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## **Carnegie Visits Nobel: Do Inheritances Affect Labor and Capital Income?**

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## Abstract

The objective of this paper is to study when and how much labor supply and savings of heirs respond to inheritances. We estimate fixed effects models following direct heirs, inheriting in 2004, during the years 2000–2008 using Swedish panel data. Our first main result is that the more the heir inherits, the lower her labor income becomes. This labor supply effect appears in the years after the heir had inherited. We also find evidence of anticipation effects that occur before the actual transfer. Our second main result is that the more the heir inherits, the higher her capital income becomes. This savings effect only appears in the years after receiving the inheritance. It disappears after a couple of years.

Keywords: inheritances, bequests, windfall gains, labor supply, capital income, uncertainty

JEL Codes: D10, D80, D91, J22

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# 1 Introduction

The Swedish inventor and industrialist Alfred Nobel (1833–1896) and the American businessman Andrew Carnegie (1835–1919), who were some of the richest men of their time, argued that large inheritances will induce spendthrift behavior and depress motivation to work hard. Nobel’s arguments are well summarized in his quote:

Experience has taught me that great fortunes acquired by inheritance never bring happiness, they only dull the faculties. Any man possessing a large fortune ought not to leave more than a small part of it to his heirs not even his direct heirs - just enough to make their way in the world. (Chester, 1998, p. 31)

Similarly to Nobel, Carnegie opined that:

The parent who leaves his son enormous wealth generally deadens the talents and energies of the son, and tempts him to lead a less useful and less worthy life than he otherwise would . . . (reproduced in Carnegie, 1962, p. 56)

The idea that inheritances depress work effort and labor supply has been labeled “the Carnegie conjecture” in the literature (Holtz-Eakin et al., 1993). As more and more people die wealthier and leave larger bequests,<sup>1</sup> it becomes increasingly important to understand how inheritances affect economic behavior of those who inherit. We study how inheritances affect labor and capital income of heirs in this paper.<sup>2</sup> While Carnegie and Nobel, as well as most studies on this topic, mainly have focused on the effects of receiving very large inheritances, our objective is, instead, to study the effects of more modestly sized inheritances. We use register based data from Sweden on heirs who inherited on average SEK 300,000 or USD 45,000.<sup>3</sup>

Behavioral effects of inheritances are important for a wide range of economic problems. Distributional effects of intra-family wealth transfers and effects of inheritance and estate taxation, for instance, depend on how inheritances affect labor supply decisions.<sup>4</sup> Inheritances may also affect savings behavior. One may erroneously conclude that people are saving too little for retirement if these savings

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<sup>1</sup>For an excellent description of the evolution of inheritances in France, see Piketty (2011), for estate tax revenues in the United States, see Joulfaian (2011), and for inheritance tax revenues in Sweden, see Ohlsson (2011).

<sup>2</sup>Our study contribute to the literature on labor income elasticities, Feldstein (see 1995, 1999); Gruber and Saez (see 2002); Kopczuk (see 2005); Blomquist and Selin (see 2010); Saez et al. (see 2010), by focusing on how labor income respond to inheritances.

<sup>3</sup>The exchange rate has fluctuated around 7 SEK/USD and 9 SEK/EUR during the studied period. A USD bought more SEK in the beginning of our sample period and fewer in the end. The SEK/EUR rate was comparatively stable.

<sup>4</sup>Kopczuk (2009) discuss the implications of transfer taxes.

effects are ignored. Furthermore, responses to inheritances may shed light on how unearned income affects labor supply, savings, and consumption decisions. There have so far been few tests of the Carnegie conjecture despite its importance for economic decisions. The available tests are focused solely on the United States.

Suppose that we start from a standard life-cycle model of consumption and saving. The model predicts that the timing and magnitude of behavioral responses to inheritances critically depend on whether the inheritance is anticipated or not. Responses in consumption and labor supply will be smoothed over the entire lifetime if inheritances are anticipated. Responses will, on the other hand, take place after the receipt if the heir does not anticipate the inheritance. In reality, however, an inheritance may be partly anticipated, partly unanticipated. It is likely that extent to which an inheritance is anticipated by the heir depends on the institutional context.<sup>5</sup>

Succession rules in many European countries, more or less, follow the Roman tradition with restricted testamentary freedom. Parents are prohibited from completely disinheriting their children. Germany, France, and Sweden, are examples of this. Anglo-Saxon countries, e.g., the United States and the United Kingdom, often grant full testamentary freedom. It is, therefore, likely that a larger fraction of received inheritances are anticipated in countries with restricted testamentary freedom. Children are certain to inherit at least a share of the estate if it is positive.<sup>6</sup> We, therefore, for this reason expect heirs' labor income responses after inheriting to be smaller in Sweden than in the United States.

Sweden and many other European countries, however, have higher marginal tax rates on labor income than the United States. This creates stronger incentives to use inherited wealth to increase leisure relative to consumption. It is, therefore, not theoretically clear if post-receipt responses in labor and capital income can be expected to be larger in Sweden than in the United States. Restricted testamentary freedom and high marginal tax rates also give the heirs incentives to reduce their labor income long before the inheritance is received.

We have collected data for individuals who passed away in 2004 and their heirs. Data are collected from administrative registers. The data set includes information on the estates and the corresponding inheritances, family characteristics, and the heirs' labor and capital income during the period 2000–2008.

We present estimated effects of inheritances on labor and capital income for each year during a period four years before and four years after the transfer. Inheritances are likely to be correlated with unobservable characteristics such as taste for leisure and risk aversion. This is a serious concern when estimating the behavioral effects of inheritances on labor supply and saving. The panel structure of our data allows us, however, to estimate fixed effect models to account for this type of

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<sup>5</sup>For an excellent review of differences in institutions governing inheritances and transfer taxes across countries, see Pestieau (2003).

<sup>6</sup>Elderly also face lower risks of large out-of-pocket health care expenses in the final stages of life in countries with generous public insurance systems. This makes a parent's bequeathable wealth more certain.

individual heterogeneity.

There is, nonetheless, a limitation with our approach. The individual fixed effects will capture any behavioral effects that might occur before our sample period. Our inheritance variables might, therefore, not capture the total behavioral responses. We correlate the individual fixed effects with the inherited amounts in a second step to address this issue. This makes it possible for us to decompose the pre-inheritance responses into pre-sample period responses and pre-receipt responses within the sample period.

Receiving an inheritance, unlike lottery winnings and most other types of wealth shocks, also means that someone close to the heir, typically a parent, has died.<sup>7</sup> This has several implications for when behavioral responses are likely to occur.

First, the parent's health has often deteriorated some time before death. The children may, therefore, have taken time off from work to care for the parent.<sup>8</sup> Inheritances are considered *quid pro quo* for in-kind services provided by the children in strategic/exchange models of bequest motives (Bernheim et al., 1985; Cox, 1987). These models also assume that parents' purchases of these services are positively correlated with their wealth. Important behavioral responses could, therefore, occur also before the demise if heirs spend more time caring for wealthier parents.

Second, heirs may mourn immediately after the bereavement and, therefore, not work as much or as hard as they would otherwise. They might also not think about how to incorporate inheritances optimally into their allocation of assets.<sup>9</sup>

Third, heirs may need to devote time and effort to arrange the funeral, prepare the estate inventory report, divide the estate, and related tasks. Changes in hours of work and work effort may, furthermore, take time to materialize in labor income. We may also observe short-run changes in asset allocation that are not necessarily representative for a new optimum. This is because the re-optimization of the asset allocation, to incorporate inherited assets, might take time and result in realized capital gains. Inheritances could potentially cause behavioral effects over several years, including in the years prior to the receipt. It is necessary to account for all these effects to credibly estimate the true causal effects.

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<sup>7</sup>See Kaplan (1978, 1987); Lindh and Ohlsson (1996); Imbens et al. (2001) for studies that estimate labor market responses to lottery winnings. Krueger and Pischke (1992) study the responses to shocks in social security wealth.

<sup>8</sup>Studies have documented a negative relation between the provision of informal care to elderly parents and labor market outcomes of the children. The outcomes are labor force attachment, earnings, hours of work, etc., see Ettner (1995); Bolin et al. (2008); Fevang et al. (2009).

<sup>9</sup>Studies have found that the death of a parent is associated with severe grief among adult children (Umberson et al., 1992; Umberson and Chen, 1994; Kessler, 1997; Bennedsen et al., 2009). The death often causes psychological stress and worse performance at work for the child. Schulz et al. (2003) find that individuals who provided informal care to their dying parents are likely to show depressive symptoms. They also increase their consumption of antidepressant medicines immediately after the bereavement. A year after the demise the symptoms had, however, returned to levels lower than those prior to the death.

Access to panel data covering a relatively long time period allows us to estimate responses for several years. This is a significant advantage and makes it possible to provide a solid picture of dynamic labor and capital income responses.

Our results support the presence of a substantial negative impact of inheritances on labor income in each of the four years following the receipt. At the same time, we do not find any effects in the year of inheriting or in the four preceding years. The results from our estimates of early anticipation effects, however, suggest that the heirs might have reduced their labor incomes already before the start of our sample period. We interpret this as indicating that inheritances were partly anticipated, partly unanticipated.

We find large increases in capital income in the years immediately after inheriting. There is, on the other hand, no evidence of any responses in pre-inheritance years. The same is true for the years before the beginning of the sample period. This contrasts the results for labor income. Our results imply that the short run increase in capital income tend to outweigh the decrease in labor income. The heirs better off in terms of leisure as well as available financial resources. Inheritances, in other words, improve welfare.

Our results are related to those presented in previous studies of labor supply, consumption, and saving effects of inheritances using data from the United States. Holtz-Eakin et al. (1993) test the Carnegie conjecture in a seminal article. They use register data covering very large inheritances. The probability of leaving the labor force increases with the size of the inheritance. Inheritances also decrease the earnings of the heirs who remain in the labor force.

Joulfaian and Wilhelm (1994) use survey data from the PSID to study the effects on hours of work and consumption. They also use register based panel data (EITM) on individuals who have received very large inheritances. How do inheritances affect household earnings one year before the receipt, the year of receipt, and three years after the receipt? Their results suggest that inheritances have a small positive effects on consumption after it is received, but not before. The post-inheritance effect on labor supply is negative but small.

Brown et al. (2010) use data from the HRS. Inheritance receipt has a positive effect on retirement. They also establish that the effects are larger when inheritances are unexpected by using information on self-reported inheritance expectations. Weil (1994) uses the 1984 PSID survey to study the effect of inheritances on household consumption. He finds that both expectation of future inheritances and actual receipt are associated with increased consumption. In a more recent paper, Joulfaian (2006) uses administrative data on tax returns of donors matched to individual income tax returns of the heirs. He estimates the impact of inheritances on capital income and labor force participation two years after the decedent passed away. The results suggest that capital income increases by less than what a corresponding increase in wealth would yield. Joulfaian also finds a negative effect on labor force participation. This is consistent with the results reported in earlier studies.

## 2 Theoretical framework

We present a life-cycle model of consumption to illustrate how inheritances affect heirs' optimal labor supply, consumption, and savings decisions. The theoretical framework closely resembles those presented in Weil (1996) and Joulfaian (2006). The main difference is that we augment the model with endogenous labor supply responses and a bequest motive.<sup>10</sup>

We, furthermore, focus explicitly on how anticipation and labor income taxation affect behavioral responses. Suppose that an heir receives an inheritance at the time of the donor's death. The heir, however, knows the size and the time of the transfer already from the beginning of her life. Such anticipated inheritances will not affect labor supply (and labor income) and consumption when inheriting. The responses to an anticipated inheritance will affect optimal paths already from the beginning of the life-cycle.

Inheritances will, on the other hand, affect labor supply, consumption and savings only after the inheritance is received if it is not anticipated. We will, for simplicity, consider the two polar cases when inheritances are either completely anticipated or completely unanticipated. Intermediate cases can be viewed as combinations of anticipated and unanticipated inheritances.

### 2.1 The model - with perfectly anticipated inheritances

Suppose that the individual begins her economic life in period 1 and lives for  $T$  periods. We, furthermore, assume that the individual explicitly desires to leave a bequest. An alternative interpretation is that the individual wants to be wealthy at the time of death. Each individual operates in an environment of perfect certainty concerning wages, prices, and length of life.

The individual chooses consumption ( $c$ ), leisure ( $l$ ), and wealth to bequeath ( $k$ ) to maximize lifetime discounted utility. We assume that utility from consumption and leisure can be represented by the concave function,  $u(c_t, l_t)$ . It is time-separable, strictly increasing in both of its arguments, and  $t$  is an index for time period.  $H$  is maximum hours worked each period and actual hours of work,  $n_t$ , is given by  $H - l_t$ . The function  $v(k_{T+1})$  represents the individual's utility from bequeathing. We assume  $v(\cdot)$  to be concave and strictly increasing in the individual's wealth.<sup>11</sup> The heir's problem is:

$$\max_{\{c_t, n_t, k_{t+1}\}} \sum_{t=1}^T \beta^{t-1} u(c_t, n_t) + \beta^{T-1} v(k_{T+1}), \quad (1)$$

<sup>10</sup>Omitting the bequest motive does not change the analysis except that optimal consumption path becomes higher.

<sup>11</sup>This specification of  $v(\cdot)$  is consistent with the egoistic or joy-of-giving models of bequest motives (Blinder, 1976; Abel and Warshawsky, 1988). The function can, however, be modified to depend on the financial status of the children as in the altruistic framework (Becker, 1974; Barro, 1974) and in the strategic model of bequests (Bernheim et al., 1985).

where  $\beta$  is the intertemporal discount rate. Utility is maximized subject to a sequence of intertemporal budget constraints:

$$c_t + k_{t+1} = k_t(1 + r) + n_t w + I_t, \quad (2)$$

where  $r$  is the interest rate, which we assume to be exogenous, and  $w$  is the exogenous wage rate. The inheritance,  $I_t$ , is received in period  $p$ , where  $p < T$ , or put differently:

$$I_t = \begin{cases} I & \text{if } t = p \\ 0 & \text{if } t \neq p \end{cases} \quad (3)$$

Furthermore, we assume that  $I > 0$ . Let us simplify and assume that  $\beta = \frac{1}{(1+r)}$ . We can then find the optimal consumption path by solving (1):

$$c_1 = c_2 = \dots = c_p = \dots = c_T. \quad (4)$$

The labor supply response will, similarly, be incorporated already at  $t = 1$  if we assume that leisure is a normal good. There will be no change in labor supply at the time of the transfer. The inheritance will cause a one-to-one change in wealth when received as there will be no changes in consumption or hours worked.

## 2.2 Unanticipated inheritances

Suppose, instead, that the inheritance is not at all anticipated. The heir considers it a windfall gain.

The consumption path equation (4) will no longer hold. (The same applies for the paths for leisure and wealth.) There will be discontinuous changes in the consumption and labor supply between period  $p - 1$  and  $p$ . The inheritance will increase consumption with the same amount each period during the heir's remaining life-time. The optimal consumption path satisfies:

$$c_1 = c_2 = \dots = c_{p-1} < c_p = \dots = c_T. \quad (5)$$

The leisure and labor supply paths follow the same logic, but with decreasing hours of work. The larger the unanticipated inheritance, the larger is the corresponding response. Consequently, the inheritance will cause a smaller than one-to-one wealth increase in period  $p$ . The inheritance will affect behavior both before and after the receipt if the received inheritance is partly anticipated, partly not anticipated.

## 2.3 Extensions

*Taxation.* Suppose that we introduce a proportional tax on labor income,  $\tau$ . How will differences in labor income tax rates affect labor supply and savings? We start from the heir's maximization problem in a one-period setting. Differentiate



the optimal level of leisure with respect to the inheritance. Then take the second-order derivative with respect to the tax rate. We find that:  $\frac{d^2l}{d\tau^2} > 0$ .<sup>12</sup> This derivative tells us that an increase in the tax rate increases the individual's optimal leisure time. There will, in other words, be a negative labor supply response. This response will be larger when tax rates are higher.

*Liquidity constraints.* People may not always be able to borrow against a future inheritance. One should keep this in mind when studying responses to inheritances using this framework. There will be no consumption and labor supply responses before the inheritance is received if the heir faces binding liquidity constraints. This result holds even if the inheritance is perfectly anticipated. It is, therefore, not possible to use post-receipt responses to infer if inheritances are from anticipated or unanticipated in this situation. The outcome will be similar if heirs, who anticipate the inheritance, are risk averse or prudent (Kimball, 1990; Weil, 1996).

### 3 Swedish succession rules

#### 3.1 Rules governing the deceased

The default succession scheme in Swedish civil law is based on consanguinity. This means that relatives in a closer relationship to the deceased inherit before more distant relatives. Civil law classifies the relatives to the deceased into three inheritance classes of legal heirs. The succession scheme uses *successio ordinum*. This means that each class has to be empty of heirs before continuing to the next. The succession scheme also uses *jus repraesentationis*. This means that the inheritance is passed on to the heir's descendants if the heir is deceased.

The first inheritance class in the succession scheme contains the deceased's descendants, i.e., children, grandchildren and so on. Children are the first in line to inherit. The heirs in this class are the direct heirs.

There are also specific rules for surviving spouses.<sup>13</sup> A surviving spouse has the right to dispose the estate freely for the remainder of her life if the deceased and the surviving spouse have common children. This has been the rule since 1988. Free disposal means that the surviving spouse can spend the money but not bequeath it. Common children are defined as direct heirs with a postponed right to inherit. They have to wait for their second parent to die until they receive their inheritances. Suppose that the deceased has children who not are common with the surviving spouse. These children will not have to wait, they inherit when their parent dies.

The relatives in the second inheritance class will inherit the estate if there are no direct heirs. This class consists of the deceased's parents, siblings, and their descendants. The third inheritance class includes grandparents and their children,

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<sup>12</sup>This result holds for all concave, homothetic and differentiable utility functions.

<sup>13</sup>A surviving spouse does not inherit the deceased if the deceased has children. These children will inherit.

i.e., aunts and uncles. First cousins are not legal heirs. The estate will go to a public fund, The Swedish Inheritance Fund, if there are no legal heirs in any of the three inheritance classes and if there is no surviving spouse.

The default succession scheme can be set aside by a will. This is a legally binding document declaring the deceased's last wish on how the estate should be divided. Swedish succession rules follow the Roman tradition with limited testamentary freedom. The testator is only allowed bequeath up to half the estate. The remaining part is divided among legal heirs according to the default succession rules.<sup>14</sup>

It should, however, be noted that people write wills for other reasons than to deviate from the intestate succession default. The testator might, for example, have emotional preferences regarding how particular assets should be divided between heirs. This does not necessarily affect the values of inheritance lots. It was also common to write a will to protect the economic interests of a surviving spouse before the reform of the Marriage Act in 1988 (Brattström and Singer, 2007).

### **3.2 Rules concerning valuation, division, and taxation of inheritances**

The deceased's assets and debts are managed by the person in charge of the estate. This might be a surviving spouse or a child for smaller estates. Large estates are often managed by banks or law firms. The estate inventory report provides information about the deceased's complete balance sheet at the time of her death.<sup>15</sup> The estate inventory report served as a basis for the inheritance tax until its repeal from 2005.<sup>16</sup> The report can be prepared by relatives or by banks, law firms, mortician, etc.

The valuation principle is that assets and debts should be valued at market prices. The values of the different assets should be declared by those in charge of the estate. The declared values should be supported by documentation from banks, financial institutions, real estate agents, etc.

Heirs had incentives to underreport the estate value, to lower their tax payments, until the repeal of the inheritance tax. Parents may also have engaged in tax planning (or evasion) both during life, and shortly before death, (see Bernheim et al., 2004; Joulfaian, 2004; Nordblom and Ohlsson, 2006; Kopczuk, 2007; Eliason and Ohlsson, 2010). It should also be noted that several exemptions from the principle of market prices applied when there was a tax.

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<sup>14</sup>See Angelini (2009), Table 2, for corresponding rules in other European countries.

<sup>15</sup>The estate inventory report should be prepared within three months after the time of death. It is to be filed with the Swedish Tax Authority within a month after its completion.

<sup>16</sup>The inheritance tax was to be repealed from January 1, 2005. Parliament, however, later changed the repeal date to December 17, 2004. The reason was that many Swedes died in the Asian Tsunami on December 26, 2004. The gift tax was repealed at the same time. Surviving spouses were exempted from tax already from January 1, 2004. The inheritance tax was progressive in two dimensions; first, large inheritances were taxed at higher rates than small. Second, direct heirs faced lower tax rates than more distant heirs.

The most important exception concerned real estates. The tax value of this asset was supposed to be 75 percent of the market value. Financial assets were, on the other hand, to be declared according to their market values as of the date of death. Any assets that were realized by the estate manager before the actual estate division were valued at market prices. Heirs, therefore, had tax incentives to postpone realization of capital gains until the estate was divided. It was, in other words, better to inherit an asset with unrealized capital gains than having the estate manager selling the asset and, instead, getting the cash. There are several reasons to believe that the reported inheritance values until 2004 understated the market values of the transfer.

It is an option, not an obligation, to inherit according to Swedish law. The estate is solely responsible for all existing debts until the estate is divided. Heirs can never be forced to pay the debts of estates in deficit. Estates can go bankrupt.

*Inter vivos* gifts are regarded as inheritances received in advance in many situations. The law defines when and how such transfers should be taken into account when dividing an estate. The objective is to secure that succession rules should not be circumvented by *inter vivos* gifts.

## 4 Data and empirical strategy

We start out with a data set of decedents and heirs that was originally collected from *the Swedish Tax Authority's Inheritance Tax Register*. The objective was to study the incidence and the determinants of unequal sharing of bequests between heirs (Ohlsson, 2007). The sample was limited to decedents registered in the city of Stockholm (the capital) who passed away in 2004 and their heirs to make data collection feasible.<sup>17</sup> The sample was also limited to deceased who had a will, more than one child, and a positive estate, as these are necessary conditions for unequal sharing. In addition, the sample also only includes decedents who were not married at the time of their death. This was done to avoid the uncertainties in estate division that might appear when there is a surviving spouse.

It is not a perfectly representative sample of decedents and heirs. We still believe that it is appropriate for this study. The decedents and the heirs are relatively wealthy. It is, therefore, less likely that the heirs are liquidity constrained. This is an advantage. It should be noted, however, that being relatively wealthy in Sweden is quite different from being very wealthy in the United States.<sup>18</sup>

The complete sample contains 232 decedents and 820 heirs. The estates were divided up in inheritances transferred to 573 children, 176 grandchildren, 8 partners, 45 relatives, and 18 other individuals and charities. Few lots go outside the family. This suggests that testator tend to follow the principles of the default suc-

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<sup>17</sup>The data were collected manually from estate reports at the Uppsala Tax Office.

<sup>18</sup>The average estate in our sample is about twice as large as the average net worth in the Swedish population, (Berg, 2006). Kopczuk and Saez (2004) reports that the net worth of the two percent of the decedents who file estate tax returns is about six times higher than average wealth.

cession rules. The data set has information on the net worth of the estate, the value of each inheritance received by the heirs, and data on possible taxable *inter vivos* gifts made by decedent to each heir during the last ten years.

We have added data on annual labor income, capital income, self-employment income, taxable wealth, and real estate wealth for decedents and for heirs. These data come from *the Tax Authority's Register of Final Tax on Income*. This concerns the nine years 2000–2008 for the heirs. Taxable wealth is measured on a household basis whereas the other variables are measured at the individual level.<sup>19</sup> Demographic characteristics, such as sex, marital status, year of birth, number of children, place of residence etc., have been collected from *the Tax Authority's Total Register of the Population*.

We study responses to inheritance receipts in a sub-sample of heirs who were between 21 and 59 years old in 2004. There are two reasons for this. First, we want to separate labor supply responses from retirement and education decisions. Second, we do not want to include retired heirs. People tend to spend down their wealth after retirement and this might result in negative saving. Third, we do not want to include heirs who are minors during the sample period.

We only include direct heirs in our sample. The responses of other heirs could be quite different. It becomes more clear to which population our results generalize when the sample is limited to direct heirs.<sup>20</sup> We have complete observations for every year for about 96 percent of the heirs. We lack income data for at least one year for the remaining 4 percent. This leaves us with an unbalanced panel of 374 direct heirs and 3,310 observations during 9 years.

The inherited amount is our main explanatory variable. It is calculated as the amount inherited by the heir not including *inter vivos* gifts and payments from life insurance policies. The amount is also net of taxes.

Ideally we would have preferred to have data on hours worked, effort, and wage rates. This is not possible. We use taxable labor income instead. Taxable labor income includes salaries, social insurance benefits (sickness, parental, and unemployment), and pension payments. This, in some sense, captures aspects of hours worked, effort, and wages. Changes in taxable labor income are likely to reflect conscious decisions. It is desirable from a tax revenue perspective to use taxable labor income as measure of labor supply. The effects on tax revenues come via taxable income.

Capital income includes interest received on financial assets, dividends, and realized capital gains minus interest paid on loans and realized capital losses. It is the result of past savings and investment decisions. Capital income is taxed independently of how long a particular asset has been held. Capital gains are only taxed when realized. The tax rate has been 30 percent throughout the sample period.

One can think of using capital income to calculate an approximate measure of

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<sup>19</sup>Previous studies, based on data from administrative records, have used data at the household level.

<sup>20</sup>The original data contained one decedent with a very considerable estate. The heirs of this estate have been excluded from the analysis.

wealth.<sup>21</sup> The analysis could then be done using wealth rather than capital income. This would move the empirical analysis closer to theory as presented in Section 2. We would, however, need to assume rates of return on assets. This is difficult since we do not have information about the heirs' portfolios composition. Asset returns on different assets have also varied substantially during the sample period.

#### 4.1 The heirs

Table 1 provides descriptive statistics for the heirs.<sup>22</sup> Inheritances vary between zero and SEK 2,6 million with an average value of SEK 300,000.<sup>23</sup> The P90:P10 ratio shows that those in the top of the distribution inherit around 12 times more than those at the bottom. The heirs have an annual labor income of on average SEK 310,000 in 2003. Inheritances are, on average, almost as large as average annual labor income. It is, therefore, plausible that inheritances may considerably influence economic behavior.

The heirs in our sample are on average 50 years old when inheriting.<sup>24</sup> Women are in slight majority and about half of the heirs are married. Heirs have, on average, 1.45 siblings and 1.75 children. Almost all the direct heirs in the sample, 96 percent, are children of the decedents.<sup>25</sup> Furthermore, 75 percent of the heirs live in the County of Stockholm.

Our sample of heirs is not completely representative for the all Swedes in 2004. The heirs here earn more and have more siblings than Swedes on average.<sup>26</sup> There is one clear advantage of having a sample with wealthier decedents and higher income heirs than Swedes on average. It is less likely that our heirs face binding liquidity constraints. Such constraints may, otherwise, confound the interpretation of our empirical results.

Figure 1 shows that the amount inherited is positively correlated with the recipient's age. Unconditional average inheritance amounts peak for heirs who are about 42 years old.

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<sup>21</sup>The correlation between taxable wealth in period  $t-1$  (for those with taxable wealth) and capital income in period  $t$  is 0.21. This is statistically significant at all conventional levels.

<sup>22</sup>Descriptive statistics for the decedents are presented in Appendix A.

<sup>23</sup>Estates are reported in the 2004 price level. All amounts reported in the paper are, therefore, deflated to the 2004 price level. Inflation was low during the studied period. The CPI increase from 2000 to 2008 was 14.6 percent. The year by year CPI increases were: 2.4 percent (2001); 2.2 percent (2002); 1.9 percent (2003); 0.4 percent (2004); 0.5 percent (2005); 1.4 percent (2006); 2.2 percent (2007); 3.5 percent (2008).

<sup>24</sup>This is considerably older than in previous studies. The heirs in Joulfaian and Wilhelm (1994) are 42 years old on average. Holtz-Eakin et al. (1993) and Joulfaian (2006) report average ages of 39.

<sup>25</sup>The remaining 4 percent are grandchildren. We have only included grandchildren when they are direct heirs. Grandchildren become direct heirs when a child of a decedent is already deceased. Omitting grandchildren does not affect the empirical results.

<sup>26</sup>Blomquist (1979) report that the inherited amount is inversely related to the number of children of the deceased.

Table 1: Descriptive statistics for the heirs.

	Mean	S.d.	Median
Inheritance, 2004	299.3	313.4	192.3
Age, 2004	49.97	7.88	50
50 years and older in 2004, percent	55		
Male, percent	47		
Married, percent	52		
Number of siblings	1.45	0.69	1
Number of children	1.75	1.10	2
Direct heir child of the deceased, percent	96		
Living in the County of Stockholm, percent	75		
Labor income, 2003	311.3	231.5	269.7
Capital income, 2003	-1.3	64.5	-4.3
Self-employment income, 2003	7.7	61.8	0
Share with taxable wealth in 2003, percent	20		
Taxable wealth, 2003 <sup>a</sup>	2,468	1,974	2,114
Share with taxable real estate in 2003, percent	68		
Taxable real estate, 2003 <sup>b</sup>	972	1,341	701
Share with taxable gift(s), percent	8		
Value of gift(s), 2004 <sup>c</sup>	241.9	274.3	155
Number of observations	374		

Notes. Amounts are measured in SEK thousands, price level 2004.

<sup>a</sup> value is conditional on having taxable wealth,

<sup>b</sup> value is conditional on having taxable real estate,

<sup>c</sup> value is conditional on having received a gift.



Figure 1: Average value of inheritance receipt per age group.

## 4.2 Descriptive results and empirical challenges

We start by visually inspecting how labor income and capital income evolve over the sample period. This will guide our estimation strategy. We observe labor and capital income for each heir in the sample during four years before the decedent passed away (2000–2003), the year when the decedent died (2004), and the following four years (2005–2008).

We classify heirs into two groups. The high inheritance group consists of heirs with inheritance higher than the sample mean (SEK 299,000). Those with inheritances below the sample mean are classified as the low-inheritance group. We then compute sub-sample means for inheritances in the two groups.<sup>27</sup> The question is: Do the two groups differ in labor income and capital income responses?

The two lines in Figure 2 show how labor income evolves for the heirs in the two inheritance groups. We first observe that those who inherit less have higher labor income on average than those who inherit more. This result perhaps surprises some. It lies close at hand to expect inheritance amounts to be positively correlated with the heir's earnings potential. Those who inherit more might, however, also have anticipated a larger inheritance. They have, therefore, had stronger incentives to reduce their labor supply long before the actual receipt.

The figure also shows that the two groups have similar labor income trajectories in the pre-inheritance period although the levels differ. Labor income in the high inheritance group declines gradually for all years following the receipt. On the other hand, labor income in the low-inheritance group increased dramatically up to 2007. This pattern is consistent with a situation in which those in the high inheritance group inherit more than anticipated. It is also consistent with the low inheritance group inheriting less than what they anticipated. We emphasize, however, that the figure shows the unconditional means. The differences between the groups do not necessarily reflect causal effects of inheritances.

Figure 3 shows how capital income evolves during the sample period. The capital income trajectories of the two groups are similar during the pre-inheritance years. Capital income increases from zero to almost SEK 48,000 in 2004 when the inheritances are received. The inherited amount in itself may explain the dramatic surge. Some heirs may decide to realize inherited unrealized capital gains to re-optimize their asset composition.

The financial upturn starting in 2004 may also explain the increase in capital incomes. The Swedish stock market index increased by 42 percent in 2004.<sup>28</sup> The interest rate drop from 2.75 in 2003 to 2 percent in 2004 could also contribute to higher capital incomes for the heirs who had debt. Capital income in the low-inheritance group decreases in 2005. The high-inheritance group's capital income, on the other hand, continues to rise. Capital income increases for both groups in

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<sup>27</sup>We exclude heirs with incomes outside 1.96 standard deviations from the sample mean.

<sup>28</sup>The Swedish stock market index by 23 percent between 2000 and 2008. The year by year changes were: -9 percent (2001); -25 percent (2002); -35 percent (2003); 42 percent (2004); 11 percent (2005); 33 percent (2006); 26 percent (2007); -20 percent (2008).

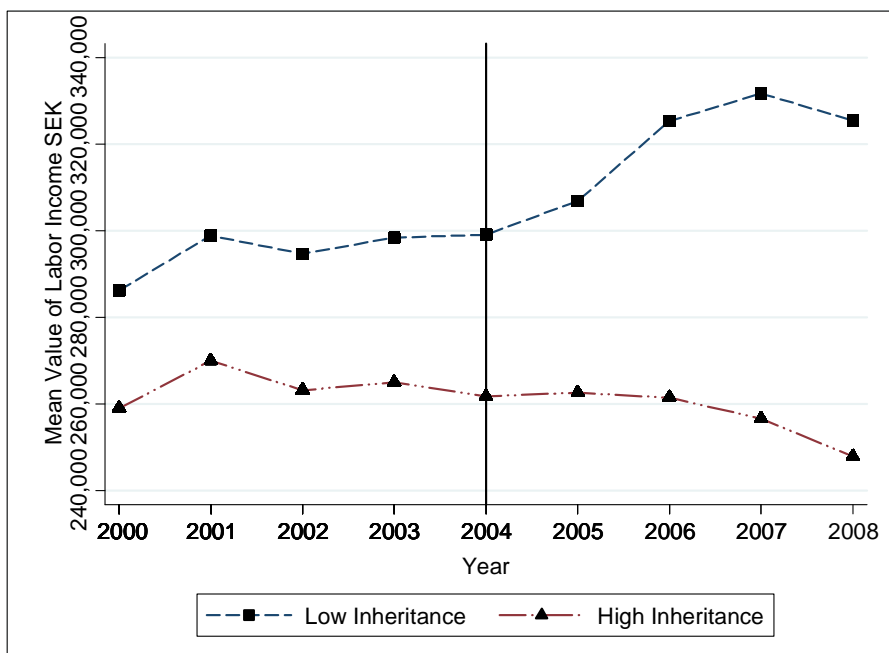


Figure 2: Annual labor income 2000–2008.

*Note.* The solid vertical line indicates the year when inheritance is received.

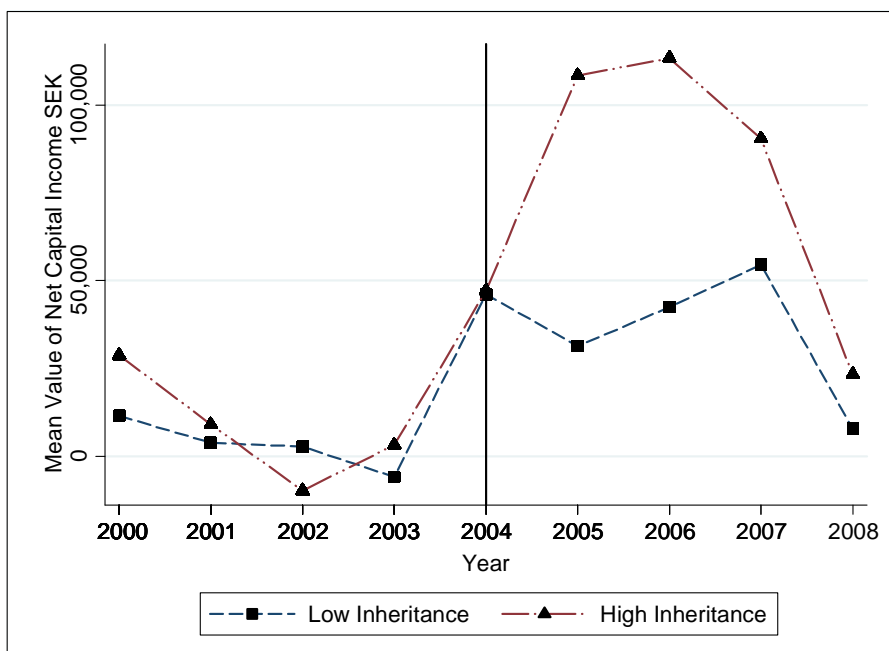


Figure 3: Average value of capital income 2000–2008.

*Note.* The solid vertical line indicates the year when inheritance is received.



the subsequent years followed by a dramatic fall in 2008. The difference between the two groups almost disappears as a consequence.

There are at least two plausible explanations for why capital incomes converge. The financial crisis in 2008 might have hit wealthier heirs harder. Those who inherited more may also have had a larger share of their wealth invested in assets that yield little or no cash flow, e.g., residential real estate.

It is clear that the two groups follow the same trends in labor and capital income in the years before the inheritance was received. This is, however, not a formal test. The observed differences during the post-inheritance period may depend on differences in inherited amounts. But the observed differences may also depend on differences in the heirs' characteristics, characteristics that are correlated with the inherited amount. We need a more thorough econometric analysis to test this. We will, therefore, now turn to the empirical model.

### 4.3 Empirical model

It is reasonable to believe that heirs differ in unobservable characteristics, such as taste for leisure, risk aversion, early family upbringing, ability, etc. This may affect their behavior and, therefore, labor and capital income. Cross section analysis is likely to yield upward biased estimates of the labor and capital income responses if, for example, inheritances are positively correlated with unobserved income potential. We deal with this type of omitted variable bias by estimating models with individual fixed effects. This approach is similar in spirit to a difference-in-differences approach. Individuals inheriting different amounts serve as counterfactuals to each other in these approaches.

Suppose that an heir inherits more than another heir. It is crucial for our approach that these two heirs would have had the same labor or capital income had they inherited the same amount. This is necessary for obtaining unbiased estimates, at least conditional on a fixed effect. We cannot test this assumption. Figure 2 and Figure 3, however, indicate that this assumption is reasonable. The labor income trajectories of the high and low inheritance groups follow the same trends before the year when the inheritances are received. The same is also true for the capital income trajectories.

We start by running different versions of the following regression to explore the effects of inherited amounts on our dependent variables:

$$y_{it} = \sum_{t=2000}^{2008} \delta_t I_{i2004} + \beta X_{it} + \theta_t + a_i + u_{it}, \quad (6)$$

where  $y_{it}$  is individual  $i$ 's labor or capital income in year  $t$ . The sample period is  $t = 2000, 2001, \dots, 2008$ . These variables are both measured in SEK. The main variable of interest is the inherited amount,  $I_{i2004}$ . It is also measured in SEK. We interact the inherited amount with year indicators to estimate the annual responses of our dependent variables. The vector  $X_{it}$  includes controls for a third order

polynomial in age, and in some specifications, also individual or groups specific trends. We want to avoid that differences in age-related factors (e.g., human capital, labor market experience, and job tenure) bias our estimates.

We include a full set of year dummies,  $\theta_t$ , to capture time effects such as macroeconomic changes etc. Moreover,  $a_i$  captures individual fixed effects. This includes factors that are assumed to be constant over time and correlated with the inherited amount and the dependent variables. We also report results from specifications where we control for group-specific year effects or individual-specific linear time trends.

The idiosyncratic error  $u_{it}$  is assumed to be uncorrelated with  $I_{i2004}$ ,  $X_{it}$ , and  $a_i$ . We also assume the errors to be serially uncorrelated, and have constant variance for all  $t$ . The  $F$ - and  $t$ -statistics are valid under these assumptions. We can consistently estimate  $\delta_t$  as the annual marginal causal effect of an additional SEK inherited.

Our theoretical model suggests that the individual fixed effects capture responses to the anticipations of inherited amounts formed before the studied period. This implies that  $\delta_t$ ,  $t = 2000, 2001, \dots, 2003$ , captures responses to updated anticipations of inherited amounts. On the other hand,  $\delta_t$ ,  $t = 2004, 2005, \dots, 2008$ , captures responses to inherited amounts that were not anticipated at the time of the receipt. The annual effects  $\delta_t$ , in other words, underestimate the total causal effects if inheriting was anticipated before the studied period. We, therefore, also test for early anticipation effects by correlating the estimated individual fixed effects from Specification 6 with the inherited amounts.

## 5 Results

Subsection 5.1 presents the main regression results for labor income and several robustness tests. Corresponding results for capital income are in Subsection 5.2. The estimated coefficients of the inheritance-year interaction variables are the parameters of prime interest. We choose 2003, the year before the deceased passed away, as the reference year. The standard errors are clustered at the family level to correct for possible correlation between heirs from the same family. We present the results from the tests for pre-sample period anticipation effects in Subsection 5.3.

### 5.1 Labor income

Table 2, column 1, reports small and statistically insignificant effects of the inherited amount on labor income in the years before the receipt. This suggests that anticipation effects are either small or that the heir has adjusted her labor income already before the start of our sample period. We also do not find any statistically significant effects the year when the inheritance is received. We cannot, however, observe the exact dates when the estates are divided and the inheritances are transferred to the heirs. A possible explanation for the insignificant effect is that many

inheritances were received late in 2004 (or even early in 2005). These inheritances, therefore, had relatively small effects on the labor income in 2004. The estimated coefficients for the subsequent years 2005–2008 are economically and statistically significant. Heirs use some of their newly obtained wealth to increase their consumption of leisure as expected.

The estimated effect of the interaction term for 2005 is that labor income decreases by SEK 0.048 for each additional SEK received. The estimated responses are almost twice as large the following two years. The results suggest that it takes time for the responses to materialize in labor income.

We can approximate the effect on the life-time income of the heir assuming that the response in 2008 reflects a new optimum. The heirs are 50 years old on average and the inheritances are SEK 299,000 on average. The coefficient estimate for 2008, therefore, implies that average annual after tax labor income decreases by approximately SEK 14,400.<sup>29</sup>

Suppose that we also assume that heirs retire at age 65 and that there is no time discounting. A back of the envelope calculation, then, suggests that the impact on life-time labor income corresponds to about 72 percent of the inherited amount. The impact of the inherited amounts on labor income is large. We also see that the coefficients of the age variables are imprecisely estimated. A Wald-test, however, tells us that the age variables are jointly significant at the ten percent level.

There is a potential drawback with Specification 6. It does not allow for heirs to have different trends in labor income growth. This was also mentioned when discussing Figure 2. Average wage increases in Sweden were moderate during our sample period. Income growth may still differ substantially between socioeconomic groups.

We, therefore, also include interactions between year dummies and demographic variables in our empirical specification. The demographic variables are gender, marital status, presence of children, and place of residence. Column 2 in Table 2 presents the results. The estimates are very similar to the baseline estimates in column 1. Adding individual specific linear trends is an alternative way to control for heterogeneity in income growth. Column 3 in Table 2 displays the coefficient estimates. The exercise confirms our previous findings.

A related literature studies if receiving an inheritance enables the heir to become an entrepreneur by relaxing liquidity constraints. The results are clear-cut, inheriting increases the probability of starting a business (Holtz-Eakin et al., 1994b,a; Lindh and Ohlsson, 1996; Blanchflower and Oswald, 1998). It also improves the performance of existing businesses.

Our labor income measure does not include income from small businesses and sole proprietorships. This is a limitation. We have information about the heirs' self-employment income. Only about 12 percent of the heirs in our sample, however, report this type of income. It would, therefore, not be fruitful to perform a separate

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<sup>29</sup>We assume that the average heir pays 30 percent in labor income tax. This is a plausible assumption as most heirs in our sample were in this labor income tax bracket in 2004.

Table 2: Labor income.

	1	2	3
Inherited amount * Year:			
2000	-0.028 (0.029)	-0.026 (0.028)	-0.038 (0.027)
2001	-0.038 (0.029)	-0.039 (0.027)	-0.046* (0.027)
2002	-0.012 (0.019)	-0.016 (0.017)	-0.016 (0.018)
2003, reference			
2004	-0.026 (0.018)	-0.027 (0.018)	-0.022 (0.018)
2005	-0.048** (0.021)	-0.050** (0.020)	-0.040* (0.022)
2006	-0.092*** (0.029)	-0.094*** (0.029)	-0.080*** (0.030)
2007	-0.085*** (0.024)	-0.081*** (0.023)	-0.070** (0.027)
2008	-0.069*** (0.021)	-0.068*** (0.022)	-0.049* (0.028)
Age <sup>2</sup>	-139 (790)	476 (850)	-112 (779)
Age <sup>3</sup>	-0.290 (5.668)	-6.174 (6.354)	-0.491 (5.582)
Constant * 1,000	692 (1,240)	-80 (1,311)	3,658 (3,554)
Individual fixed effects	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Group specific time trends <sup>a</sup>	No	Yes	No
Individual specific time trends	No	No	Yes
Number of heirs	374	374	374
Number of observations	3,310	3,310	3,310

*Notes.* Standard errors are clustered on donor.

<sup>a</sup> Group specific dummy variables (taking value one if restriction in parenthesis is satisfied, and zero otherwise) are measured in 2004 and include gender (female), marital status (married), presence of children (>1), place of residence (Stockholm county), taxable real estate wealth (>0).

\* significant at the 10 percent level, \*\* significant at the 5 percent level,

\*\*\* significant at the 1 percent level

analysis of self-employment income.

Instead we create an earnings variable by summing self-employment and labor income. We would, on the one hand, expect self-employment income to contribute positively to earnings. The results in the studies discussed above support this. Managing a small business may, on the other hand, require substantial time and effort. This might, therefore, reduce labor income and, possibly also, earnings. We have estimated Specification 6 with earnings as dependent variable, see the Appendix B, Table B.1, column 1. The results are both quantitatively and qualitatively similar to those for labor income.

The labor income distribution is positively skewed. We have accounted for this by estimating the empirical model with log labor income as dependent variable. The results are similar to the main results in Table 3. Table B.1, column 2, in Appendix B reports the results.

We pointed out in Section 3.2 that it is the tax value of real estate wealth that enters our measure of the estate. This implies that the reported value of many inheritances in our sample is below the market value. Suppose that we adjust the inheritances to reflect market values rather than the reported values. How will our previous results change? We will now come closer to the true effect. The previously understated estate value, leading to upward biased coefficient estimates, is corrected.

We divide the tax value with the factor 0.75 to get the market value.<sup>30</sup> The difference between the market value and the reported value is then distributed equally between the legal heirs of each donor. We calculate the average inherited amount at market value to SEK 330,000. Estimating Specification 6 using the inherited amount at market value, however, yields results that are akin to those presented in Table 3. Table B.1, column 4, in Appendix B presents the detailed results.

We have also estimated the empirical models with different age restrictions, see Table B.1 and Table B.2 in Appendix B. It is reassuring that these estimations give virtually the same results as the baseline specification. (The statistically insignificant coefficient estimate for 2005 is the exception.) The results are also robust to specifications where we limit the sample to heirs with labor income within 1.96 and 2.57 standard deviations from the sample mean. We report the details in Table B.1, column 6, and Table B.2, column 1, in Appendix B.

We conclude that the inherited amount affects the heir's labor income during the four years following the transfer. We also find that the negative impact of the inherited amount is lasting. This is contrary to the findings of Joulfaian and Wilhelm (1994). Our findings suggest that the inherited amount is at least partly unanticipated. The succession rules guarantee each direct heir a share of the estate. Inheriting *per se* is, therefore, expected. Our results are, however, not consistent with the inherited amounts being perfectly anticipated.

The relatively large responses are also consistent with the theoretical prediction that high marginal tax rate create disincentive effects. There is an alternative

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<sup>30</sup>The tax value was supposed to be 75 percent of the market value until 2004.

interpretation of our results. Heirs may have been liquidity constrained prior to inheriting because as they cannot borrow against future inheritances. We, however, consider this explanation implausible. The deceased and their heirs in our sample are significantly wealthier than the averages. It has, therefore, been possible for many heirs to borrow directly from their parents. The parents may also have acted as creditors for regular loans.

## 5.2 Capital income

We proceed by estimating responses in capital income. Column 1 in Table 3 shows that there are no statistically significant effects during the pre-inheritance years or the year of the receipt. It is possible that the insignificant response in 2004 has to do with insufficient adjustment time as for labor income. We find that the response in 2005 is positive and statistically significant at 1 percent level. This is consistent with our predictions.

The coefficient estimate suggests that capital income in 2005 increases by 27.5 percent of the inherited amount. We consider this response non-trivial. A large immediate response is, however, reasonable if the heirs decide to realize capital gains. The undervaluation of the inherited amount will also tend to increase the estimated coefficient.

Let us turn to the years 2006–2008. The estimated coefficients are positive and statistically significant on at least the 10 percent level. Capital income responses first decline gradually and then drop sharply in 2008, the last year of the sample period. It is, however, difficult to say how important the financial crisis is for this drop without detailed information on the heirs' asset holdings. We also note that the coefficients on the age polynomials are both individually and jointly insignificant. The stock market return was unusually high during the post-inheritance years, except for 2008. We may, therefore, find estimates that are higher than otherwise if heirs' held stock.

Our estimates, nevertheless, suggest that the capital income of the heirs increased substantially up to three years after the transfers. Suppose that capital income in 2007 reflects a new steady state. The average inherited amount will lead to a SEK 38,000 increase in annual capital income net of tax.

We also extend our empirical specification to include group and individual specific time-trends. The second column and third column in Table 3 present the results. Allowing for group specific time-trends does not affect our quantitative or qualitative results, see column 2.

Including individual specific trends, however, gives different results. The estimated responses reported in column 3 are marginally lower than those in column 1. The coefficient estimates for 2007 and 2008, however, become statistically insignificant. These results reinforce the conclusion that the responses are temporary. There are large effects during the first two years after inheriting, then the effects decline. It is, however, difficult to separate temporary effects from effects from the financial crisis as the 2007 coefficient still is quite large.

Table 3: Capital income.

	1	2	3
Inherited amount * Year:			
2000	0.195 (0.154)	0.200 (0.155)	0.200 (0.164)
2001	-0.102 (0.111)	-0.098 (0.106)	-0.098 (0.109)
2002	-0.019 (0.024)	-0.013 (0.022)	-0.017 (0.026)
2003, reference			
2004	-0.013 (0.029)	-0.009 (0.032)	-0.015 (0.029)
2005	0.275*** (0.095)	0.280*** (0.095)	0.270*** (0.089)
2006	0.213*** (0.065)	0.210*** (0.065)	0.207*** (0.060)
2007	0.182* (0.098)	0.194* (0.102)	0.173 (0.106)
2008	0.048* (0.026)	0.049* (0.027)	0.037 (0.042)
Age <sup>2</sup>	75.090 (762)	880 (1,036)	60 (749)
Age <sup>3</sup>	-1.303 (6.655)	-6.801 (8.870)	-0.918 (6.539)
Constant * 1,000	-58 (1,046)	-1,308 (1,440)	-1,764 (6,203)
Individual fixed effects	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Group specific time trends <sup>a</sup>	No	Yes	No
Individual specific time trends	No	No	Yes
Number of heirs	374	374	374
Number of observations	3,310	3,310	3,310

*Notes.* Standard errors are clustered on donor.

<sup>a</sup> Group specific dummy variables (taking value one if restriction in parenthesis is satisfied, and zero otherwise) are measured in 2004 and include gender (female), marital status (married), presence of children (>1), place of residence (Stockholm county), taxable real estate wealth (>0).

\* significant at the 10 percent level, \*\* significant at the 5 percent level,

\*\*\* significant at the 1 percent level

It is possible that the rate of return on the inherited amount affects the estimates in Table 4. We follow Joulfaian (2006) and adjust capital income to reflect the change in wealth less the inherited amount to account for this. We first assume a uniform 4.67 percent rate of return on inherited assets. Our dependent variable becomes capital income excluding the return in the inherited amount. We then rerun Specification 6. Table B.2, column 7, in Appendix B reports the results from this regression. The results are almost identical to those presented in Table 4.

The distribution of capital income is less skewed than that of labor income. This is clear from the descriptive statistics in Table 1. We, still, want to test if our results are robust accounting for the influence of outliers. The estimation results using log capital income as dependent variable are both economically and significantly akin to those in Table 4. Table B.1, column 3, in Appendix B presents the results.

We have also varied the sample's age restrictions. The estimated coefficient for 2008 is sensitive to this. We find that the response is positive but not statistically significant when we estimate Specification 6 without any age restriction. This is also the case when we include all heirs older than 21. Table B.1, column 7, and Table B.2, column 2, in Appendix B report the detailed results. We obtain a similar result is obtained if we omit heirs with capital income deviating more than 1.96 standard deviations of the sample mean. This is not the case if we omit heirs with capital income deviating more than 2.57 standard deviations from the sample mean, see Table B.2, column 4, and Table B.2, column 6, in Appendix B. It is, nevertheless, reassuring that reasonable variations in specifications and sample definitions do not alter our main results except for 2008.

### **5.3 Anticipations formed before the sample period**

The results presented so far do not indicate any behavioral responses during the four years preceding the transfer. It is, still, reasonable to believe that some heirs during a long time may have had a fairly good idea about how much they will inherit and roughly when. They may, therefore, have adjusted their labor supply and savings behavior before the start of our sample period. We would potentially risk overlook important behavioral responses if this is the case.

The fixed effects parameters, however, would capture responses that are constant over time. Specification 6's fixed effects capture the impact of unobserved factors on the income level. The unobserved factors include the inheritance anticipations formed before the sample period.

We can, therefore, predict the pre-sample period anticipations by correlating the estimated fixed effects and the inherited amount. This procedure would, however, lead to biased estimates if the inherited amount correlates positively with the (unobserved) earnings potential. It is difficult to completely deal with this omitted variable bias by controlling for the heirs' observable characteristics. Our approach, however, yields conservative estimates of pre-sample period anticipation effects. The reason is that the expected bias goes in the opposite direction to the expected



Table 4: Anticipations formed before the sample period.

	1	2
	Dependent variable: Estimated individual fixed effect	
	Labor income	Capital income
Inherited amount	-0.0735** (0.032)	-0.001 (0.0347)
Age	105,526 (66,554)	9,540 (29,753)
Age <sup>2</sup>	-2,296 (1,657)	-460.2 (735.6)
Age <sup>3</sup>	18.84 (13.19)	5.335 (5.833)
Female	-71,237*** (24,529)	4,652 (20,568)
Married	8,549 (26,583)	4,409 (17,748)
Children	25,364 (27,708)	1,137 (12,125)
Stockholm	97,482*** (25,252)	1,835 (21,976)
Taxable real estate	108,220*** (23,03)	39,640*** (11,552)
Constant * 1,000	2,023** (849)	-227 (381)
Number of observations	374	374

*Notes.* Standard errors, in parentheses, are clustered on donor. Independent variables are measured in 2004, except Taxable real estate which is measured in 2003.

Female, Married, Children, Stockholm, and Taxable real estate are binary variables taking the value one if category indicated by name is satisfied, and zero otherwise.

\*\* significant at the 5 percent level,

\*\*\* significant at the 1 percent level

income responses.

We regress the estimated individual fixed effects from the regressions presented in Table 2 and Table 3 on the inherited amount. Column 1 in Table 4 reports a negative and statistically significant relationship between the inheritance amounts and the labor income fixed effects. It is a good idea to be cautious in interpreting the magnitude of this relationship. It, nevertheless, indicates that the more an heir has inherited, the lower is the level of the annual gross labor income already from the start of the sample period.

The second column provides the estimates of anticipations formed before the sample period for capital income. The correlation between the estimated fixed effects from the capital income model and the inherited amount is close to zero. It is statistically insignificant at all conventional levels. The level effects in capital income are, in other words, unrelated to the inherited amount. This contrasts the findings for labor income. It is difficult to tell if there is no effect for capital income

or that the estimates suffer from upward bias.

We obtain reasonable values for the estimated coefficients of the control variables in both regressions. This makes us more confident in the results. It remains, however, to find more definite answers.

## 6 Concluding remarks

This paper presents new evidence on the impact of inheritances on heirs' labor income and capital income. We use data from administrative records for a sample of Swedish decedents and their heirs. Our focus is on how the heirs' labor income and capital income evolve during the years before and after receiving an inheritance.

Labor and capital income responses will, according to theory, critically depend on whether the inheritance is anticipated or not. The behavioral responses to inheritances are likely to take place already before receiving the inheritance if it is anticipated. Inheritances that the heir did not anticipate will, on the other hand, generate responses after the inheritance is received.

The institutional context in Sweden makes inheritances easier to anticipate than, for instance, inheritances in the United States. Previous studies have not found any persistent significant effects on labor supply. We do find, in contrast, that inheritances decrease labor income. The negative effect is considerable in each of the four years following the transfer. The corresponding effects on life-time labor income are large relative to the inherited amount using some simplifying assumptions. We also show results supporting that heirs have reduced their labor income already before the start of our sample period.

There are several possible explanations for why we find larger and longer lasting responses in labor supply than those found reported by, e.g., Joulfaian and Wilhelm (1994). First, labor income taxes in Sweden are higher than those levied in the United States. This suggests that the opportunity cost of leisure is higher in the United States than in Sweden. Second, the heirs in our sample are significantly older than those in the studies from the United States. It is possible that older people have a higher propensity to reduce their hours of work. The results, nevertheless, indicate that the fears of Nobel and Carnegie are confirmed even for comparatively small inherited amounts.

We also find large positive responses in capital income during the three years following the transfer. There is a sharp decline in the response, however, in 2008. It is difficult to say to what extent this is a consequence of the financial crisis that started in 2008.

The temporary increase in capital income is sufficiently large to outweigh the corresponding loss in labor income. The heirs are better off both in terms of leisure and available financial resources. We believe that the large responses of capital income partly is because previously unrealized capital gains were realized. The high returns on the stock market during this period may also have contributed. It is, however, necessary to have more detailed data on the assets inherited and the

associated rates of return to draw more clear conclusions.

The results in our paper contribute to the literature in several ways. First, the results provide detailed information about dynamic effects of inheritances. This can be useful for policy makers who want to account for behavioral responses when designing optimal estate or inheritance tax schedules. One important implication is that inheritance taxes are likely to also increase revenue from labor income taxes. Revenue from capital taxes might, on the other hand, decrease, at least temporarily. Second, it is not sufficient only to look at labor supply responses when studying the welfare effects of inheritances. Third, it is important to study the effects of inheritances in different institutional contexts to better understand the impact on economic behavior. Our results differ from those of the previous literature which has been based on data from the United States.

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## Appendix A

Table A.1 presents summary statistics for the decedents. The average age at the time of death in the sample is 85 years. This is 7 years older than the average age at death in 2004. This suggests that the decedents were healthier than the overall Swedish population. There are fewer men than women among the decedents. This is expected since women live longer than men. We have sampled households where the deceased was widow(er), divorced, or unmarried.

The number of children of the deceased varies between 2 and 5. We also note that about 20 percent of the decedents in the sample paid wealth taxes in 2003. The corresponding share for the total population of Swedes aged 60 years and older was 6.3 percent in 2004. Furthermore, we see that the average estate in 2004 amounts to SEK 960,000 with a median value of SEK 600,000. The average value of labor income in 2003 was rather low. This reflects that the majority of deceased were retired in the last year of their lives. Moreover, we have information on the share in the sample with self-employment income. Self-employment income can be a good proxy for whether the estate constitute of a small business. Table A.1 reveals, however, that the share of decedents with self-employment income is negligible.

It is clear that the sampling strategy has resulted in a sample of deceased who were both healthier and wealthier than the deceased Swedes in 2004 in general. This is expected given the sampling criteria.

Table A.1: Descriptive statistics for the decedents.

	Mean	S.d.	Median
Age, 2004	85.3	8.8	86.5
Male, percent	31		
Widow(er), percent	81		
Number of children	2.45	0.69	2
Labor income, 2003	216.8	139.5	188.2
Capital income, 2003	27.7	100.6	5.3
Share with taxable wealth in 2003, percent	22		
Taxable wealth, 2003 <sup>a</sup>	2,608	1,300	2,117
Share with taxable real estate in 2003, percent	26		
Taxable real estate, 2003 <sup>b</sup>	858.3	763.7	669.8
Share with self-employment income in 2003, percent	0.5		
Estate, 2004	959.0	978.0	600.0
Number of decedents	194		

*Notes.* Amounts are measured in SEK thousands, price level 2004.

<sup>a</sup> value is conditional on having taxable wealth,

<sup>b</sup> value is conditional on having taxable real estate



## **Appendix B**

Table B.1: Sensitivity analyses.

	1	2	3	4	5	6	7
	Earnings <sup>a</sup>	Log transformation <sup>b</sup> Labor income    Capital income	Inheritances at market values <sup>c</sup> Labor income    Capital income	No age restrictions Labor income    Capital income			
Inherited amount * Year:							
2000	-0.0414 (0.0294)	-6.63e-08 (8.80e-08)	1.08e-06* (5.59e-07)	-0.0248 (0.0276)	0.163 (0.139)	-0.0318 (0.0276)	0.140 (0.135)
2001	-0.0493* (0.0288)	-1.03e-07 (7.37e-08)	2.79e-07 (3.56e-07)	-0.0339 (0.0280)	-0.102 (0.110)	-0.0449 (0.0282)	-0.111 (0.0825)
2002	-0.0160 (0.0182)	-6.55e-09 (6.51e-08)	2.10e-07 (3.62e-07)	-0.0112 (0.0162)	-0.0155 (0.0213)	-0.00556 (0.0159)	-0.0317 (0.0242)
2003, reference							
2004	0.0625 (0.0848)	-8.34e-08 (1.07e-07)	-1.11e-07 (4.56e-07)	-0.0263 (0.0175)	-0.0179 (0.0277)	0.00826 (0.0313)	-0.0236 (0.0301)
2005	-0.0548*** (0.0218)	-2.09e-07* (1.08e-07)	1.79e-06*** (4.16e-07)	-0.0410* (0.0208)	0.241*** (0.0915)	-0.0152 (0.0418)	0.236*** (0.0854)
2006	-0.101*** (0.0289)	-2.48e-07** (1.03e-07)	1.66e-06*** (4.48e-07)	-0.0865*** (0.0286)	0.190*** (0.0646)	-0.0834*** (0.0244)	0.198*** (0.0581)
2007	-0.0805*** (0.0244)	-3.52e-07** (1.40e-07)	1.49e-06*** (4.87e-07)	-0.0815*** (0.0235)	0.162* (0.0826)	-0.0803*** (0.0222)	0.155* (0.0846)
2008	-0.0655*** (0.0206)	-4.38e-07** (1.80e-07)	8.97e-07 (5.57e-07)	-0.0641*** (0.0202)	0.0414* (0.0242)	-0.0827*** (0.0227)	0.0375 (0.0262)
Age <sup>2</sup>	-517.0 (724.4)	-0.00148 (0.00641)	0.0212 (0.0175)	-97.48 (797.7)	42.46 (767.1)	-247.2 (462.0)	-234.9 (453.0)
Age <sup>3</sup>	2.474 (5.248)	9.23e-06 (4.35e-05)	-0.000186 (0.000122)	-0.586 (5.706)	-0.732 (6.683)	0.670 (2.934)	1.678 (3.020)
Constant	1.279e+06 (1.129e+06)	14.95 (10.35)	-20.31 (28.16)	625,382 (1.251e+06)	-13,116 (1.052e+06)	940,703 (-873,349)	414,917 (-834,186)
Individual fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of heirs	374	374	374	374	374	552	552
Number of observations	3,310	3,310	3,310	3,310	3,310	4,891	4,891

Notes: Standard errors are clustered on donor.

<sup>a</sup>Earnings is defined as the sum of labor and self-employment incomes. <sup>b</sup>Labor and capital incomes are in natural logarithms.

<sup>c</sup>Inherited amount is market value adjusted with respect to inherited taxable real estate wealth.

\* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level

Table B.2: Sensitivity analyses, continued.

	1		2		3		4		5		6		7	
	Heirs older than 21 <sup>a</sup>		Capital income		Incomes $\pm$ 1.96 s.d. from mean <sup>b</sup>		Capital income		Incomes $\pm$ 2.57 s.d. from mean <sup>c</sup>		Capital income		Adjusted capital income <sup>d</sup>	
	Labor income	Capital income	Labor income	Capital income	Labor income	Capital income	Labor income	Capital income	Labor income	Capital income	Labor income	Capital income	Labor income	Capital income
Inherited amount * Year:														
2000	-0.0327 (0.0279)	0.143 (0.137)	-0.00438 (0.0197)	0.0210 (0.0361)	-0.0114 (0.0193)	0.216 (0.152)	-0.0114 (0.0193)	0.216 (0.152)	-0.0114 (0.0193)	0.216 (0.152)	-0.0114 (0.0193)	0.216 (0.152)	-0.0114 (0.0193)	0.192 (0.154)
2001	-0.0455 (0.0285)	-0.112 (0.0833)	-0.0126 (0.0179)	0.000322 (0.0203)	-0.0156 (0.0176)	0.00959 (0.0173)	-0.0126 (0.0179)	0.000322 (0.0203)	-0.0156 (0.0176)	0.00959 (0.0173)	-0.0126 (0.0176)	0.00959 (0.0173)	-0.0126 (0.0176)	-0.104 (0.111)
2002	-0.00584 (0.0161)	-0.0318 (0.0245)	-0.00867 (0.0183)	-0.0265 (0.0281)	-0.00888 (0.0184)	-0.0191 (0.0243)	-0.00867 (0.0183)	-0.0265 (0.0281)	-0.00888 (0.0184)	-0.0191 (0.0243)	-0.00888 (0.0184)	-0.0191 (0.0243)	-0.00888 (0.0184)	-0.0196 (0.0240)
2003, reference														
2004	0.00824 (0.0317)	-0.0238 (0.0304)	-0.0147 (0.0166)	-0.0133 (0.0348)	-0.0223 (0.0181)	-0.0109 (0.0291)	-0.0147 (0.0166)	-0.0133 (0.0348)	-0.0223 (0.0181)	-0.0109 (0.0291)	-0.0223 (0.0181)	-0.0109 (0.0291)	-0.0223 (0.0181)	-0.0127 (0.0290)
2005	-0.0155 (0.0423)	0.241*** (0.0853)	-0.0422* (0.0218)	0.205*** (0.0558)	-0.0441*** (0.0216)	0.282*** (0.0942)	-0.0422* (0.0218)	0.205*** (0.0558)	-0.0441*** (0.0216)	0.282*** (0.0942)	-0.0441*** (0.0216)	0.282*** (0.0942)	-0.0441*** (0.0216)	0.275*** (0.0952)
2006	-0.0847*** (0.0247)	0.194*** (0.0592)	-0.0715*** (0.0254)	0.224*** (0.0731)	-0.0769*** (0.0253)	0.225*** (0.0634)	-0.0715*** (0.0254)	0.224*** (0.0731)	-0.0769*** (0.0253)	0.225*** (0.0634)	-0.0769*** (0.0253)	0.225*** (0.0634)	-0.0769*** (0.0253)	0.214*** (0.0650)
2007	-0.0810*** (0.0225)	0.159* (0.0854)	-0.0652*** (0.0212)	0.114** (0.0572)	-0.0728*** (0.0212)	0.197** (0.0976)	-0.0652*** (0.0212)	0.114** (0.0572)	-0.0728*** (0.0212)	0.197** (0.0976)	-0.0728*** (0.0212)	0.197** (0.0976)	-0.0728*** (0.0212)	0.184* (0.0980)
2008	-0.0868*** (0.0229)	0.0376 (0.0266)	-0.0632*** (0.0211)	0.0482 (0.0309)	-0.0708*** (0.0212)	0.0520* (0.0265)	-0.0632*** (0.0211)	0.0482 (0.0309)	-0.0708*** (0.0212)	0.0520* (0.0265)	-0.0708*** (0.0212)	0.0520* (0.0265)	-0.0708*** (0.0212)	0.0519* (0.0264)
Age <sup>2</sup>	-180.8 (516.8)	-217.5 (503.0)	-350.3 (750.5)	147.4 (356.4)	-366.0 (747.1)	-232.2 (728.9)	-350.3 (750.5)	147.4 (356.4)	-366.0 (747.1)	-232.2 (728.9)	-366.0 (747.1)	-232.2 (728.9)	-366.0 (747.1)	75.90 (762.9)
Age <sup>3</sup>	0.263 (3.260)	1.568 (3.296)	1.711 (5.227)	-0.782 (2.846)	1.824 (5.205)	2.235 (6.235)	1.711 (5.227)	-0.782 (2.846)	1.824 (5.205)	2.235 (6.235)	1.824 (5.205)	2.235 (6.235)	1.824 (5.205)	-1.029 (6.655)
Constant	815,084 (980,728)	382,51 (-936,121)	927,423 (1,187e+06)	-265,367 (-519,856)	959,779 (1,183e+06)	287,377 (1,007e+06)	927,423 (1,187e+06)	-265,367 (-519,856)	959,779 (1,183e+06)	287,377 (1,007e+06)	959,779 (1,183e+06)	287,377 (1,007e+06)	959,779 (1,183e+06)	-72,332 (1,046e+06)
Individual fixed effects		Yes		Yes		Yes		Yes		Yes		Yes		Yes
Year dummies		Yes		Yes		Yes		Yes		Yes		Yes		Yes
Number of heirs		551		359		359		359		365		365		374
Number of observations		4,882		3,183		3,183		3,183		3,237		3,237		3,310

Notes: Standard errors are clustered on donor.

<sup>a</sup>Heirs older than 21 in 2004. <sup>b</sup>The sample is limited to heirs with incomes within 1.96 s.d. from the sample means.

<sup>c</sup>The sample is limited to heirs with incomes within 2.57 s.d. from the sample means.

<sup>d</sup>Capital income is net of the return on the inherited amount. The annual rate of return on inherited capital (2000–2008) is 4.67 percent.

\* significant at the 10 percent level, \*\* significant at the 5 percent level, \*\*\* significant at the 1 percent level