996), Cowell (2013) and OECD (2013, chapter 7).

themselves into treatment (i.e., have inherited) while others have not.

Identifying the causal effect of inheritances on wealth inequality and mobility is coupled with a number of challenges. To illustrate the two most prominent ones, consider first a strategy that compares the wealth distributions of heirs before and after the receipt of inheritance. A difference between the two distributions may, but is not likely to be, caused by inheriting only. For example macroeconomic events such as housing market downturns tend to slash middle class wealth and thus increase wealth inequality whereas financial market crashes instead primarily hit the affluent groups and tend to make the wealth distribution more equal (Wolff, 2013; Lundberg and Waldenström, 2015). Second, we know that there is a strong age-wealth profile with wealth being more equally distributed in older cohorts than in young (Paglin, 1975). A simple before-after analysis may therefore yield biased estimates of the effects of inheritances on the wealth distribution.

A solution to this problem is to compare the before-after change in the wealth distribution of the cohort of heirs inheriting in a given year with the same before-after change of a cohort that is identical except that it does not inherit in the same year, but rather a year later. In our case, we will compare wealth distributions across the three inheritance cohorts that inherited sequentially over the period 2002–2004. We aim at identifying the effect of inheriting in a given year relative to inheriting one or two years later. It should be noted that this is quite different from estimating the effect of inheritances relative to a world without intergenerational transfers.

By comparing the changes in wealth distributions before and after inheritances, across the cohorts, using a difference-in-differences estimator, we effectively account for biases stemming from any year-specific events affecting the cohorts similarly as well as biases due to time-invariant differences between the cohorts, like the differences in age. A potential concern is that the wealth distributions of the three inheritance cohorts may evolve differently from one year to another, i.e., there might be cohort-specific year effects. If this happens our results may be biased. In section 4.1 we present a placebo analysis that shows graphically that cohort-specific year effects appear to be negligible.

When characterizing the inheritance effect on wealth inequality below, we start by visualizing the effect graphically. This shows how the wealth distribution changes across different segments of the distribution as a result of inheritances. In addition to that, we estimate the

inheritance effect on unidimensional measures of inequality, using the following empirical model:

$$y_{c,t} = \delta \cdot PostInheriting_{c,t} + \gamma_t + \gamma_c + \varepsilon_{c,t} . \quad (1)$$

In equation (1),  $y_{c,t}$  is a unidimensional measure of wealth inequality that varies by year  $t$  and cohort  $c$ . *PostInheriting* is a cohort-specific indicator variable that takes the value one from the year of the inheritance and onwards. We also include year and cohort fixed effects, captured by  $\gamma_t$  and  $\gamma_c$  respectively. Finally,  $\varepsilon_{c,t}$  is an error term. Using wealth inequality as dependent variable means that we collapse the data at the cohort-year level. We leave out the year when the decedent passed away since we have reasons to believe that in most cases when the donor passes away late in the year heirs do not receive the inheritance until the year after. This leaves us with an estimation sample of 24 observations (three cohorts observed in eight years).

It should be noted that this identification strategy critically relies on the assumption that wealth inequality trends would be parallel had the inheriting cohorts not inherited during this time period. In the next section we will carefully show that this assumption seems justified.

It is important to note that this strategy do not identify effects of inheritances that occur through changes in the pre-inheritance wealth distribution. Such responses may be important and stem from expectations about receiving inheritances, which may affect saving decisions, or from *inter vivos* gifts. In section 4.4, we address, specifically, how potential pre-inheritance responses in the wealth distribution influence the interpretation of our findings.

#### **4. The effect of inheriting on wealth inequality**

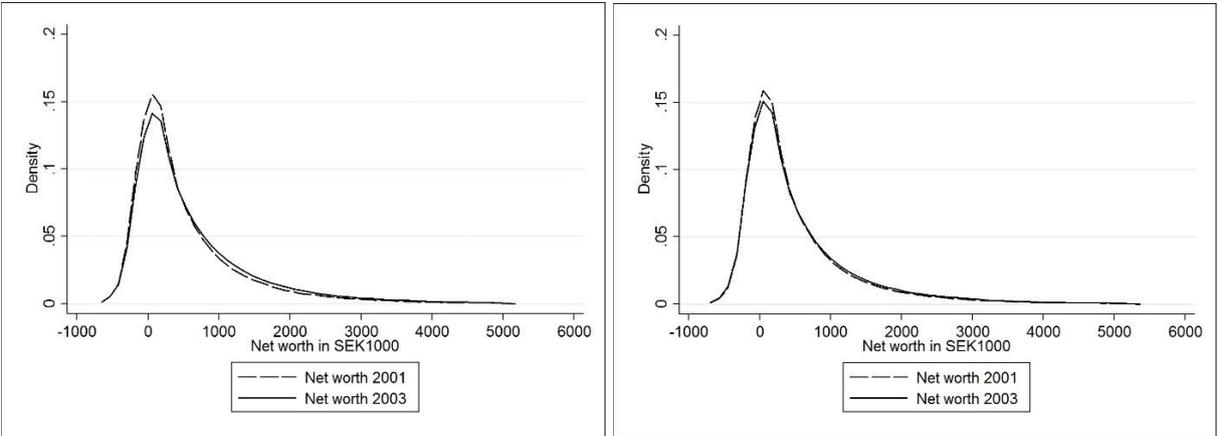
We examine the impact of inheritance on wealth inequality among heirs in several steps. First, we show graphically how inheriting changes the distribution of wealth. Next we estimate the inheritance effect, using the empirical approach discussed in Section 3, on several different unidimensional measures of wealth inequality. Both the graphical and the econometric analyses are designed to capture the causal effect of how wealth inequality is changed by the receipt of inheritances. Finally, we contrast these results with how the wealth distribution would change when we simply add the inherited amounts observed in the registers to the heirs' pre-inheritance

wealth. This exercise shows us the impact on the wealth distribution without any of the behavioral responses (e.g., consumption and savings responses) that will potentially influence the post-inheritance wealth distribution.

**4.1 A graphical analysis**

The left panel of Figure 2 shows two wealth distributions for the cohort inheriting in 2002, one in the year before they inherit (2001) and one in the year after (2003). At first glance both distributions appear similar. But a closer look reveals that the density around the mode of the distribution is lower in 2003 and that the density is higher at higher levels of wealth. Although this change in the wealth distribution is consistent with an equalizing effect of inheritances (the Gini coefficient decreases from 0.802 to 0.763), we know that during these years the wealth distributions may have changed also due to reasons that are unrelated to inheriting wealth. Most importantly, macroeconomic events and life-cycle effects are likely to also lead to a change in the wealth distribution. The right panel of Figure 2 illustrates that these concerns are indeed valid. It displays the wealth distribution for the same years (2001 and 2003) but for the cohort inheriting in 2004. This cohort experiences the same macroeconomic changes as the 2002 cohort and also becomes two years older, but they do not inherit between the three years. Since we see a similar, but less pronounced, change in the wealth distributions over the three years also for this cohort, we conclude that a before-after analysis will yield biased estimates of the effect of inheritances on the wealth distribution.

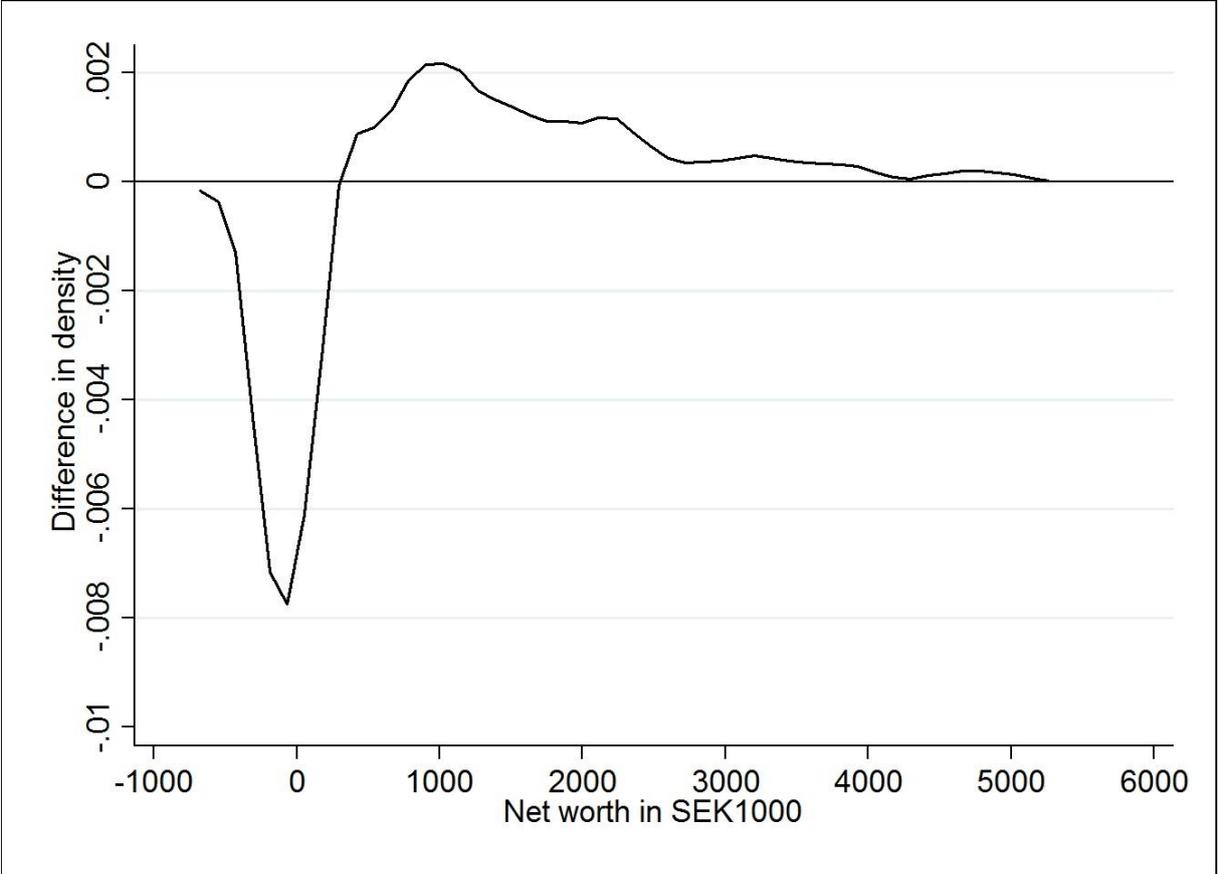
Figure 2. Wealth distributions in 2001 and 2003 for cohorts inheriting in 2002 (left) and 2004 (right).



Notes: Wealth in 2003 year’s prices. The top and bottom 1 percent are excluded in the graphs. The bandwidth is 150 thousand SEK, respectively and the reported densities are scaled with the bandwidth.

In order to get rid of the aging and macroeconomic effects we plot the differences in density, at all wealth levels, between 2001 and 2003 for the 2002 cohort *minus* the differences between 2001 and 2003 for the 2004 cohort, similar to a difference-in-differences estimator, in Figure 3. By doing this, we can come closer to illustrate the causal effect on the wealth distribution. The results clearly show that the wealth distribution changes as a result of inheritances so that a part of the density around zero wealth move to higher levels of wealth.

Figure 3. Illustration of the causal effect of inheritances on the wealth distribution of heirs.

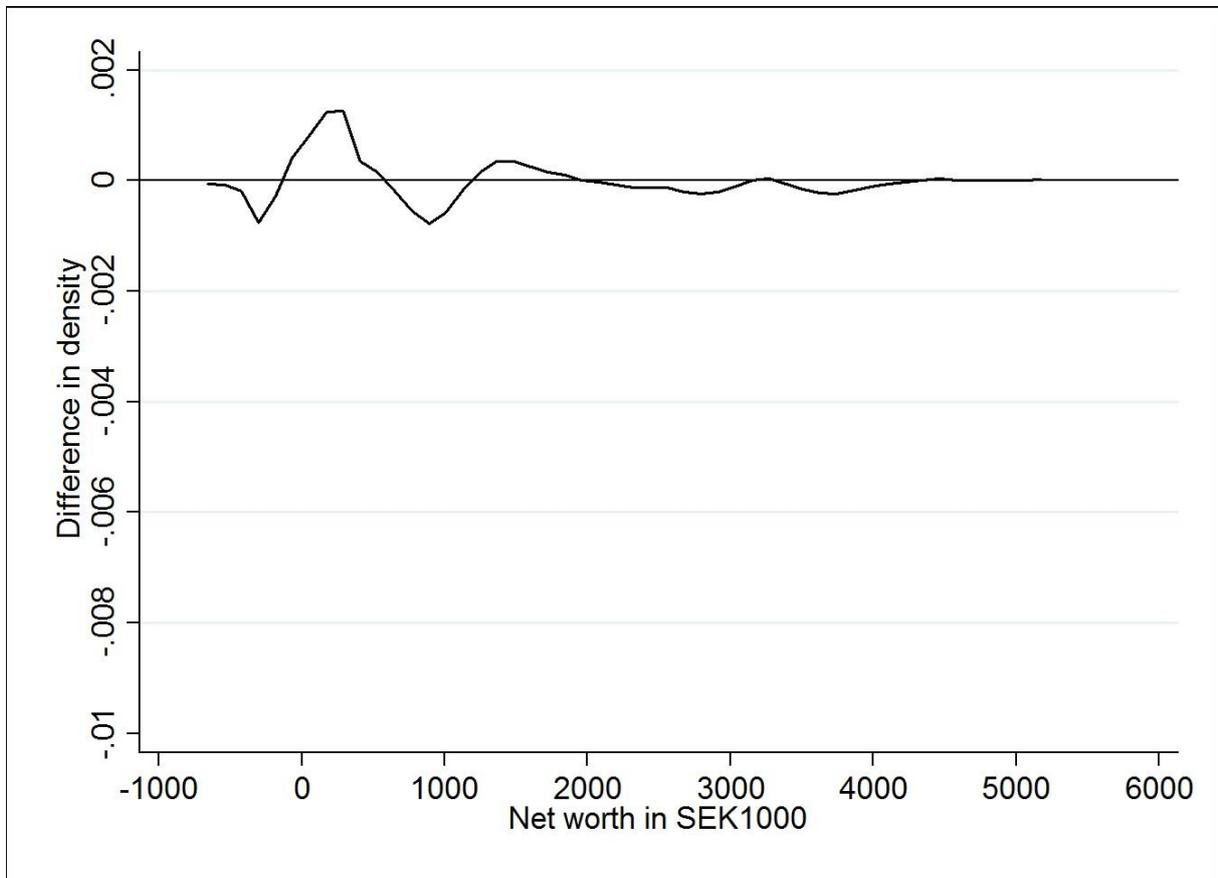


Notes: Wealth in 2003 year’s prices. The top and bottom 1 percent are excluded in the distribution graph. The bandwidth is 150 thousand SEK, respectively and the reported densities are scaled with the bandwidth.

However, if the 2002 and the 2004 cohorts are affected *differently* by macroeconomic events or aging, then the estimated change in the wealth distribution may still be biased. Although we cannot graphically illustrate differences in such effects during the treatment years, we can show differences in the evolution of the wealth distributions of the two cohorts between 1999 and 2001, i.e., when neither of the cohorts have inherited. The results of this placebo test is presented in Figure 4. The graph clearly shows that the changes in the wealth distributions between 1999 and 2001 of the two cohorts are nearly identical. From this we conclude that neither cohort-specific macroeconomic or aging effects appear to confound the finding of the inheritance effect

presented in Figure 3.

Figure 4. Illustration of cohort specific trends between 1999 and 2001.



Notes: Wealth in 2003 year's prices. The top and bottom 1 percent are excluded in the distribution graph for wealth. The bandwidth is 150 thousand SEK, respectively and the reported densities are scaled with the bandwidth.

#### 4.2 Effects on unidimensional measures of inequality

We now turn to an analysis of the inheritance effect on unidimensional measures of wealth inequality. The motivation is that we wish to quantify the distributional effects of inheriting in terms of standard measures of inequality which, in turn, allows us to easily relate the effect to other factors and events affecting the wealth distribution. Our primary focus is on the Gini coefficient, but as discussed in Section 2 we also present results for several other commonly used inequality measures: the coefficient of variation, top and bottom wealth shares and wealth percentile ratios. In addition, we examine the effect on two measures of absolute dispersion, the interquartile wealth range and the range between the 99th and 1st wealth percentiles.

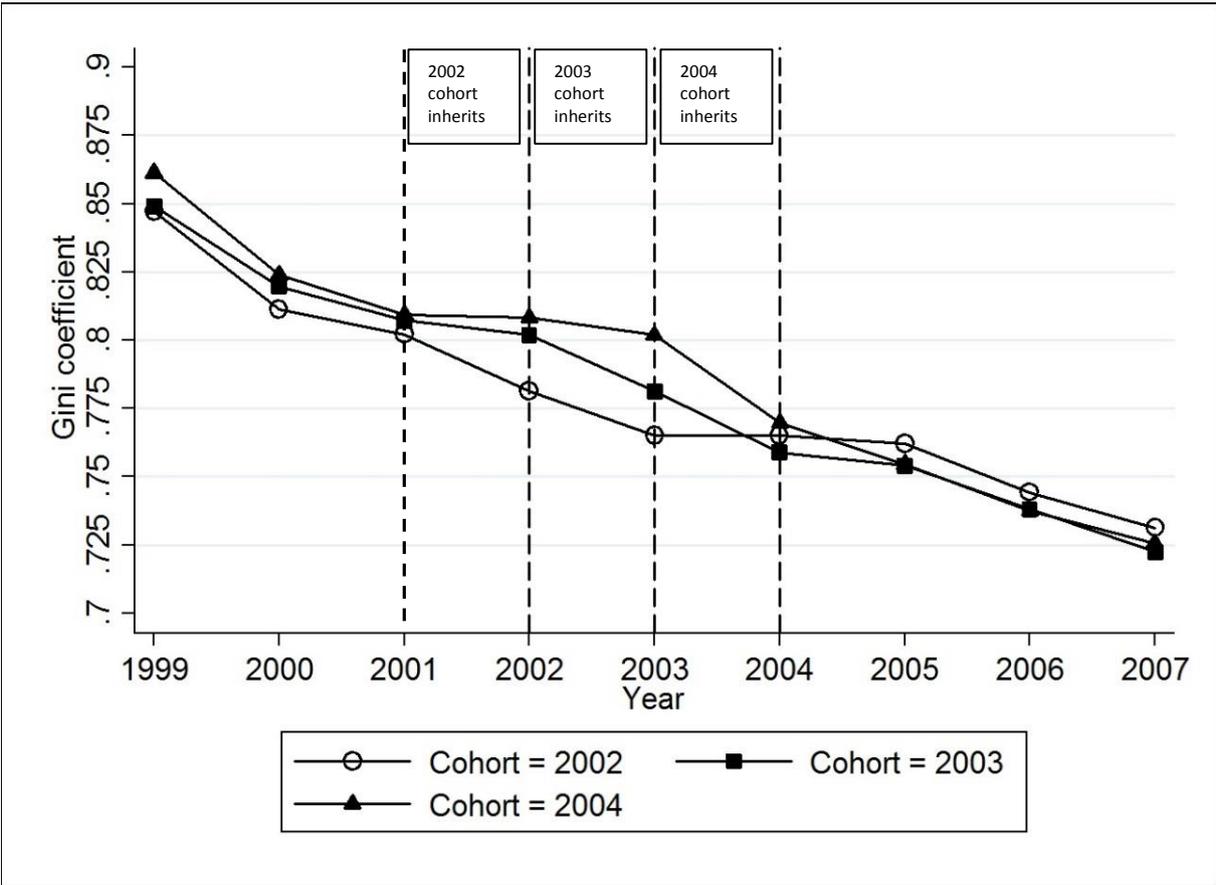
In contrast to the previous graphical analysis, we now use the 2002, 2003 and 2004 cohorts simultaneously. Moreover, we make use of wealth data from 1999 to 2007. The identification

strategy assumes that the Gini coefficient evolves similarly for all cohorts before inheriting and that the Gini coefficient of an inheriting cohort would have developed as it does in the cohorts that inherit later.

Figure 5 plots the development of the wealth Gini for the three inheritance cohorts separately. If we start by looking at the development of the Gini for the cohort that inherited in 2002, we see that it starts with a Gini coefficient of 0.86 in 1999 that decreases to 0.82 in 2000 and then continues with a marginal drop to 0.81 in 2001. Up to this point we can see near identical developments for the other two cohorts. In year 2002, the 2002 cohort inherits and we see an immediate and sharp drop in the Gini coefficient to 0.78 and a further reduction in 2003 when heirs of decedents who passed away late in the year received their inheritances. In contrast, the Gini coefficients of the two other non-inheriting cohorts remain virtually unchanged in 2002. Starting in 2003, when the 2003 cohort inherits, the Gini of that cohort drops over two years. This pattern is repeated also for the 2004 cohort. Between 2005 and 2007 when all groups have inherited the Gini coefficients converge back to a common level and development.

A clear finding from Figure 5 is that the development of the Gini coefficients differs across the cohorts *only in the year and the year after the inheritance receipt*. This pattern is strikingly consistent and provides strong evidence that inheritances reduce wealth inequality. The post-inheritance downward trend in the Gini could in principle mean that the equalizing impact of inheritances is reinforced by time, but here we cannot separate this effect from other confounding factors affecting inequality trends.

Figure 5. Development of the Gini coefficient by inheritance cohort.



Notes: The points in the graphs indicate the Gini the last day of the respective year.

In order to quantify the size of the reduction in the Gini coefficient that is caused by the receipt of inheritances, we estimate the differences-in-differences model specified in equation (1). The results, reported in Table 2, show that the inheritances reduce the Gini by 0.035 points. This reduction is statistically significant at conventional levels and also economically important. The drop corresponds to a 4.4 percent drop in the Gini coefficient, which is about the same size as the drop observed in Figure 5 after the burst of the dot com bubble in 2000.

In addition to the Gini coefficient, Table 2 also presents estimates of the inheritance effect on other measures of wealth inequality and dispersion. When we estimate the effect on the ratio of the wealth of the 90th and the median in the wealth distribution we find a 9 percent reduction. The same effect appears for the ratio of the 99th percentile and the median. Furthermore, we find that the share of total wealth held by the top one percent wealthiest falls by nearly 13 percent. For the top ten percent wealthiest, the fall is 5 percent. Interestingly, the poorest half increases their share of total wealth from minus 1.5 percent to just above zero. Finally, we see that the coefficient of variation falls as well, although this effect is not statistically significant.

When we measure the effect on inequality by the distance between the 75th and the 25th, or the 99th and the 1st wealth percentile, inequality increases. Taken together the results suggest that wealthier heirs may inherit larger amounts than less wealthy heirs, but less in relation to their pre-inheritance wealth level. The overall pattern is that wealth inequality decreases as a consequence of inheritances, at least when measured by the most standard measures. The pattern is also consistent with the results of the graphical analysis. The relatively poor inherit enough to reach positive levels of wealth and, in some cases end up with substantial wealth. However, the distance between the 99th and the 1st wealth decile increases, which is in line with the conjecture that the wealthiest heirs inherit larger amounts than the poorest. We will return to a detailed characterization of the relationship between pre-inheritance wealth and inherited amounts in Section 5.

Table 2: Inheritance effects on wealth inequality.

Outcome:	(1) Gini	(2) P90/P50	(3) P99/P50	(4) Top1%	(5) Top10%	(6) Bottom 50%	(7) CV	(8) P75–P25	(9) P99–P1
Treatment effect ( $\delta$ )	-0.035*** (0.008)	-0.601*** (0.163)	-1.876** (0.831)	-0.023** (0.010)	-0.029*** (0.004)	0.018*** (0.005)	-4.320 (3.007)	64,998*** (15,484)	259,586* (128,255)
Mean of outcome $t - 1$	0.802	6.609	20.618	0.189	0.556	-0.015	6.79	765,926	5,545,335
Effect in %	-4.36	-9.10	-9.10	-12.70	-5.21	-	-63.62	8.49	4.68

Notes: The estimations are based 24 observations (3 cohorts [2002–2004] and 8 years) using data on 472,413 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome*  $t - 1$ .

### **4.3 The direct mechanical effect**

Finally, we also compute the direct, mechanical effect of inheritances on wealth inequality. By adding the observed inherited amounts to the heirs' wealth in the year before inheriting, we can illustrate how the wealth distribution would change if heirs save the entire inheritance, and nothing else happens. The result of this exercise shows that the Gini coefficient falls from 0.802 to 0.754 (averaged over all three inheritance cohorts), a reduction of the Gini by 6.0 percent, which is a somewhat larger equalization than the main effect of 4.4 percent found in Table 2. While we cannot fully account for this discrepancy, a plausible explanation would be that less-endowed heirs immediately consume a larger share of their inheritance than wealthier heirs, which thereby mitigates the equalization impact.<sup>10</sup>

### **4.4 Sensitivity analyses**

In this section we assess the robustness of the main finding that inheritances reduce wealth inequality by (1) adjusting for potential undervaluation of asset values, (2) excluding heirs who are not children of the decedents, (4) adjusting for non-observed gifts that could be considered part of the inheritance, and (5) assessing how expectations about receiving inheritances may affect the interpretation of our results.

#### **4.4.1 Undervaluation of recorded assets**

We add SEK 10,000 plus ten percent of the total value of assets to each individual's portfolio. The motivation for doing this adjustment is that consumer durables (i.e., the values of assets such as vehicles, furniture, machines) are not reported in the Swedish Wealth Register. In fact, consumer durables are not part of the official personal wealth definition in the U.N.'s System of National Accounts, but this exclusion is partly at odds with the economic reality of many households where these goods can be important, not least in relative terms among poor households. We do not observe the true value of these assets in the registers, but we believe that our adjustment of the wealth levels (although to some extent arbitrary) brings us somewhat closer to the true values of marketable wealth of the heirs.<sup>11</sup> The results (reported in Appendix B, Table B1) are broadly consistent with our main results. The level of inequality falls when

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<sup>10</sup> See, e.g., Dynan, Skinner and Zeldes (2002) on how the rich tend to save relatively more of the bequests they receive than the poor do.

<sup>11</sup> Looking at aggregate shares, consumer durables amounted about ten percent of total household assets in Sweden in the early 2000s (Ohlsson et al., 2014).

adding the imputed values of durables, which is expected since they are relatively more important in the lower part of the distribution. However, the effect of inheriting wealth still reduces the Gini coefficient in the heirs' wealth distribution by 4.0 percent, which is about the same effects as found in our main specification. The effects on the other measures of inequality point in the same direction, namely that our main analysis is broadly robust to the treatment of consumer durables in the portfolios of heirs.

#### **4.4.2 Children heirs**

The second sensitivity check is that we adjust the study population by dropping all heirs that are not children of the decedents (about one third).<sup>12</sup> This is done to make sure that our results are not driven by inheritances to distant relatives or beneficiaries of wills. The results (reported in Appendix B, Table B2) are once again consistent with our main results. The Gini coefficient falls by 4.8 percent, which is slightly higher than when including all heirs, children and others. The other inequality measures are also in line with our main results in Table 2.

#### **4.4.3 Gifts as inheritance in advance**

As we discuss above intergenerational transfers consist of both inheritances at death and *inter vivos* gifts handed over by decedents during their lifetime. Some studies have attempted to assess the relative importance of *inter vivos* gifts and found that they amount to about 20 percent of the bequests transferred at death, but with substantial variation both over time and across countries.<sup>13</sup> While we cannot, and do not attempt to, estimate the distributional effects of all *inter vivos* transfers, it would be disturbing if substantial amounts were transferred during the years just prior to the inheritance, as they may have led to pre-inheritance responses in the wealth distribution, which we do not capture with our empirical strategy. Although gifts are liable to a gift tax at the same rate as if they were received as an inheritance, it is possible that some transfers occur without being reported to the tax office. In this section we present the results from three empirical tests aimed at shedding some light on the role of gifts for our main findings.

The first test uses the fact that the Inheritance Tax Register contains information about the sum of *taxable* gifts made over the last ten years prior to the decedent's demise to the respective heir. Our calculations show that the aggregate value of these gifts corresponds to 3.6 percent of

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<sup>12</sup> See Appendix A2, Table A2 for details about the heirs' relationships with the decedents.

<sup>13</sup> See, e.g., Wolff (2015) and Piketty and Zucman (2015) for overviews.

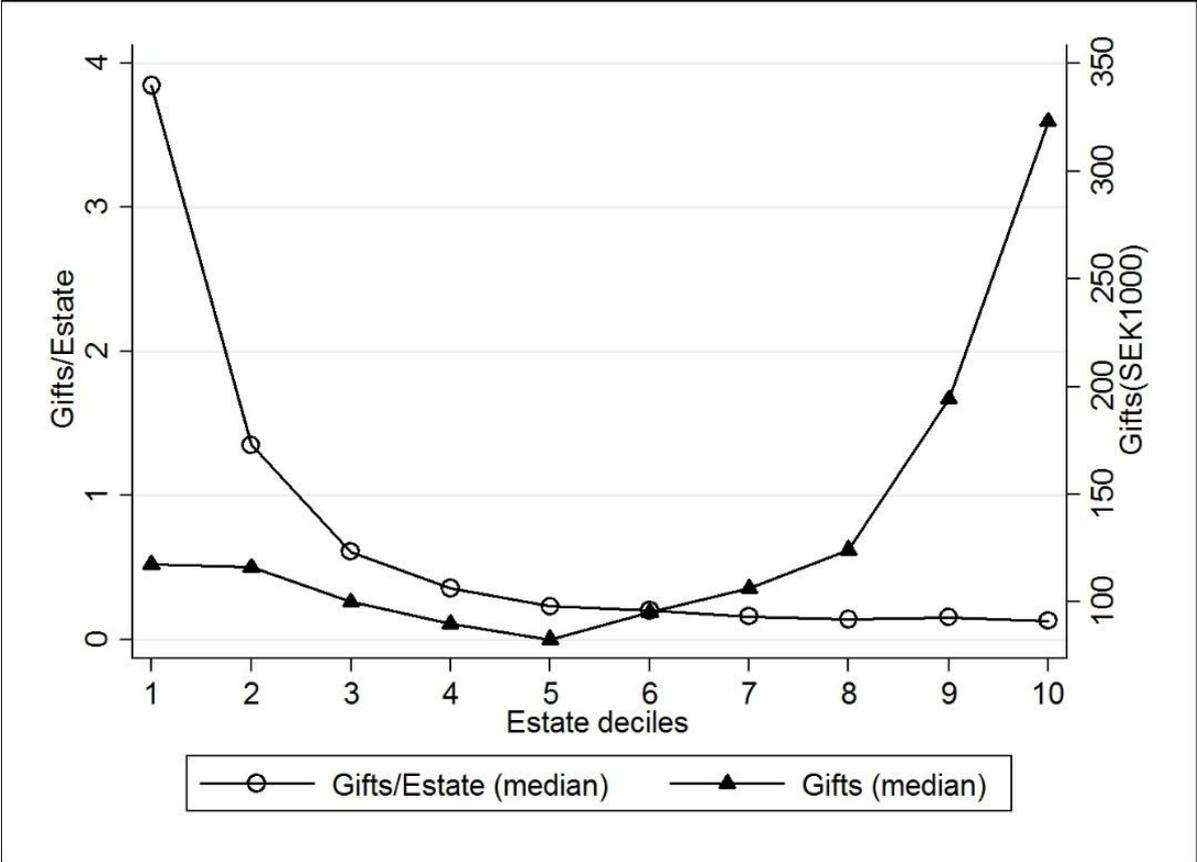
the aggregate value of net-of-tax inheritances. This is clearly a lower bound of the share of actual gifts and indicates that many gifts have indeed not been reported to the tax authorities. We nevertheless subtract this sum of taxable gifts from the heirs' pre-inheritance wealth in order to get an appraisal of how much wealth the heir had before receiving gifts, and then redo the main analysis. Table 3, column 1, shows that the inheritance effect with respect to the Gini coefficient is in line with the corresponding estimate in Table 2. The estimates with respects to the other inequality measures display a similar pattern (see Appendix B for the full set of results for this test, and the two following tests). Taken together these results suggest that reported taxable *inter vivos* play a minor role for our main findings.

The second test follows from Piketty and Zucman (2015) who argue that, absent actual data on *inter vivos* gifts, these transfers can be imputed as a fixed share of the bequeathed wealth. Following this suggestion, we compute two different gift amounts, one equaling 20 percent of the inheritance (which roughly corresponds to the level used for Sweden in the 2000s by Ohlsson et al., 2015) and one, more extreme, equaling 50 percent of the inheritance. Table 3, columns 2 and 3, present the results from this exercise. The negative impact of inheritance on inequality remains and, somewhat unexpectedly, increases in comparison to when we used the observed (and possibly understated) gift receipts.

In the third test we impute gift values for all heirs exploiting information about the actual gifts for heirs who have received gifts. Our assumption is that, conditional on estate wealth, decedents *without* reported gifts did still make gifts of the same size as those *with* gift reports. More specifically, we classify the decedents *with* reports of gifts into estate size deciles and calculate the median gift amount within each decile. Figure 6, right axis, displays the relationship between estate size and gift amount for decedents reporting gifts. We then, classify the decedents *without* gift reports into ten estate groups using the decile thresholds for those with reports, assign them the decile specific median value of gifts, and distribute the amount between the heirs in equal proportions. Finally, we follow the same procedure as in the previous tests and subtract the imputed gift receipt from the heirs' pre-inheritance wealth and redo the main analysis. The results of this third test, displayed in column 4 of Table 3, suggest that the equalizing effect is bigger than the main results in Table 2 and similar to the estimates from the second gift test. In fact, the estimates closely resemble the estimates we achieved in the test making a 50 percent gift amount adjustment. This may partly be due to the fact that the aggregate *imputed* gift amount as a share of total inheritance is 53 percent. However, unlike the

previous test, which assumed that all heirs have received the same proportion, the current test accounts for the fact that gifts are not necessarily proportional to the inheritance. This becomes evident when we again look at Figure 6. Wealthier decedents have obviously made larger gifts than decedents with lower estate values (right axis), but the ratio of gifts to estate (left axis) decreases in estate size and imply that, while those with smaller estates make smaller gifts in absolute terms they give away a larger portion of the wealth during life than those with larger estates. The graph can thus explain why we find that the equalizing effect of inheriting increases when we adjust the analysis to account for imputed gifts.

Figure 6. Absolute and relative size of gifts by estate deciles.



Notes: The values are based on decedents who have reported gifts.

Table 3: Gift adjusted effects of inheriting on Gini coefficient.

	(1)	(2)	(3)	(4)
	Gifts:			
	Actual	20 percent of inheritance	50 percent of inheritance	Imputed
Treatment ( $\delta$ )	-0.036*** (0.008)	-0.050*** (0.009)	-0.077*** (0.013)	-0.084*** (0.009)
Mean of outcome $t - 1$	0.803	0.818	0.849	0.855
Effect in %	-4.44	-6.05	-9.08	-9.80

*Notes:* The estimations are based 24 observations (3 cohorts [2002–2004] and 8 years) using data on 472,413 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect ( $\delta$ )/ Mean of outcome  $t - 1$ .*

#### 4.4.4 Expectations and pre-inheritance wealth accumulation

One limitation with our estimation strategy is that we only capture how inheritances influence the wealth distribution after the receipt of the inheritance, and not in the period prior to that. If heirs who have expected to receive inheritances have compensated for this by saving less (and consume more) in the years prior to inheriting, we may miss an important part of the total wealth response to inheritances.

If the expected size of future inheritances are correlated with the heir’s self-made wealth level, then it is likely that those with relatively low (high) wealth would save more (less) than if inheritances were unexpected. This means that the pre-inheritance wealth distribution would be more compressed (equal) than in a world in which heirs do not adjust savings decisions to expectations about inheritances. Consequently, the total effect of inheritances – including both pre-inheritance and post-inheritance responses – might be more equalizing than what our estimates suggest.

Quantifying expectation responses to inheritances is difficult and only a few studies have attempted to do it. Wolff (2015, chapter 3) presents simulation evidence on the extent of saving responses to expectations about future inheritances and find these expectations to be quantitatively unimportant for the saving behavior, suggesting that expectation responses play a minor role for the overall relationship between inheritances and wealth inequality. Moreover, Elinder, Erixson and Ohlsson (2012) study the impact of inheritance on labor income of heirs and present indicative evidence that heirs have adjusted (lowered) their labor incomes in response to the inheritance already several years before inheriting, suggesting the presence of inheritance expectations. However, the authors provide no estimates of the magnitude or

importance of expectation responses.<sup>14</sup>

We present a new test designed to assess the importance of expectations about inheritances on the heirs' pre-inheritance wealth level. If decedents suddenly become richer (poorer), and heirs adjust their savings in response to changes in the expected size of inheritances, we would expect the heirs to respond by dissaving (saving) an offsetting amount of wealth.

Specifically, we estimate a simple heir-decedent regression (at the heir level), in which we test if changes in the expected size of inheritances, measured as the change in decedent wealth from  $t - 3$  to  $t - 1$  (adjusted by the number of heirs), lead to an offsetting wealth change among heirs. If the expected inheritance increase with SEK 1, the hypothesis is that there would be a corresponding decrease in the wealth of the heirs of SEK 1. However, we find that an increase in expected inheritance has no detectable impact on the heir's wealth, suggesting that short-term behavioral expectation effects may not be important. In a second version of the test, we exploit the idea that heirs may respond more strongly to changes in decedent wealth in the years before the demise, if the decedent passes away as a consequence of a terminal illness compared to if the decedent passes away suddenly. To investigate this more carefully we use data from the Cause of Death Register to identify heir-decedent-pairs where the decedent passed away suddenly. The classification of sudden deaths (natural and unnatural) follows the classification in Andersen and Nielsen (2010). When we redo the previous test using only heir-decedent pairs where the decedent passed away due to a terminal illness, we again find that increases in the expected size of the inheritance have no impact on the heir's wealth. Consequently, neither this test nor the previous variant of the test provide evidence of responses in the heirs' wealth prior to inheriting. Details about the tests can be found in Appendix C.

The concern that the saving behavior of heirs depends on expectations about receiving an inheritance may indeed be plausible, but we find little evidence that it confound our main findings. Neither the past literature nor our own empirical tests indicate that such behavioral expectation effects are quantitatively important. While we, of course, cannot rule out that such behavioral effects still exist, they appear to matter little in this context.

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<sup>14</sup> Additionally, Dynan, Skinner and Zeldes (2002) and Kopczuk and Lupton (2007) study those who intend to leave bequests and their responsiveness in terms of wealth accumulation to the possibility to bequeath their wealth. These studies find that although the donors have bequest motives, a confiscatory inheritance tax would not change their saving behavior much, perhaps with exception for the wealthiest groups. It is thus not obvious that even at the donor level the behavioral response to inheritance would be important enough to influence our analysis.

## **5. Why do inheritances reduce wealth inequality?**

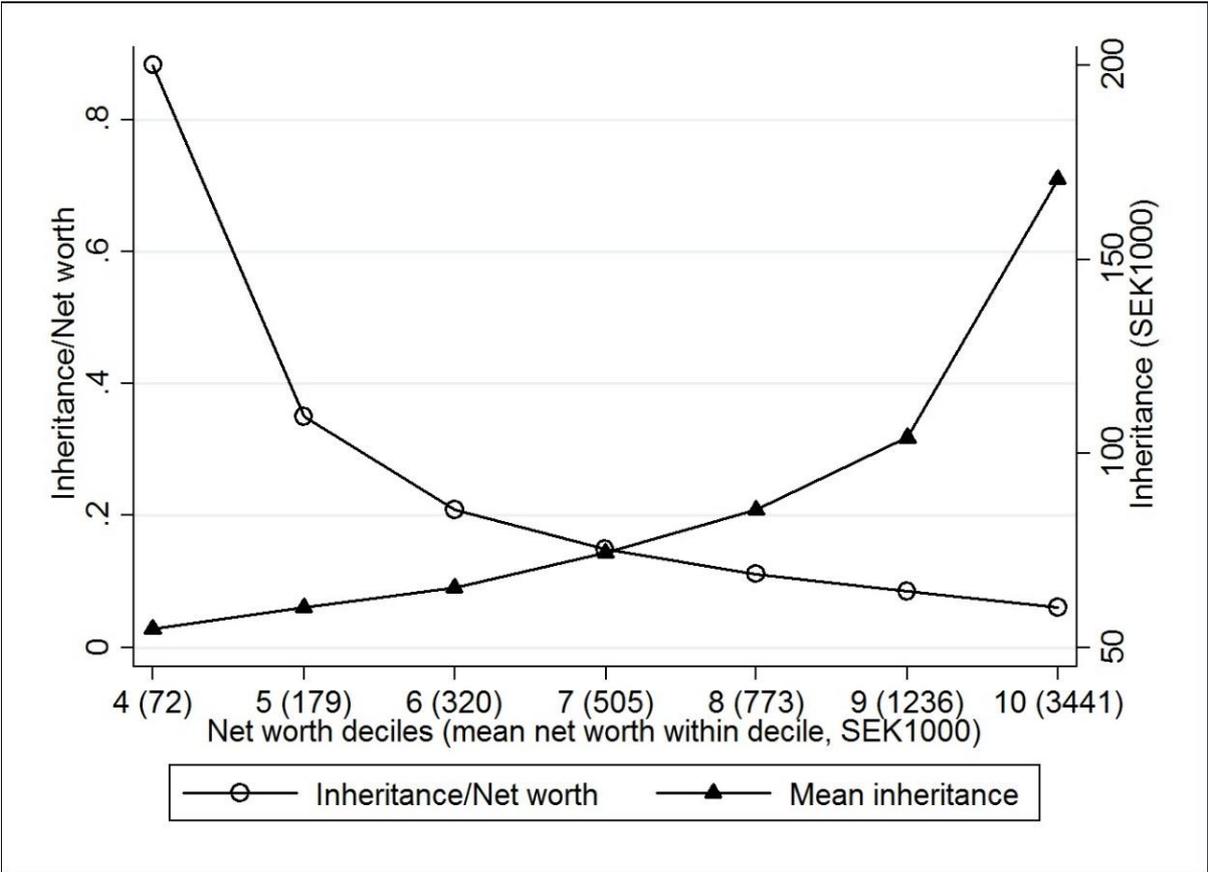
In this section we investigate three potential mechanisms that may explain why inheritances reduce wealth inequality: (1) the relative size of inheritances to wealth, (2) number of children of the rich, and (3) the progressive inheritance tax in effect until December 2004.

### **5.1 The absolute versus the relative size of inheritances**

In Section 4 we conjectured that the equalizing effects of inheritances stem from the fact that the less affluent inherit more than the rich relative to their pre-inheritance wealth. To investigate this more carefully, let us therefore see how the size of the inheritances varies with wealth of heirs. Figure 7 shows that heirs that are wealthier (in the year before they inherit) receive larger inheritances than heirs who are initially poorer. Heirs in the fourth wealth decile, (which is the lowest decile for which all heirs have positive wealth) receive inheritances amounting to about SEK 60,000 (right axis) on average. We note that the inherited amount increases as we move up to higher deciles. In the top decile the mean inheritance amounts to SEK 187,000. While richer heirs indeed receive larger inheritances, Figure 7 also shows that the inherited amount, as a share of wealth (left axis) displays the opposite pattern. Heirs in the fourth wealth decile, receive inheritances which effectively doubles their wealth whereas heirs in the higher wealth deciles receive inheritances which are smaller relative to their pre-inheritance wealth. In the top decile the inheritance corresponds only to about 7 percent of pre-inheritance wealth on average.

The fact that the less wealthy receive relatively larger inheritances appear to explain well why we see an equalizing effect of inheritances on the wealth distribution. A potential objection lends from previous research stating that the rich save more, which would suggest that the less affluent, predominantly low-income heirs would tend to consume away their relatively larger transfers and that the equalizing effect would evaporate as a result (Scholtz, 2003). However, our analysis shows clearly that this concern is not met by the data. We observe that wealth stocks of the less wealthy indeed change, and that this change persists over several years after inheriting.

Figure 7. Absolute and relative size of inheritance by wealth deciles.



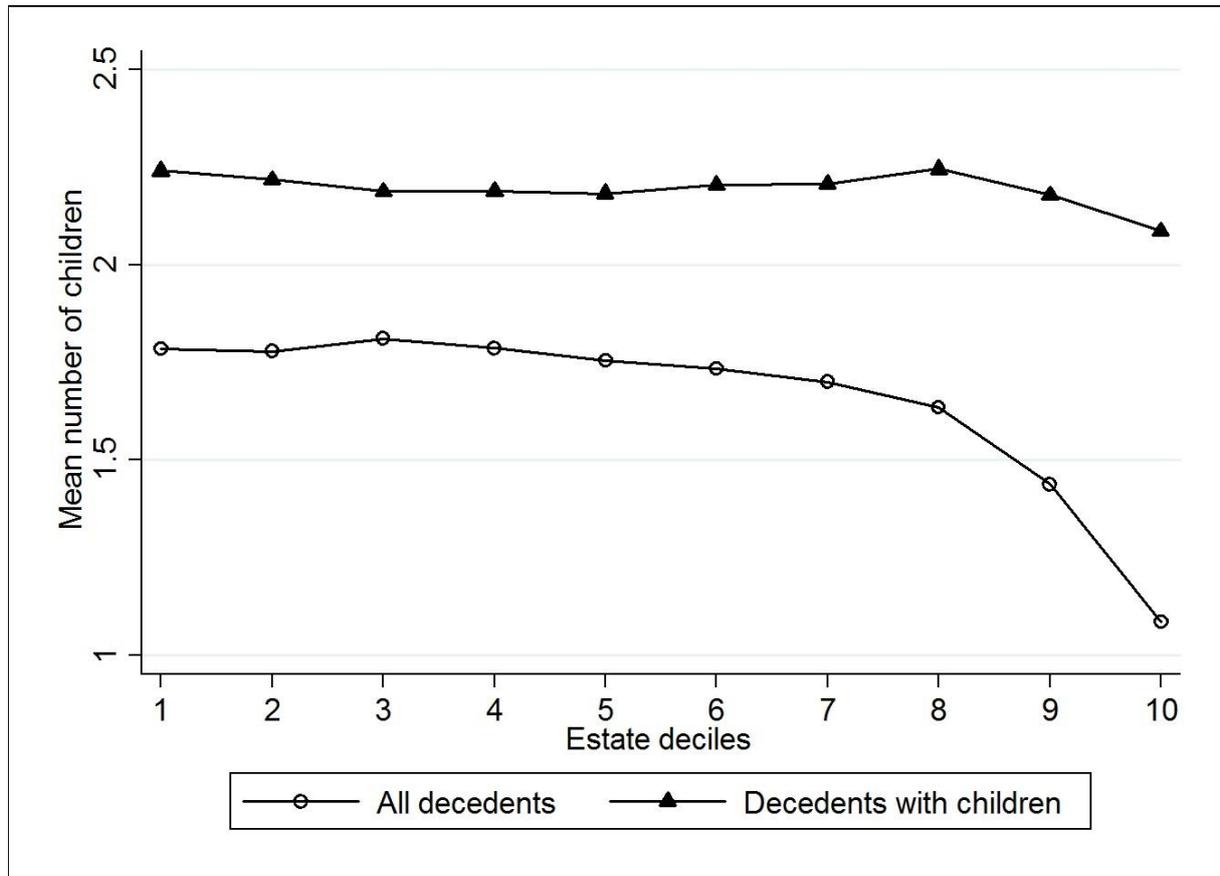
Notes: Wealth deciles 1–3 are omitted because of negative values for wealth. Mean wealth and mean inheritance for deciles 1–3 are SEK –114,000 and SEK 49,000 respectively. Cohorts 2002–2004.

**5.2 Do the rich have more children?**

One of the most standard implications of any model of intergenerational transfers is that the degree of equalization increases in the number of children (see, e.g., Stiglitz, 1969; Atkinson and Harrison, 1978). If it is the case that wealthy decedents have more children, then this would indeed be another explanation to the equalizing effect inheritance that we find.

Figure 8 shows the average number of children by the level of estate size of the decedents. In the bottom eight deciles the average number of children hovers around 1.7, but then it falls to 1.4 in the ninth estate decile and just over one in the top estate decile. Even when considering only estates where there are children, the top estates do not have more children than the overall average. While there are naturally a number of factors accounting for this pattern, it still offers forceful evidence against the hypothesis that the rich have more children on average and that this is what is driving the equalizing effect of inheritances.

Figure 8. Number of children by estate size.



### 5.3 The role of the inheritance tax

The natural hypothesis with a progressive inheritance tax, like the one Sweden had until 2004, is that it makes the wealth distribution of heirs more equal. This follows from the observation that wealthy heirs in general tend to receive larger inheritances than heirs with lower level of wealth. But, we saw in Figure 9 that inheritances are larger for less wealthy heirs *relative to their pre-inheritance wealth* than they are for wealthier heirs. The less wealthy heirs, who receive large inheritances, thus have to pay taxes that may be substantial relative to their wealth. A priori, it is therefore not obvious that the Swedish inheritance tax was equalizing for the wealth distribution.<sup>15</sup>

We implement two tests to evaluate the impact of inheritance tax. First, we add the tax payment paid by each heir to the heirs' post-inheritance wealth, i.e., as if the tax payments were reimbursed in  $t+1$ . Then we re-estimate the regression model used in Section 4 using the new

<sup>15</sup> For an overview of central issues in the taxation of intergenerational transfers, see Kopczuk (2013).

gross-of-tax wealth. Table 4 presents the results and they show, consistently, that the reduction in inequality is larger than in the baseline case. In other words, the inheritance tax may actually have contributed, albeit marginally, to an *increased* wealth inequality among heirs.

Second, we make use of the inheritance tax reform in late 2004 which led to the repeal as of 2005. We also observe the cohort that inherited in 2005 but without paying any tax, and this enables us to examine if the inheritance effect on wealth inequality differs for this cohort inheriting under a no-tax regime from the other tax-paying cohorts. Table 5 reports that the equalizing effect is actually larger for the 2005 cohort than for the other cohorts. The stronger equalizing effect is apparent in all outcomes except the wealth share of the top 1 percent and the coefficient of variation which are not statistically significant. It can also be noted that the increase in absolute dispersion as measured by the two range measures P75–P25 and P99–P1 is larger for the 2005 cohort.

To see what causes this result, Figure 9 shows how the mean tax payments vary by the heirs' pre-inheritance level of wealth. The pattern is actually almost identical to that of inheritances; richer heirs pay more in tax in absolute numbers, but less relative to their initial wealth. This implies that, for the wealthiest heirs both the inheritance and the inheritance tax is relatively insignificant in relation to their pre-inheritance level of wealth while both the inheritance and the tax payments are substantial relative to pre-inheritance wealth of the less wealthy. This fact is likely to explain why a (mildly) progressive inheritance tax can increase wealth inequality.

Table 4: Inheritance tax analysis: assuming tax payments are reimbursed in  $t+1$ .

Outcome:	(1) Gini	(2) P90/P50	(3) P99/P50	(4) Top1%	(5) Top10%	(6) Bottom 50%	(7) CV	(8) P75-P25	(9) P99-P1
Treatment ( $\delta$ )	-0.037*** (0.008)	-0.630*** (0.162)	-1.940** (0.841)	-0.024** (0.010)	-0.030*** (0.004)	0.020*** (0.005)	-4.368 (3.024)	73,252*** (15,696)	324,877** (127,529)
Mean of outcome $t - 1$	0.802	6.609	20.618	0.189	0.556	-0.015	6.79	765,926	5,545,335
Effect in %	-4.62	-9.53	-9.41	-12.49	-5.36	132	-64.33	9.56	5.86

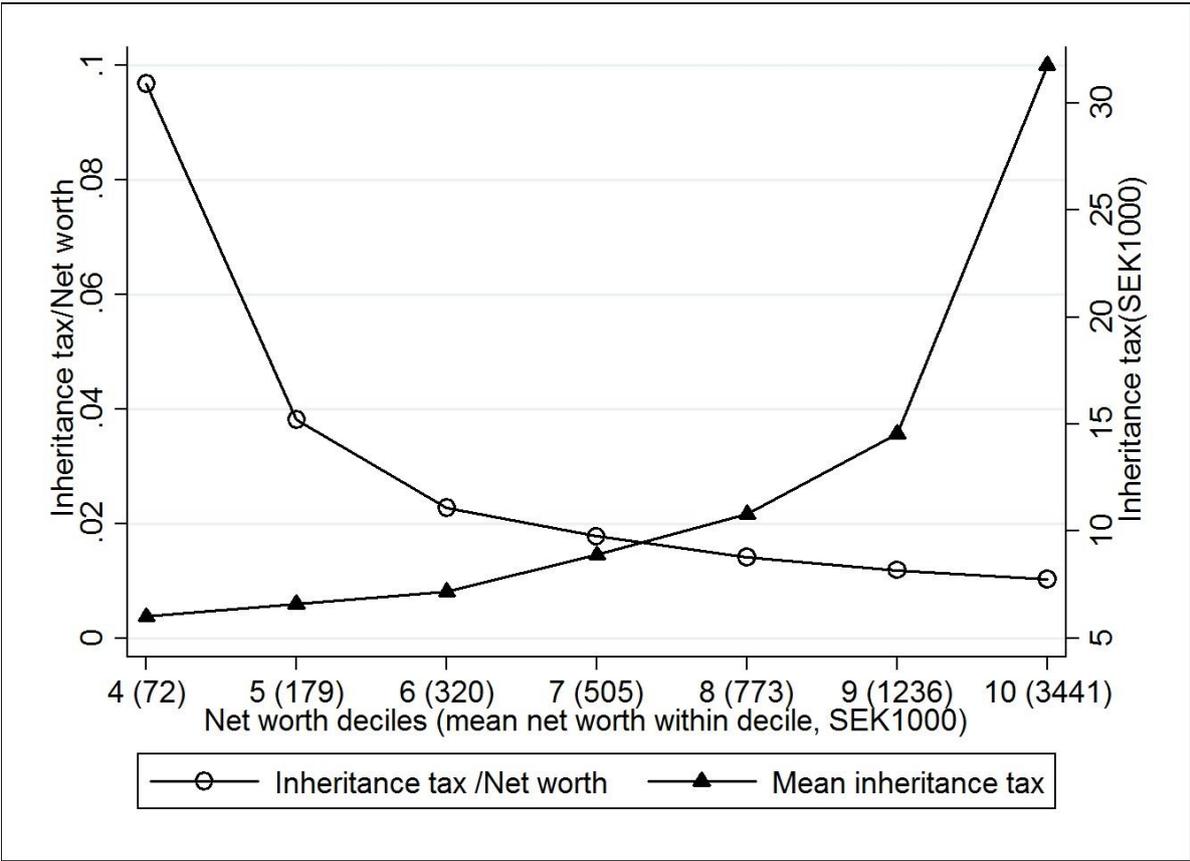
Notes: The estimations are based 24 observations (3 cohorts [2002–2004] and 8 years) using data on 472,413 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome*  $t - 1$ .

Table 5: Inheritance tax analysis: Effect of 2005 inheritance tax repeal.

Outcome:	(1) Gini	(2) P90/P50	(3) P99/P50	(4) Top1%	(5) Top10%	(6) Bottom 50%	(7) CV	(8) P75-P25	(9) P99-P1
Treatment ( $\delta$ )	-0.025*** (0.005)	-0.409*** (0.104)	-1.247** (0.509)	-0.019*** (0.006)	-0.021*** (0.003)	0.014*** (0.003)	-3.850** (1.732)	60,157*** (8,672)	248,075*** (76,241)
Treatment $\times$ 2005 ( $\theta$ )	-0.014*** (0.005)	-0.443*** (0.101)	-1.484*** (0.493)	0.003 (0.006)	-0.007** (0.003)	0.009*** (0.003)	2.259 (1.680)	47,526*** (8,413)	240,967*** (73,965)
Mean of outcome $t - 1$	0.799	6.603	20.529	0.185	0.552	-0.014	5.930	794,688	5,709,305
Effect (%)									
$\delta$	-3.13	-6.19	-6.07	-10.43	-3.95	–	-64.92	7.57	4.35
$\delta + \theta$	-4.88	-12.90	-13.30	-8.65	-5.07	–	-26.83	13.55	8.57

Notes: The estimations are based 32 observations (4 cohorts [2002–2005] and 8 years) using data on 622,827 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome*  $t - 1$ .

Figure 9. Absolute and relative inheritance tax payments, by pre-inheritance wealth of heirs.



We thus interpret the results of the two tests as evidence that the equalizing effect of inheriting is actually stronger without an inheritance tax. In other words, the inheritance tax appears to have increased wealth inequality.

It should be noted that this result is in part due to the fact that the Swedish inheritance tax in the early 2000s was only mildly progressive. Almost a third of heirs paid a ten percent tax rate while the top tax rate was only 30 percent, giving an average effective inheritance tax rate that was seldom above 20 percent. A more progressive tax schedule, such as those used in France, the U.K. or the U.S., may thus give rise to a different result.

**6. Mobility effects**

We now turn to the question how inheritance influences wealth mobility. The previous section showed how the level of wealth inequality was reduced, but we learned nothing about whether this effect was associated with a reshuffling of heirs’ positions in the wealth distribution or whether bequests are essentially rank-preserving. In this section we therefore analyze if

bequests influence wealth mobility, measured as the process by which people change position in the wealth distribution from one year to another.<sup>16</sup>

Measuring intragenerational wealth mobility can be done in different ways (Burkhauser, Nolan and Couch, 2009; Jäntti and Jenkins, 2015). We choose a standard approach which is based on calculating transition probability matrices for heirs before and after inheriting. The matrices contain the shares of heirs who leave their quantile over time, which gives details about whether mobility differs between the bottom, middle and the top of the distribution. In order to also get a unidimensional mobility measure, we compute the well-known Shorrocks-Prais mobility index (Prais, 1955; Shorrocks, 1978) which essentially relates the sum of the diagonal elements (i.e., the trace of the matrix) to the matrix dimension and ranges from 0 (perfect immobility) to 1 (perfect mobility).<sup>17</sup>

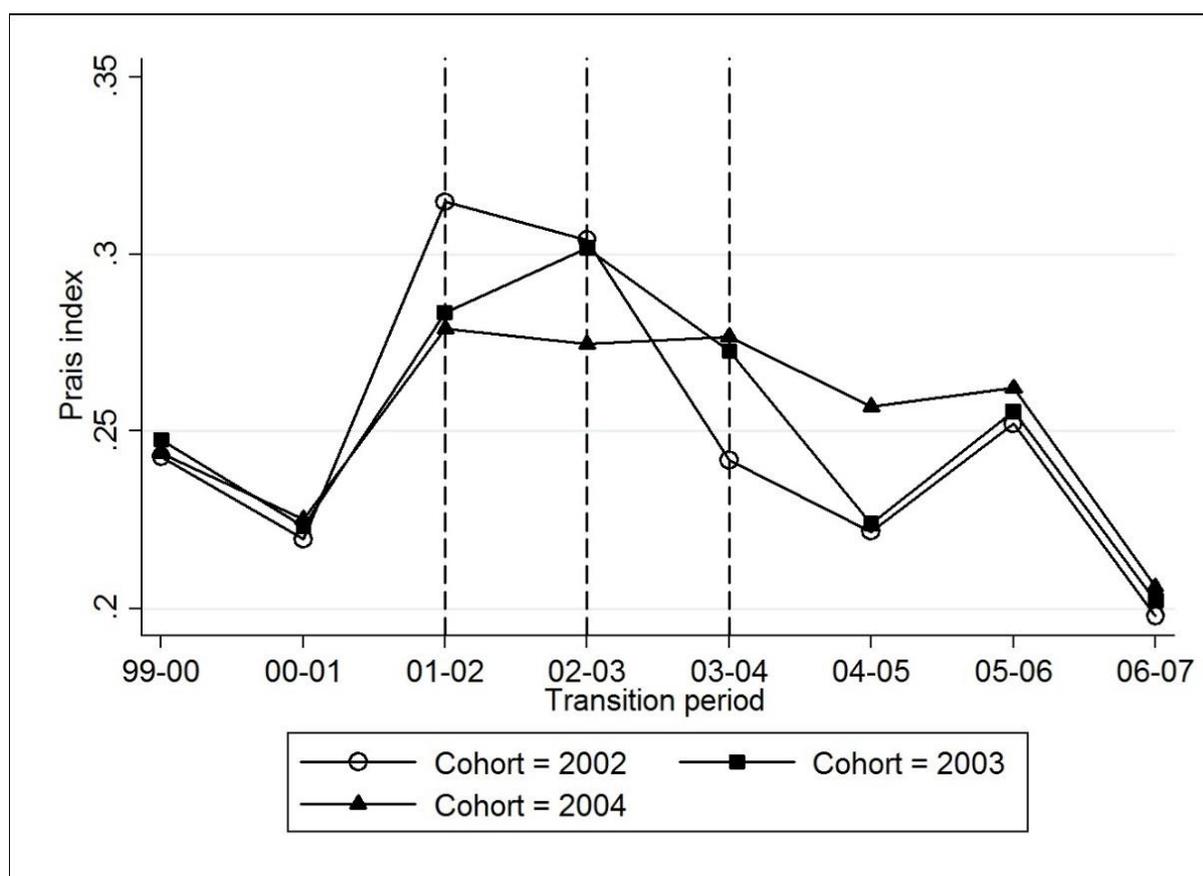
Figure 10 shows the evolution of the Shorrocks-Prais mobility index, using two-year transitions in wealth status of heirs, in a similar manner as for wealth inequality above, separately by inheritance cohort over the period 1999–2007. The parallel trends assumption is reinforced judging from the fact that wealth mobility is essentially the same across cohorts in both pre-inheritance (transitions 1999–2000, 2000–2001) and post-inheritance periods (transitions 2005–2006 and 2006–2007). There is a general increase in mobility in the 2001–2002 period, but the rise is about one fifth higher for the 2002 cohort (going from 0.23 to 0.32) compared to the two non-inheriting cohorts (going from 0.23 to 0.28). One year later, the 2003 cohort experience a larger increase in mobility and yet, two years later the 2004 cohort increases more (the increase in mobility is marginal but the other two cohorts experience substantial decreases in the same period).

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<sup>16</sup> Another mobility dimension concerns the role of family background for a person's wealth outcome, i.e., the degree of intergenerational mobility. For a study of how inheritance affects this kind of mobility, see Adermon, Lindahl and Waldenström (2015).

<sup>17</sup> For an  $n \times n$  matrix  $M$  the Shorrocks-Prais mobility index is defined as  $(n - \text{tr}(M))/(n - 1)$ .

Figure 10. Evolution of wealth mobility (Shorrocks-Prais mobility index.)



Notes: Based on transition matrices with two-year transitions in wealth status of heirs.

Table 6 presents regression results with respect to the causal effect of inheriting on wealth mobility. The same difference-in-difference methodology is used as when we investigated the wealth inequality effects in Section 2.<sup>18</sup> Overall mobility, as measured by the Shorrocks-Prais index, increases by almost one fifth as a result of inheritances according to the results in Column (1) (a treatment effect of 0.043 compared to the average pre-inheritance Shorrocks-Prais index of 0.259). Determining whether this effect is to be considered large or small is hard since there are few previous studies that explicitly investigate the impact of bequests on intragenerational wealth mobility. Klevmarcken (2004) compares wealth transition matrices with and without self-reported inheritances in a sample of Swedes surveyed in the 1990s where only a very small group had actually inherited. He finds that mobility is practically unaffected by receiving an inheritance, which may be due to, either the small number of treated or, the nature of survey data.

<sup>18</sup> Rather than controlling for year fixed effects we now include transition period fixed effects.

In order to gain more insight into the mobility effects of inheriting, we also investigate how effects may differ across the distribution. Specifically, in columns (2) through (6) the dependent variables are transition probabilities for each of the five quintiles in the wealth distribution, i.e., the likelihood to leave the quintile from one year to the next. Here, Table 5 indicates a notable conformity of results, with effects being almost identical in all wealth quintiles except the bottom one where mobility responds somewhat less to inheritances.

Table 6. The effects on wealth mobility.

Outcome:	(1)	(2)	(3)	(4)	(5)	(6)
	Mobility effect (Shorrocks-Prais)	Probability to leave quintile after inheriting:				
		1st	2nd	3rd	4th	5th
Treatment ( $\delta$ )	0.043** (0.015)	0.021** (0.007)	0.050*** (0.014)	0.048** (0.018)	0.037** (0.014)	0.018** (0.007)
Mean in $t - 1$	0.259	0.170	0.255	0.273	0.231	0.108
Effect, %	16.51	12.18	19.53	17.58	15.88	16.76

Notes: The estimations are based 21 observations (3 cohorts [2002–2004] and 7 transition periods) using data on 472,413 heirs.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome*  $t - 1$ .

Altogether, our estimates show that the yearly wealth mobility increases by 20 percent as a direct consequence of inheriting and that this mobility occurs over the whole distribution. These results conform well to our previous estimates, indicating that not only do the less wealthy heirs become relatively wealthier when inheriting, many also rise in ranks in the wealth distribution. The opposite is true for the richer heirs who receive smaller bequests relative to their own wealth and this makes some of them move downwards in the distribution.

## 7. Concluding discussion

We have shown that wealth inequality within a cohort of heirs is reduced by receiving inheritances. This finding is explained by the empirical observation that, compared with richer heirs, the less wealthy receive inheritances which are much larger relative to their initial wealth.

Several important questions still remain to answer before we will fully understand the role of inheritances for economic inequality. An important limitation of our study is that we have estimated how the *receipt* of inheritances affects wealth inequality. It is plausible that the heirs, who expect to receive inheritances, have adjusted their wealth levels already before inheriting. While we cannot quantify the importance of such behavioral responses, neither previous

empirical work nor the tests we present indicate any substantial pre-inheritance responses in the wealth distribution, due to expectations about inheritances.

Furthermore, intergenerational transfers consist not only of inheritances but also of *inter vivos* gifts. While we have tried to account for the influence of some *inter vivos* gifts (those that should be taxed and are received within ten years prior to the inheritance), we, admittedly, cannot perfectly quantify the importance of unreported gifts or gifts received in the distant past. Contextual factors, such as laws and social norms, are likely to influence the relative importance of gifts versus inheritances. For instance, donors are likely to prefer *inter vivos* gifts to inheritances if inheritances, but not gifts, are heavily taxed. While gifts in terms of money, time and other parental resources, are obviously the key to the success of children it is beyond the scope of this paper to quantify their impact on wealth inequality.

Finally, we should mention that we have only investigated the effects of inheritances on *wealth* inequality. Economic inequality and equality of opportunity encompasses many other dimensions that are not captured by wealth alone. That being said, it would definitely be interesting to investigate to what extent inheritances affect other dimensions of inequality, such as inequality in income, consumption, and health.

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## **Appendix A    Additional data description**

### **A1. Details on the study population**

There are in total 1,367,148 observations (individuals and organizations) in the Belinda database who are observed as heirs or in other ways recipients of transfers during the years 2002–2005. All of these observations are not part of our study population. Table A1 shows how many observations that fulfills the following seven exclusion criteria (744,321), leaving us with a study population of 622,827 heirs.

First, we exclude individuals from our analysis that appears in the database only because they receive cedes, and cedes are not the consequence of decisions made by the decedent but instead by heirs deciding to pass on parts of (or the entire) inheritance.

Second, we also exclude organizations since they do not contribute to the distribution of personal wealth.

Third, we exclude heirs of married decedents. These almost predominantly spouses of the decedent and are excluded because there is no, or only a partial, bequest division and transfer to children or other heirs when a married person dies.

Fourth, we exclude heirs of the decedents that passed away over the period December 17 to 31, 2004. The motivation is that these heirs were exempted from inheritance taxation, due to the unusual event of the Asian Tsunami.

Fifth, we exclude whom there is not a Swedish personal identity number (PIN) reported in the deceased's estate inventory report. Without this identifier we cannot merge the data on personal wealth to the inheriting individuals. One potential reason that individuals may lack a PIN is because he or she is not a Swedish resident. Missing PINs for non-Swedish residents is not an issue as these individuals do not contribute to the wealth distribution in Sweden. Misreporting is another potential source of a missing PIN. While the law requires that all individuals mentioned in the estate division have a PIN in the estate inventory report, we cannot exclude the possibility that some have failed to comply with this requirement. One may worry that heirs lacking a PIN differ systematically from heirs with a PIN, especially if they would be extremely wealthy. We have investigated this issue by comparing some descriptive statistics of the two

groups, heirs with and without PINs, using only the variables in the Belinda database (note that we cannot link data from other registers to the heirs when we have no PIN). The results indicate that they receive inheritances of similar magnitude. Heirs with PIN receive on average SEK 68,222 from the current decedent and heirs without PIN SEK 63,977. This, admittedly crude, comparison provide no indication that heirs without PIN would be wealthier than the average heir with PIN. The main difference that we can find is that heirs without PIN are much less likely to be the child of the decedent (4% vs. 56%). Instead they are often a sibling or nephew/niece of the decedent (50%) or a relative outside the succession order, a friend or similar (24%).

Sixth, we exclude heirs who under 18 years old the year when the decedent passed away. The motivation for not considering heirs under 18 is that minors do not receive full ownership of the inheritance and therefore it is unclear how to interpret this event in terms of a change in the level and relative position of their personal wealth.

Seventh, we exclude heirs that were not registered as living in Sweden in the year when the decedent passed away and in at least one more year over the study period 1999–2007. Heirs who are not registered in Sweden do not contribute to the wealth distribution and are therefore omitted.

Table A1. Exclusion criteria and study population

Total number of heirs and other recipients of transfers at death		1,367,148
<i>Exclusion criteria</i>		
(1) Only cedes	198,538	
(2) Organization	6,047	
(3) Spouse	491,869	
(4) 17 – 31 Dec 2004	15,112	
(5) No Personal Identity Number (PIN)	110,213	
(6) Under 18 years old	177,219	
(7) Not living in Sweden	24,203	
Fulfills <i>any</i> of (1) – (7)		744,321
Study population		622,827

## A2. Additional descriptive statistics

Table A2: Heirs' relationship with the decedent, by cohort.

Cohort:	2002	2003	2004	2005
<i>Total class 1</i>	62.7	63.3	61.8	65.1
Child	56.7	57.1	55.6	59.4
Grandchild	5.7	5.9	6.0	5.4
Great grandchild	<0.1	<0.1	0.1	<0.1
Others in class 1	0.2	0.2	0.2	0.3
<i>Total class 2</i>	33.2	32.6	33.9	28.2
Father	0.7	0.8	0.7	0.8
Mother	1.0	1.1	1.0	1.1
Sibling	9.1	9.0	8.9	8.2
Nephew/niece	18.3	17.7	18.7	15.0
Grandchild of sibling	2.9	3.0	3.3	2.4
Others in class 2	1.2	1.0	1.2	0.7
<i>Total class 3</i>	0.1	0.1	0.1	0.1
Grandmother	<0.1	<0.1	<0.1	<0.1
Grandfather	<0.1	<0.1	<0.1	<0.1
Uncle	<0.1	0.1	<0.1	0.1
Aunt	0.1	0.1	0.1	0.1
<i>Outside succession order</i>	4.0	4.0	4.2	3.9
Child of partner	0.1	0.1	<0.1	<0.1
Foster child	0.2	0.2	0.2	0.1
Stepchild	0.3	0.3	0.4	0.3
Others	3.5	3.5	3.6	3.6
<i>Number of observations</i>	162,207	159,292	150,914	150,414

Notes: Variables are expressed in percent.

## Appendix B Additional results

Table B1. The effect on wealth inequality, consumer durables adjusted

Outcome:	(1) Gini	(2) P90/P50	(3) P99/P50	(4) Top1%	(5) Top10%	(6) Bottom 50%	(7) CV	(8) P75–P25	(9) P99–P1
Treatment effect ( $\delta$ )	-0.031*** (0.006)	-0.484*** (0.119)	-1.574** (0.630)	-0.020* (0.010)	-0.026*** (0.004)	0.016*** (0.004)	-3.720 (2.862)	60,852*** (17,942)	275,615* (132,091)
Mean of outcome $t-1$	0.769	6.088	18.888	0.184	0.539	0.006	6.529	860,026	6,097,398
Effect in %	-4.03	-7.95	-8.33	-10.87	-4.82	267	0.570	7.08	4.52

Notes: The estimations are based 24 observations (3 cohorts [2002–2004] and 8 years) using data on 472,413 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome*  $t - 1$ .

Table B2. The effect on wealth inequality, children only.

Outcome:	(1) Gini	(2) P90/P50	(3) P99/P50	(4) Top1%	(5) Top10%	(6) Bottom 50%	(7) CV	(8) P75–P25	(9) P99–P1
Treatment effect ( $\delta$ )	-0.039*** (0.010)	-0.742*** (0.219)	-1.960 (1.387)	-0.030** (0.013)	-0.034*** (0.006)	0.021*** (0.007)	-5.587 (3.869)	86,906*** (18,109)	403,022** (156,277)
Mean of outcome $t-1$	0.819	6.787	21.488	0.209	0.572	-0.023	8.191	778,361	5,764,000
Effect in %	-4.76	-10.93	-9.12	-14.35	-5.94	-	-68.21	11.17	6.99

Notes: The estimations are based 24 observations (3 cohorts [2002–2004] and 8 years) using data on 266,917 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome*  $t - 1$ .

Table B3. The effect of wealth inequality adjusting for observed gifts.

Outcome:	(1) Gini	(2) P90/P50	(3) P99/P50	(4) Top1%	(5) Top10%	(6) Bottom 50%	(7) CV	(8) P75–P25	(9) P99–P1
Treatment ( $\delta$ )	-0.036*** (0.008)	-0.611*** (0.160)	-1.922** (0.842)	-0.023** (0.010)	-0.029*** (0.004)	0.019*** (0.006)	-4.349 (3.027)	67,978*** (15,466)	271,162* (129,991)
Mean of outcome $t - 1$	0.803	6.619	20.635	0.190	0.556	-0.016	6.82	763,048	5,528,024
Effect in %	-4.44	-9.23	-9.31	-12.31	-5.23	118	-63.77	8.91	4.91

Notes: The estimations are based 24 observations (3 cohorts [2002–2004] and 8 years) using data on 472,413 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome t-1*.

Table B4. The effect of wealth inequality assuming gifts amounting to 20 percent of estate value.

Outcome:	(1) Gini	(2) P90/P50	(3) P99/P50	(4) Top1%	(5) Top10%	(6) Bottom 50%	(7) CV	(8) P75–P25	(9) P99–P1
Treatment ( $\delta$ )	-0.050*** (0.010)	-0.854*** (0.196)	-2.729** (0.986)	-0.0270** (0.010)	-0.037*** (0.005)	0.0274*** (0.006)	-4.528 (3.131)	81,938*** (15,308)	293,526** (128,908)
Mean of outcome $t - 1$	0.818	6.889	21.598	0.193	0.565	-0.025	6.964	748386	5509417
Effect in %	-6.05	-12.40	-12.63	-13.99	-6.57	–	-65.02	10.95	5.33

Notes: The estimations are based 24 observations (3 cohorts [2002–2004] and 8 years) using data on 472,413 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome t-1*.

Table B5. The effect of wealth inequality assuming gifts amounting to 50 percent of estate value.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Outcome:	Gini	P90/P50	P99/P50	Top1%	Top10%	Bottom 50%	CV	P75–P25	P99–P1
Treatment ( $\delta$ )	-0.077***	-1.241***	-4.128***	-0.033***	-0.051***	0.044***	-4.863	100,653**	292,881**
	(0.013)	(0.274)	(1.318)	(0.010)	(0.005)	(0.009)	(3.331)	(15,307)	(130,573)
Mean of outcome $t - 1$	0.849	7.345	23.237	0.199	0.581	-0.044	7.238	730085	5505441
Effect in %	-9.08	-16.90	-17.76	-16.68	-8.85	-	-67.19	13.79	5.32

Notes: The estimations are based 24 observations (3 cohorts [2002–2004] and 8 years) using data on 472,413 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome*  $t - 1$ .

Table B6. The effect of wealth inequality adjusted for imputed gifts.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Outcome:	Gini	P90/P50	P99/P50	Top1%	Top10%	Bottom 50%	CV	P75–P25	P99–P1
Treatment ( $\delta$ )	-0.084***	-1.468***	-4.798***	-0.035***	-0.056***	0.050***	-4.870	77,952***	279,162*
	(0.009)	(0.224)	(1.123)	(0.011)	(0.004)	(0.006)	(3.327)	(15,672)	(129,292)
Mean of outcome $t - 1$	0.855	7.571	23.973	0.201	0.585	-0.049	7.260	752703	5528419
Effect in %	-9.80	-19.39	-20.01	-17.21	-9.59	-	-67.08	10.36	5.05

Notes: The estimations are based 24 observations (3 cohorts [2002–2004] and 8 years) using data on 472,413 heirs. Standard errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.  $\delta$  is the coefficient on *PostInheriting* in Equation (1). *Effect in %* is calculated as *Treatment effect* ( $\delta$ ) / *Mean of outcome*  $t - 1$ .

## Appendix C Tests of expectations and pre-inheritance wealth accumulation.

The analysis in Section 4.4.4 are based on regressions of the following form:

$$\Delta W_{i,c}^h = \alpha + \beta \frac{\Delta W_{i,c}^h}{H_{i,c}} + \gamma_c + \varepsilon_{i,c},$$

Where the dependent variable  $\Delta W_{i,c}^h$  is the change in wealth of heir  $i$  of inheritance cohort  $c$  ( $c = 2002, 2003, 2004$ ) between  $t - 3$  and  $t - 1$ ,  $\Delta W_{i,c}^d$  the change in wealth of the decedent of heir  $i$  between  $t - 3$  and  $t - 1$ ,  $H_{i,c}$  the number of heirs of the decedent (of heir  $i$ ),  $\gamma_c$  a cohort fixed effect, and  $\varepsilon_{i,c}$  an idiosyncratic error term.

The regressions are estimated, using OLS, on the heirs of the 2002–2004 inheritance cohorts (less of heirs of decedents that had non-positive wealth in  $t - 1$ ), in total 373,615 observations in the baseline case (Column 1) and 299,809 observations when we consider the heirs with decedents that passed away due to terminal illness (Column 2). Standard errors are clustered at the heir-decedent level.

Table C1: Testing if heirs' respond to changes in expected size of inheritances.

	(1) All heirs	(2) Heirs of decedents that passed away due to terminal illness.
$\beta$	0.0518 (0.0408)	0.0678 (0.0556)
Number of clusters	122,771	98,884
Number of observations	373,615	299,809

Notes: Standard errors, clustered at the heir-decedent level, errors in parentheses. \* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level.

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