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POOR LITTLE RICH KIDS? THE ROLE OF NATURE VERSUS NURTURE IN WEALTH AND OTHER ECONOMIC OUTCOMES AND BEHAVIORS

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Abstract

Wealth is highly correlated between parents and their children; however, little is known about the extent to which these relationships are genetic or determined by environmental factors. We use administrative data on the net wealth of a large sample of Swedish adoptees merged with similar information for their biological and adoptive parents. Comparing the relationship between the wealth of adopted and biological parents and that of the adopted child, we find that, even prior to any inheritance, there is a substantial role for environment and a much smaller role for pre-birth factors and we find little evidence that nature/nurture interactions are important. When bequests are taken into account, the role of adoptive parental wealth becomes much stronger. Our findings suggest that wealth transmission is not primarily because children from wealthier families are inherently more talented or more able but that, even in relatively egalitarian Sweden, wealth begets wealth. We further build on the existing literature by providing a more comprehensive view of the role of nature and nurture on intergenerational mobility, looking at a wide range of different outcomes using a common sample and method. We find that environmental influences are relatively more important for wealth-related variables such as savings and investment decisions than for human capital. We conclude by studying consumption as an overall measure of welfare and find that, like wealth, it is more determined by environment than by biology.

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Poor Little Rich Kids?
The Role of Nature versus Nurture in Wealth and Other Economic Outcomes and Behaviors[1]

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[1] This paper was previously circulated under the titles, "Poor Little Rich Kids? The Determinants of the Intergenerational Transmission of Wealth" as well as "Understanding Intergenerational Mobility: The Role of Nature versus Nurture in Wealth and Other Economic Outcomes and Behaviors." The data used in this paper come from the Swedish Interdisciplinary Panel (SIP) administered at the Centre for Economic Demography, Lund University, Sweden. This work was partially supported by the Research Council of Norway through its Centres of Excellence Scheme, FAIR project No 262675.

1. Introduction

Wealth inequality has increased dramatically in recent decades. Indeed, a recent study found that, in the U.S., the median net worth of upper-income families doubled in a 30-year period, but declined for lower-income families.[2] This fact, in conjunction with the release of Thomas Piketty's Capital in the 21st Century that highlights the intergenerational transmission of wealth as a key determinant of the nature of society more generally, has brought renewed interest in understanding the determinants of the intergenerational correlation in wealth (Piketty 2014). However, while there are many studies about the causes of the intergenerational transmission of education and income, much less is known about wealth, even though wealth may be a better measure of economic success than income or education.[3] Wealth directly influences consumption and investment possibilities, and greater wealth may enable parents to invest more in children's human capital by loosening budget constraints. Importantly, wealth is also much less equally distributed than education and income and is highly correlated across generations.[4]

Why is wealth correlated across generations? One possible pathway is through biology (nature) -- genetic inheritance of skills, attitudes, and preferences that correlate with higher wealth in each generation.[5] This channel suggests that intergenerational correlations arise because children from wealthy families are inherently more talented and would be wealthier than others even without the advantage of growing up with wealthier parents.

Another pathway is environment (nurture) -- wealthier parents may invest more in their

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[2] http://www.pewresearch.org/fact-tank/2014/12/17/wealth-gap-upper-middle-income/

[3] See Black and Devereux (2011) for a recent survey of the literature on intergenerational mobility.

[4] Charles and Hurst (2003) use U.S. data and find elasticities of about 0.37 for net wealth. More recently, Boserup, Kopczuk, and Kreiner (2014) and Adermon, Lindahl, and Waldenström (2018) have used register data (from Denmark and Sweden, respectively) and found strong positive intergenerational rank correlations ranging from 0.27 in Denmark to as high as 0.4 in Sweden, though these rank correlations are not directly comparable to the elasticity estimates of Charles and Hurst (2003) as the methodologies employed are quite different. Other related work includes Clark and Cummins (2014), Mulligan (1997), and Pfeffer and Killewald (2015).

[5] Evidence on genetic effects in risk aversion and risk-taking behavior is found in Cesarini et al. (2010), Kuhnen and Chiao (2009), Dreber et al. (2009), and Black et al. (2017).

children's human capital, help their children get better jobs, provide funding for business start-ups, give financial gifts, or affect child preferences or attitudes. This channel suggests that intergenerational correlations arise through opportunities provided by the environment the child grows up in, and any child given these opportunities would benefit. And these two forces may interact, with environmental effects depending on biological endowments. The nature-nurture distinction is of great importance for our perspective on the intergenerational wealth correlation, as appropriate policy to address the high level of wealth inequality relies on an understanding of the underlying causes.[6] In this paper, we attempt to disentangle the role of nature versus nurture and the role of nature/nurture interactions in the intergenerational transmission of wealth.

It is difficult to distinguish between nature and nurture, however, because most children are raised by their biological parents. We disentangle the role of nature versus nurture in the intergenerational transmission of wealth using adoptees; adoption allows us to examine the effects of environmental factors in a situation where children have no genetic relationship with their (adoptive) parents. We estimate how the wealth of adoptive children is related to that of both their biological and adoptive parents (and, in some specifications, to interactions between them).[7] To do so, we use Swedish administrative data on the net wealth and other characteristics of a large sample of adopted children born between 1950 and 1970 merged with similar information for their biological and adoptive parents--as well as corresponding data on own-birth children (children raised by their biological parents).

We also ask how wealth differs from other outcomes. Several studies have distinguished

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[6] For example, a tax on parental wealth is likely to be less effective at improving intergenerational mobility if the intergenerational wealth correlation is predominantly due to nature rather than nurture. However, even if the intergenerational correlation was wholly due to nature, this does not imply that it could not be affected by policy.

[7] Note that the resources available to the biological parents could affect children through both genes and through in-utero investments, which are known to affect long-run outcomes. (See Almond, Currie, and Duque (2017) for a review of this literature.) Outcomes such as birth weight have been found to correlate with educational and labor market outcomes (Black et al., 2007, Figlio et al., 2014).

the role of nature versus nurture in the intergenerational persistence of outcomes such as education, income, and risk preferences. Given the importance of intergenerational persistence in wealth on long-run inequality in society, do the forces that drive intergenerational wealth transmission look similar to the forces driving the persistence of other economic outcomes such as income and education? In this paper, we attempt to provide a more comprehensive understanding of the broader literature. To do so, we examine the relative roles of nature and nurture (and nature/nurture interactions) across a range of variables—including some the literature has already considered such as education and income, and others that are new, such as savings rates and consumption--using a common sample and methodology.

A large body of literature in economics has used data on adoptees to disentangle the relative contribution of genes and environment to economic behavior.[8] These studies have typically used information on foreign-born adoptees, where the characteristics of the biological parents are unknown to the researcher, and have therefore not been able to compare the relative influence of biological and adoptive parents.[9]

However, a recent literature has taken advantage of the unique Swedish register data that identify both biological and adoptive parents. The seminal study by Björklund, Lindahl, and Plug (2006) studied the relative roles of nature versus nurture in the intergenerational transmission of educational attainment and earnings using cohorts born between 1962 and 1966. This was followed by papers using a similar strategy to study voting behavior (Cesarini, Johannesson, and Oskarsson,

[8] Another literature has compared fraternal and identical twins; given that both sets of twins grow up in the same environment but only identical twins share the same genes, differences in correlations across twin pairs can be attributed to different genes. Using this strategy but focusing primarily on savings behaviors, Cronqvist and Siegel (2015) argue that genetic differences explain a substantial fraction of the variation in savings propensities as well as wealth at retirement but find little role for shared environment. The twin approach relies on relatively strong assumptions about the similarities in environment and genetics across fraternal and identical twins; our approach using data on adoptees studies the intergenerational association and relies on an entirely different set of assumptions. The approaches should, thus, be seen as complements rather than substitutes.

[9] See Sacerdote (2010) for a survey of this literature.

2014), crime (Hjalmarsson and Lindquist, 2013), entrepreneurship (Lindquist, Sol, and Van Praag, 2015), health (Lindahl et al. 2016), and risk-taking in financial markets (Black et al. 2017). In general, these studies have found evidence that both characteristics of biological and adoptive parents are predictive of child outcomes, though to a varying degree across outcomes.[10] In addition to examining wealth, an important—if not one of the most important--elements of inequality, we also compare nature/nurture effects for a wide range of variables in order to obtain a more complete picture of the role of nature versus nurture, and nature/nurture interactions, on measures of children's long-run behaviors and well-being.

We find that, even before any inheritance has occurred, wealth of adopted children is more closely related to the wealth of their adoptive parents than to that of their biological parents. This suggests that wealth transmission is primarily due to environmental factors rather than because children of wealthy parents are inherently more talented. These results are not driven by one component of wealth, such as housing, as we see the same patterns when we disaggregate by type of asset. We also examine the role played by bequests and find that, when they are taken into account, the role of environment becomes much stronger.

When we compare the intergenerational transmission of wealth to that of other outcomes using a common sample and methodology, we find interesting differences. Human capital linkages between parents and children appear to have stronger biological than environmental roots. However, despite this, earnings and income are, if anything, more environmental. More directly wealth-related variables (the share of financial wealth invested in risky assets and the savings rate) are substantially environmentally driven, consistent with our finding that intergenerational

[10] Contemporaneous work by Fagereng, Mogstad, and Rønning (2015) uses Korean adoptees in Norway to determine the effect of environment on child wealth and asset allocation. Consistent with our own results, they find evidence that environment is important in the intergenerational transmission of wealth. An important advantage of our data is that we observe the characteristics of the biological family and can therefore contrast the size of the coefficient on adoptive wealth to that on biological wealth; this also enables us to test for nature/nurture interactions.

transmission of wealth, itself, is more related to nurture than nature.

Finally, when we examine consumption, which might be viewed as a summary measure of welfare that is less sensitive to temporary fluctuations than income or wealth, we find both biological and, somewhat larger, environmental influences.

Overall, our findings suggest that wealth transmission (particularly after bequests have been received) is highly environmental despite the more biological effects on human capital transmission. We conclude that biology is important for skill transfers but less important for wealth, as dynasties can transfer wealth across generations regardless of their skills and abilities.

The structure of the paper is as follows. In the next section, we describe the data and, in Section 3, we outline the econometric methodology we use to study wealth. Section 4 provides our estimates for the intergenerational transmission of wealth, where we consider various measures and functional forms for net wealth, and Section 5 presents robustness checks. We examine possible mechanisms of wealth transmission in Section 6. Section 7 then presents results for a wide set of variables to enable us to compare the role of nature and nurture across measures of human capital, earnings and income, investment behavior, savings rates, and consumption, and Section 8 concludes.

2. Data

We construct our database by merging several Swedish administrative registers. Our starting point is an administrative dataset containing information on all Swedish citizens born between 1932 and 1980. These data include information on educational attainment, county of residence, and other basic demographic information. To this, we merge data from the Swedish multigenerational register, where we can identify Swedish-born adoptees using information on both biological and adoptive parents of children.[11]

Our data on wealth come from the Swedish Wealth Register Data (Förmögenhetsregistret). These data were collected by the government's statistical agency, Statistics Sweden, for tax purposes between 1999 and 2007, at which point the wealth tax was abolished.[12] For the years 1999 to 2006, the data include all financial assets held outside retirement accounts at the end of a tax year, December 31st, reported by a variety of different sources, including the Swedish Tax Agency, welfare agencies, and the private sector including financial institutions, even for persons below the wealth tax threshold. Because the information is based on statements from financial institutions, it is likely to have very little measurement error, and because the entire population is observed, selection bias is not a problem.[13]

From the wealth register, we observe different categories of wealth. This includes the aggregate value of bank accounts, mutual funds, stocks, options, bonds, housing wealth, and capital endowment insurance as well as total financial assets and total assets. We also observe the individual assets themselves within the broad categories of wealth, which we combine with data

[11] We know the identity of biological fathers for only about 50% of adoptees. Previous studies that examined mother characteristics and behavior have found no evidence of bias due to missing fathers. See, for example, Björklund, Lindahl, and Plug (2006), Black et al. (2017), and Lindqvist et al. (2015). Our main analysis uses children for whom both the biological mother and father are known. In Section 5, we show our conclusions are robust to relaxing this restriction.

[12] During this time period, the wealth tax was paid on all the assets of the household, including real estate and financial securities, with the exception of private businesses and shares in small public businesses (Calvet, Campbell, and Sodini 2007). In 2000, the tax rate was 1.5 percent on net household wealth exceeding SEK 900,000. The Swedish krona traded at $0.106 at the end of 2000, so this threshold corresponds to $95,400. After 2000, the tax threshold was raised to SEK 1,500,000 for married couples and non-married cohabitating couples with common children and 1,000,000 for single taxpayers. In 2002 the threshold rose again, this time to SEK 2,000,000 for married couples and non-married cohabitating couples and 1,500,000 for single taxpayers. In 2005 the threshold rose once more but only for married couples and cohabitating couples, this time to SEK 3,000,000. Because the wealth tax was repealed in 2006, data for 2007 are not considered reliable; as a result, we limit our analysis to 1999-2006.

[13] In the case of foreign assets, individuals were required to report these themselves. Evidence suggests that unreported foreign assets likely represent a small fraction of total household assets. (Calvet, Campbell, and Sodini 2007)

on prices that we collect from third-party sources to calculate returns.[14] The wealth register also contains data on total debt and net wealth. Nonfinancial assets are collected from the property tax assessments and valuations are based on market prices.[15]

Because it is transferable across generations, our primary analysis focuses on non-retirement wealth in Sweden, which is principally held in real assets--primarily housing--and financial wealth, including cash, stocks, and bonds; however, we also test for the robustness of our results to the inclusion of accumulated pension wealth. Sweden has a mix of public and private pension schemes, and individuals are allocated to different pension systems depending on the public or private sector affiliation and the year of birth of the individual.[16] While we do not have a direct measure of total pension wealth, for parents, we can observe pension payments in the Income Register once they have retired. We use this information to estimate pension wealth (including both public and occupational pensions) in 1999 for all parents who we observe retiring by 2011 (the last year we observe pension payments). For the children, we observe accumulated public pension wealth as of December 2006 but do not observe private pension wealth; however, public pension wealth accounts for approximately 70% of pension wealth. We describe the details of the pension system and how we calculate our pension measures in Appendix 1. The descriptive statistics there show that accumulated pension wealth is very large relative to non-pension net

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[14] During the 1999-2005 period, banks were not required to report small bank accounts to the Swedish Tax Agency unless the account earned more than 100 SEK (about $11) in interest during the year. From 2006 onwards, all bank accounts above 10,000 SEK were reported. In our data, 47% of people do not have a reported bank account, which is consistent with Calvet, Campbell and Sodini (2007). Since almost everybody has a bank account (in surveys, the fraction of Swedes aged 15 and above that have a bank account has consistently been 99 percent (Segendorf and Wilbe, 2014)), the people who are measured as having zero financial wealth probably in fact have some small amount of financial wealth. We follow Calvet, Campbell, and Sodini (2007) and Calvet and Sodini (2014) and impute bank account balances for persons without a bank account using the subsample of individuals for whom we observe their bank account balance even though the earned interest is less than 100 kronor. Details are available in Black, Devereux, Lundborg, and Majlesi (2017). In practice, whether or not we impute small bank balances makes very little difference to the results.

[15] Statistics Sweden calculates tax-assessed property values using a hedonic housing price model, incorporating information on house characteristics as well as geography. Because of this, housing prices are measured with error.

[16] The retirement age is flexible and individuals can claim retirement benefits beginning at age 61.

wealth.

We measure years of schooling using the information on highest educational degree completed contained in the education register.[17] We measure labor earnings and income for our sample by using data from the Swedish Income Register (available from 1968 onwards). We define earnings as income from work including self-employment and sickness benefits. On the other hand, income includes earnings, but also taxable benefits like unemployment insurance and pensions as well as capital income and realized capital gains. For parents, earnings and income are averaged over a twenty-year period running from 1970 to 1990. For children, we take a three-year average around age 36. When calculating average earnings, we follow Bjorklund, Lindahl, and Plug (2006) by first excluding observations for which annual earnings is missing, below 1000 dollars, or obtained when the person is younger than 30 or older than 60 (we use equivalent restrictions when using income).

We measure consumption at the household level by applying a methodology detailed in Koijen, Van Nieuwerburgh, and Vestman (2014). They propose a measure of consumption that is essentially the residual from the household's budget constraint, where consumption is equal to the amount of money taken in (including income and returns on assets) less the amount spent or saved. (Details of the calculation are in Appendix 2). This calculation requires the detailed information on asset portfolios that we have in our data.[18] Because consumption can vary significantly by year

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[17] We follow the coding of Holmlund, Lindahl, and Plug (2011) and impute years of schooling in the following way: 7 for (old) primary school, 9 for (new) compulsory schooling, 9.5 for (old) post-primary school (realskola), 11 for short high school, 12 for long high school, 14 for short university, 15.5 for long university, and 19 for a PhD university education. Since the education register does not distinguish between junior-secondary school (realskola) of different lengths (9 or 10 years), it is coded as 9.5 years. For similar reasons, long university is coded as 15.5 years of schooling.

[18] Koijen, Van Nieuwerburgh, and Vestman (2014) validate this measure of consumption; to do so, they use a subsample of the Swedish wealth data to calculate this consumption measure and then match it to two other measures of consumption (including a more standard survey of individuals); when they compare their proposed measure to the more traditional survey measure, they find that, while the mean and median of the consumption distributions are similar, survey data overstate consumption of the bottom quintile of the distribution while understating consumption at the top. They also match their data to administrative data on car purchases and find that a large fraction of the individuals in the survey data on consumption fail to report car purchases, highlighting the benefits of the assets-based measure of consumption.

due to the purchase of durables, we average consumption across the 2000 to 2006 period for each household. We further use the consumption and income information to create a measure of the savings rate for each household, defined as 1 – (Consumption/Disposable Income) where disposable income is also averaged over the 2000 to 2006 period. Because consumption is fundamentally measured at the household level (and savings rates are calculated using consumption), we place an additional restriction on our sample that parents and children not live in the same household and only measure consumption for those years in which both parents are still alive. If parents are not living together in the same household, we average saving rates and consumption across both households.[19]

Stock market participation is defined as holding risky financial assets; these include stocks or mutual funds that include stock components. Like wealth, we measure these using both parents: The variables we consider are an indicator for risky market participation (whether either parent owns stocks or mutual funds with a stock component) and, conditional on participation, the share of financial assets held in these risky assets (we refer to this as the risky share). Market participation and risky share are measured on December 31, 1999 for parents and December 31, 2006 for children.

Sample Selection

For much of our analysis, we limit our sample to children born 1950-1970 with all applicable parents alive in 1999 and for whom we have information on schooling, income, and wealth.[20] In our analyses, we measure net wealth of the children in 2006 and net wealth of the

[19] This is a particular issue for biological parents of adoptees as very few of the biological mothers are in the same household as the biological fathers.

[20] Appendix Table 1 shows the distribution of adoptees by birth cohort. We have relatively few adoptees from the earliest cohorts because it is more likely that one of the adoptive or biological parents has died by 1999. There are fewer adoptees from the later cohorts as the number of domestic adoptions started to fall in the mid-1960s.

parents in 1999.

As we are interested in wealth as a measure of economic welfare, ideally we would measure lifetime wealth or typical wealth over the lifecycle. Wealth has benefits at any age but the nature of these benefits is likely to differ as people age.[21] In practice, we are constrained by data availability to study wealth of children aged around 45 and parents aged around 65.

The logic for restricting our sample to children born by 1970 and measuring their wealth in the latest possible year, 2006, is to avoid having very young people in the sample who have not yet had much opportunity to accumulate wealth. The average age of children in our sample is 44. This compares with an average age of 38 in Charles and Hurst (2003), 33 in Fagereng et al. (2015), 47 for the third generation in Adermon et al. (2018), and 34 for the second generation in Boserup et al. (2014). Later, we show that our estimates are not sensitive to the exact ages of the children at wealth measurement.[22]

We focus primarily on pre-bequest wealth of children. Since children are likely to be well into middle age when they receive bequests, pre-bequest wealth of children may better reflect their wealth for most of their lives. In order to avoid the issue of inheritances, we further restrict the sample so that at least one parent is alive in 2006 (for adoptees, we require that at least one adoptive parent be alive in 2006); however, we also examine the role of bequests on the intergenerational correlation by relaxing this constraint.

During the 1950-1970 period, private adoptions were illegal, so all adoptions went through the state.[23] In order to adopt a child in Sweden between 1950 and 1970, a family had to satisfy

[21] For young people, greater wealth may enable them to buy a house without having to save for many years; at middle-age, wealth may enable parents to pay college fees and accommodation costs for their children; at older ages, greater wealth may provide insurance against health shocks and other adverse consequences of aging.
[22] Research by Boserup et al. (2014) has documented the relative insensitivity of intergenerational wealth correlations to age of measurement using data from Denmark, while work by Adermon et al. (2018) using Swedish data finds evidence that correlations are attenuated when children's wealth is measured when the children are younger.
[23] See Nordlöf (2001), Bjorklund, Lindahl, and Plug (2006) and Lindquist, Sol, and Van Praag (2015) for more details.

certain requirements. The adoptive parents had to be married and be at least 25 years old, have appropriate housing, and be free of tuberculosis and sexually transmitted diseases. The adoptive father was required to have a steady income and the adoptive mother was expected to be able to stay home with the child for a certain period of time.[24] Overall, the adoption criteria meant that the adoptive parents were positively selected relative to the general population.

The state collected information on both the biological and adoptive parents; while it only required information on the biological mother, in many cases, social workers were also able to identify the biological fathers. While we do not observe how old the children were when they were adopted, aggregate statistics suggest that, at that time, about 80% of children were adopted in their first year of life (Bjorklund, Lindahl, and Plug, 2006).[25]

We have information on over 1.2 million children who are raised by their biological parents and 2598 adopted children for whom we have data available for both biological and adoptive mothers and fathers. Descriptive statistics for wealth and some other characteristics of our sample are shown in Table 1a. In the top panel, we show means for children, both biological and adoptive. In 2006, when their assets and education are measured, the average child age is 44 for biological children and 43 for adoptive children. On average, biological children have 0.4 of a year more education and hold slightly higher net wealth (634K SEK vs. 610K SEK).

In the second panel, we show means for biological parents, both parents who raised their own biological children and parents who gave their children up for adoption. The two types of parents are quite different in their characteristics, with biological parents of adoptees being much less wealthy and having fewer years of schooling.

[24] Prior to 1974, there was no parental leave to care for adopted children. However, from 1955, mothers of biological children had a right to 3 months of paid leave (SOU 1954).
[25] Upon turning 18, an adopted child has the legal right to obtain information from public authorities about the identity of his or her biological parents (Socialstyrelsen 2014). However, according to Swedish law, there is no legal requirement for parents to inform adopted children that they are adopted (SOU 2009).

The bottom panel of Table 1a shows descriptive statistics for adoptive parents. For adopted children, adoptive parents are, on average, older, wealthier, and better educated than the child's biological parents. Adoptive parents also appear positively selected when we compare them to biological parents who raise their own children, although the differences here are much smaller. Table 1b shows similar breakdowns when we look at the components of wealth. Again, adopted children hold slightly less wealth in each of the categories of wealth (except for other real estate). Biological parents of adopted children look significantly poorer across all components of wealth relative to biological parents who raise their child, while adoptive parents are wealthier across all dimensions.

3. Empirical Strategy using Wealth

Wealth in Sweden

Because we study the individual wealth of children, it is important to note that there are no tax incentives to transfer wealth holdings from one spouse to another. In the event of a divorce, in the absence of a prenuptial agreement, all assets are split equally among spouses. For wealth tax purposes, the value of jointly owned assets was split evenly between the two tax filers. Thus, there are no incentives for husbands and wives to strategically allocate assets between themselves in order to reduce their wealth tax bill.

Our main variable of interest is net wealth, which is constructed by subtracting total debts from total gross wealth. As our primary measure of net wealth, we construct within-cohort measures of parents' and children's rank within the wealth distribution. As discussed in more detail later, we base this choice on the fact that the relationship between child's rank and parent's rank is approximately linear. However, we also test the sensitivity of our conclusions to the choice of an inverse hyperbolic sine transformation of net wealth, as well as the untransformed value of net wealth (in levels).

Our main specification relates the rank of net wealth of an adoptee to the rank of net wealth of both his/her biological and adoptive parents. We estimate the following equation:

$$W_{ij} = \beta_0 + \beta_1 W_i + \beta_2 W_j + X\beta_3 + \epsilon_{ij} \quad (1)$$

where W, our main variable of interest, is the rank of net wealth, i indexes the biological family, and j indexes the adoptive family. X refers to the set of control variables including a dummy variable for the gender of the child, indicators for the region in which the parents lived in 1965, year-of-birth dummies for the child, as well as the cohort dummies for parents, where the cohort represents the average cohort of the two parents. To allow for non-linearities and nature/nurture interactions, we also estimate regressions of the following form (in some specifications we exclude the quadratic terms while continuing to include the interaction term):

$$W_{ij} = \beta_0 + \beta_1 W_i + \beta_2 W_j + \beta_3 W_i^2 + \beta_4 W_j^2 + \beta_5 W_i W_j + X\beta_6 + \epsilon_{ij} \quad (2)$$

We measure child wealth at the individual level but measure parental wealth as the total of the mother's and father's wealth; we also show estimates where child wealth is measured at the household level. For each child, we compute his/her rank in the distribution of child wealth for individuals born in the same year and so measured at the same age. Within an age cohort, ranks are normalized to lie between 0 and 1.[26] We use the child's rank within the entire distribution of their cohort throughout the analysis even when we are studying subgroups of children such as the sample of adoptees. We carry out the same exercise for parental wealth basing the cohort on the average cohort of the two parents.

Identifying Assumption

[26] Ranks are calculated as $[(i - 0.5)/N]$ where *i* denotes individuals sorted by wealth, and $i = 1,2, \ldots, N$.

A key assumption of our empirical strategy is that adoptees are randomly assigned to adoptive families at birth. While matching of children to adoptive parents was at the discretion of the caseworkers, the evidence from that period suggests that social authorities were not able to systematically match babies to families based on family and child characteristics (see Lindquist, Sol, and Van Praag 2015 for more details).[27]

If the random assignment assumption holds, the coefficients on the wealth of biological parents provide an estimate of the effect of pre-birth factors and the coefficient of adoptive parents provide an estimate of the effects of post-birth factors. The assumption will be violated if adoptees are systematically matched to adoptive parents that are similar to their biological parents. The fact that we can observe and control for the wealth rank of the biological parents mitigates these concerns, and previous studies using these adoption data have shown that, while children are not assigned randomly to adoptive parents, the resultant biases are likely to be small.[28] However, in a later section, we will examine this issue in more detail.

4. Results for Wealth

When considering the intergenerational correlation in wealth, the literature is agnostic as to the appropriate functional form. Research in the area has used a variety of transformations of net wealth, including levels, logs, the inverse hyperbolic sine transformation, and within-cohort ranks. When we examine the data, the within-cohort rank specification best fits the linear model; as a result, we use that as our preferred specification. However, in later analyses, we will show that our conclusions are robust to the choice of the functional form of net wealth.

Figure 1a plots the relationship between the within-cohort rank of net wealth of parents

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[27] While children could be adopted by relatives, in practice this was very rare (41 children, or approximately 1.5% of our sample). We drop these children from our sample.
[28] See, for example, the analysis in Björklund, Lindahl, and Plug (2006).

and children for the large own-birth sample using a local linear kernel regression with an epanechnikov kernel and rule-of-thumb bandwidth.[29] Importantly, we see that this relationship is approximately linear from around the 5th percentile to the 95th percentile. Consistent with the Swedish findings of Adermon et al. (2018), the slope is negative at the very bottom of the distribution and more steeply positive at the top. The declining slope at the bottom is driven by parents with large negative wealth. The increase in slope at the top is consistent with general findings of greater persistence in economic status at the very top of the distribution (Björklund et al. 2012). Figure 1b shows the equivalent picture when we drop the parents in the top and bottom 5% of their within-cohort distribution, and the linearity of the relationship becomes more pronounced.

Among adopted children, Figure 2 plots the within-cohort rank relationship between children and biological and adoptive parents, respectively. Here, we see similar patterns to the full sample. However, confidence intervals become much wider at the tails, and this is more pronounced at the top of the distribution among biological parents and at the bottom of the distribution among adoptive parents. This highlights the fact that biological parents are primarily negatively selected in terms of net wealth while adoptive parents are positively selected. When we use the trimmed data (where trimming is done on the full sample and not the subsample of adoptees), the relationship again becomes much more linear (Figure 3). It is also clear that the slope is steeper for adoptive parents than for biological parents.

Baseline Results

In Table 2, we report the regression results when we estimate equation (1) on the sample

[29] Adermon et al. (2018) also use this approach. An alternative, used by Boserup et al. (2014), is to plot average child rank against parental wealth percentile. The local linear kernel regression is more efficient and this is important given our sample of adoptees is not very large.

of own-birth children (top panel) and adoptees (bottom panel). As noted earlier, we include cohort dummies for parents and children, region dummies for where the parents lived in 1965, as well as the gender of the child in all specifications.[30] We show estimates for a variety of different measures of wealth.

Column 1 presents the rank-rank coefficient for own-birth and adopted children, respectively, for our baseline measure of net wealth that does not include pension wealth. Among own-birth children, the rank-rank coefficient is approximately 0.35. This implies that a one percentile increase in the position of parents in the wealth distribution is associated with just over one third of a percentile increase in the average position of their children. Among adoptees (bottom panel), we find that child's wealth is predominantly associated with that of adoptive parents and has a much weaker relationship with biological parents' wealth. The rank coefficient for biological parent wealth is 0.11 but that for adoptive parent wealth is 0.27.[31]

We saw in Figures 1 and 2 that the rank-rank relationship is approximately linear except in the tails of the parental wealth distribution -- for ranks up to the 5th percentile and in the very top of the distribution. Therefore, in Column 2, we drop cases with parental wealth in the top or bottom 5 percentiles of the within-cohort parental wealth distribution. This is particularly important in the adoptive sample, as biological parents are, on average, much poorer than adoptive parents. Not surprisingly given the figures earlier, these exclusions affect our estimates, with an increase in the effect of biological wealth and a decrease in the effect of adoptive wealth. Still, however, the

[30] Given wealth is measured in the same year for all parents and wealth is measured in the same year for all children, the cohort dummies also serve as age dummies. The estimates without these dummies are quite similar. This is what we would expect for the rank transformation as the ranks are computed by cohort.

[31] Adoptive parents might invest less or more in their adopted children than other parents. The former could occur if adoptive parents don't treat their children as well as they would if they were biological children; the latter could occur if adoptive parents are "better" parents than average -- adoptive parents must, for instance, be approved before being able to adopt and may have a particularly strong desire for children. By definition, we are limited in how much we can assess the unobserved differences between adoptive and other parents. However, there are 495 own-birth children of adoptive parents in our data. The estimated effect of parental wealth rank on their wealth rank is 0.35, which is the same as that for the full sample of own-birth children.

adoptive coefficient is substantially larger than the biological one, and this difference is statistically significant. The relatively weak relationship between biological parental wealth and child wealth is interesting, as it suggests that most of the reason for the intergenerational transmission of wealth is not because children from wealthier families are inherently more talented. Instead, it appears that, even in a relatively egalitarian society like Sweden, wealth begets wealth.

The baseline net wealth measure we use equals total assets less total liabilities and excludes pension wealth, as we consider it appropriate to measure wealth based on the resources available to the individual at a given point in time. These may be illiquid but should, in principle, be transferrable to other people or available for use to purchase economic or non-economic services. An alternative approach would be to include accumulated pension wealth in our measure. In Columns 3 and 4 we redo the analysis using a measure of net wealth that includes pension wealth, both with and without trimming (column 4 has the trimmed estimates).[32] We find that including pension wealth reduces the intergenerational rank correlations for both biological and adoptive parents. Indeed, the biological correlation now becomes small and borderline in statistical significance. Our overall conclusion of stronger nurture rather than nature effects remains.

In Column 5 of Table 2, we measure child wealth at the household level (excluding pensions). Because household sizes can vary, we report estimates with controls for family size and an indicator for whether the child is married (these controls have very little impact on the estimates). Consistent with positive but imperfect assortative mating, the nurture coefficient is a little smaller than when we measure child wealth at the individual level, but the conclusions are

[32] Because we do not have information on pension wealth for all parents (because some of the younger parents have not retired by 2011 so we do not observe the pension payments they receive), we have verified that the baseline estimates on the sample of those with pensions are similar to those for the whole sample.

similar.[33]

We next consider whether these relationships are the same for sons and daughters. We do not have a strong prior in terms of whether adoptive or biological relationships should be stronger for boys or girls. In Columns 7 and 8, we report the estimates for our preferred specification where we use net wealth (without pensions) and exclude children whose biological or adoptive parents have net wealth in the bottom or top 5% of the rank distribution. While the biological coefficient is larger for boys than for girls and the environmental effect is larger for girls, the differences are not statistically significant, suggesting there is not much evidence for gender differences in the nature/nurture split.

Inheritances

Piketty and Zucman (2014, 2015), among others, show that inheritances have important effects on the distribution of wealth. We next consider the potential role of inheritances in understanding intergenerational correlations in wealth.

In Sweden, as in the United States, when a spouse dies their assets automatically transfer to the surviving spouse. Because we have restricted the sample so that at least one parent is alive when child wealth is measured in 2006, we are unlikely to have captured bequests. To test the potential role of inheritances, we remove this restriction and allow the degree of intergenerational transmission to vary depending on whether both parents have died by 2006. If this is the case, it is likely that the child has received an inheritance in the interim. To estimate the potential effect of inheritances, we add a dummy variable for whether both parents are deceased in 2006 plus an interaction of this dummy variable with adoptive parental wealth.[34] The estimates are in Table 3.

[33] Charles, Hurst, and Killewald (2013) show that, in the U.S., wealthier individuals are likely to marry wealthier spouses.
[34] We assume that biological parents of adoptive children will not have bequest motives for the children they gave up.

While we have added just more than 100 extra adoptive families to the sample, we still find a statistically significant interaction effect of 0.28 in the trimmed sample (0.23 in the untrimmed sample). This suggests that the rank correlation with adoptive parent wealth increases from 0.23 to 0.51 once inheritances are included.[35] This large effect is consistent with the findings of Adermon et al. (2018) who use wealth and inheritances data and find that inheritance is an important component of the intergenerational wealth elasticity in Sweden.

Non-Linear Effects and Nature/Nurture Interactions

We have thus far assumed that the effects of biological and adoptive parents are independent of each other. However, this may be an oversimplification if there are nature/nurture interactions, one building on the other.[36] In Table 4, we present results for non-linear models where we allow for an interaction between biological and adoptive parents. First, in the top panel of Table 4, we allow for a quadratic effect of parental wealth rank for the large sample of own-birth children. We find that the relationship is convex, with the rank-rank relationship becoming stronger at higher parental wealth ranks. In the bottom panel of Table 4, we report both linear and quadratic models for adoptees and allow for interactions between biological and adoptive parental wealth. Our primary interest is in the interaction term; we find that, while always positive, and sometimes sizable, it is never statistically significant. To increase statistical power, we also relax our sample restriction that biological fathers are known and we use only mother's wealth to construct the wealth ranks in order to increase precision. However, the interaction terms remain

[35] There was an inheritance tax in Sweden until December 2004 when it was abolished. When it was in effect, heirs paid a progressive tax rate of between 10% and 30% on inheritances above a 70,000 SEK deductible (about $8000). This would tend to reduce the inheritance effect that we find.

[36] There are mixed findings in the literature about these types of interactions – Björklund, Lindahl, and Plug (2006) find evidence of these interactions for mothers' education and fathers' earnings, although more recent work by Branden, Lindahl, and Öckert (2018) finds that nature/nurture interactions for education, earnings, and cognitive skills are either zero or non-positive. Lindquist, Sol, and van Praag (2015) find no evidence for these interactions when studying entrepreneurship and Black et al. (2017) find no evidence for them when studying risky investment behavior.

statistically insignificant and are sometimes negative. (See Appendix Table 3.) Overall, we conclude that there is little evidence of nature/nurture interactions in the transmission of parental wealth, although we have limited statistical power to identify these effects.[37]

5. Robustness Checks

Non-Random Assignment

As noted above, our identification strategy assumes that children are randomly assigned to adoptive parents; this assumption will be violated if adoptees are systematically matched to adoptive parents who are similar to their biological parents. The fact that we can observe and control for the wealth rank of the biological parents mitigates these concerns, and previous studies using these adoption data have shown that, while children are not assigned randomly to adoptive parents, the resultant biases are likely to be small.

The concern is that children may have been assigned to adoptive parents in such a way that there are correlations between net wealth of adoptive (biological) parents and *unobserved* characteristics of the biological (adoptive) parents that are correlated with child wealth after controlling for biological (adoptive) parents' wealth (in our trimmed sample, the correlation between net wealth rank of adoptive and biological parents is 0.075).

As a test, in Appendix Table 2, we follow much of the literature by showing that, conditional on the wealth rank of biological parents, the coefficient on the wealth rank of adoptive (biological) parents is not sensitive to adding controls for additional characteristics of biological (adoptive) parents. These controls include education and within-cohort earnings rank included separately for mothers and fathers. This suggests that our estimates are unlikely to be significantly

[37] We have also estimated nature/nurture interactions using a measure of wealth that includes pensions and found no statistically significant effects.

biased by non-random assignment. However, given that adding these variables has little effect on the explanatory power of the regression, this test has little power.

As a further robustness check, we conduct a Monte Carlo simulation based on the observed data to illustrate the bias induced by non-random assignment. Instead of random assignment, the simulation assumes that the adoption agency chooses adoptive parents that are similar to the biological parents. The methodology and results are discussed in detail in Appendix 3, but again we conclude that the bias is likely insignificant. The simulation highlights that a major advantage of having information on biological parents is that we can control for biological parental wealth in our specifications. To the extent that the adoption authorities attempt to match children to parents who have similar characteristics to the biological parents, controlling for biological parental wealth will reduce any bias in the coefficient on adoptive parental wealth resulting from non-random assignment.

Age at Measurement of Wealth

While we have chosen to measure wealth when the children were at their oldest (in 2006) to avoid them being too young to have accumulated wealth and when the parents were at their youngest (in 1999) in order to avoid issues of retirement, we next test the sensitivity of our conclusions to these choices.

By measuring child wealth in 2006, we are measuring it as late as possible in our data, and all children are aged at least 36. However, there is still the concern that, because it is relatively early in their career for many of these children, our measure of wealth may not be representative of their wealth at later ages. Figure 4a plots child wealth by age. There is a clear life-cycle pattern to wealth accumulation and our children (aged 36-56) are at ages at which wealth is still increasing. However, the fact that we are not measuring child wealth at its maximum does not imply that our nature/nurture estimates are biased, as the relative importance of these factors may not change much over these ages.[38] Appendix Figure 1a shows the distribution of within-cohort net wealth rank correlations estimated by child age in the large sample of biological parents and own-birth children. These figures suggest that the rank correlation is not sensitive to the age of the child at measurement.

Figure 4b plots net wealth by age for the full sample of parents with children born between 1950 and 1970. We see that net wealth increases between age 50 and 60 and then is remarkably stable from the late 50s to the mid-80s. Appendix Figure 1b shows the distribution of within-cohort net wealth rank correlations estimated by parent age in the large sample of biological parents and own-birth children. The estimates increase until about age 60 and then stabilize at about 0.35. These figures are reassuring, as they imply that the fact that many of our adoptive parents are quite old (the average age of adoptive parents is 68.6 in 1999) is unlikely to make their wealth levels unrepresentative. If anything, it may be that the biological parents of our adoptive children are a little young at measurement (average age is 59.6 in 1999); we show later that our results are robust to measuring their wealth in 2006 when their average age is 65.5.

In Table 5, we address these issues more formally by allowing for differential effects depending on the age at which wealth is measured. For children, we create a dummy equal to 1 if they are born between 1961 and 1970 (and so aged between 36 and 45 at wealth measurement) and we interact this with wealth of both types of parents. We include these interactions in Column 1; in this specification, the main effects can be interpreted as the effects of parental wealth for children aged between 46 and 56 at measurement. We see that the interaction effects are

[38] Research by Boserup et al (2014) using data from Denmark suggests that the intergenerational rank correlation of wealth reaches its long-term value by the time children are in their teens, suggesting measurement in the child's 30s is unlikely to be a problem. This may be particularly true because we use within-cohort rank as our measure of net wealth. Nybom and Stuhler (2017) show that, in the case of income, the intergenerational rank correlation is much more robust to age at measurement than is the intergenerational elasticity.

statistically insignificant and the main effects are similar to those in Table 2 Column 2.[39] This suggests that our estimates are not sensitive to the age of child at wealth measurement.

In Column 2 of Table 5, we similarly test whether the coefficient estimates depend on parental age at measurement. Given our findings above, we define a younger group of parents who are aged less than 60 at measurement and we interact this indicator with parental wealth. The main effects can then be interpreted as the effects of parental wealth for the parents aged 60 or more. Once again, the interaction terms are statistically insignificant and the main effects are very similar to earlier estimates. In Column 3, we include interactions with the age dummies for both parents and children and once again find insignificant interaction terms. It appears that the relative contribution of nature and nurture is largely invariant to the exact age at measurement of wealth of parents and children in our sample.

Another potential issue is that biological parents are on average 9 years younger than the adoptive parents in 1999 (average age of 59.6 versus 68.6). Given that there are life-cycle patterns in wealth-holding, our conclusions may be sensitive to this difference. To address this, we measure the wealth of adoptive parents in 1999 and biological parents in 2006, thus largely eliminating the age gap at measurement. Column 4 of Table 5 reports these estimates. Once again, we find that the estimates are similar to our main specification in Table 2 Column 2.

Components of Wealth

We next examine whether the patterns we observe are driven by one type of wealth (for example, real estate/housing wealth). Our primary measure (net wealth) equals gross wealth less debts. However, for the individual components, we do not observe debts, only assets. We consider

[39] We have also tried interactions using a continuous child age variable and found the interactions to be small and statistically insignificant.

the following categories of gross wealth -- financial wealth held in "safe" assets, financial wealth held in "risky" assets (stocks and mutual funds containing stocks), wealth held in the primary home, and other real assets. Figure 5 shows the allocation of gross wealth across the four categories. As expected, children hold a larger share of their gross wealth in residential housing than their parents do, as do biological parents of adoptees relative to other parents.

For each type of wealth, we again examine the relationship between the rank of that component within cohort for parents and children using the trimmed sample, where the trimming is based on net wealth as before (thus maintaining the same sample as in Table 2 Column 2). Column 1 of Appendix Table 4 presents our net wealth results (from Table 2), while Column 2 presents our results when the within-cohort rank of gross wealth for both parents and children is used; the intergenerational relationships for gross wealth are quite similar to those for net wealth, suggesting that it may be reasonable to look at gross wealth in different categories in the absence of measures of net wealth. For all the components of wealth (Columns 3-6), the estimates for adoptive parents are positive, indicating that if adoptive parents hold a greater amount of a particular type of asset, so do their children. Interestingly, the coefficients for each component are lower than for gross wealth, suggesting less intergenerational persistence in any particular asset class than in wealth as a whole. This is true for both biological and adoptive parents. Importantly, the net wealth findings are not being driven by one type of wealth holding.

Different Transformations of Net Wealth

Thus far, we have used the within-cohort rank as our measure of net wealth as this transformation fits the linear model best in our data. However, we next test the sensitivity of our conclusions to this choice. In addition to within-cohort rank, we consider the inverse hyperbolic sine transformation as well as the level of net wealth.

Charles and Hurst (2003) use a log transformation for both parent and child wealth. However, this requires excluding all cases in which either parent or child has negative net wealth, and many individuals have non-positive net wealth.[40] To avoid using a selected sample, we use the inverse hyperbolic sine transformation (IHS) rather than logs.[41] The IHS transformation of wealth, W, is $w = log\left(W + \sqrt{W^2 + 1}\right)$ and behaves as $\log(W)$ for positive values.

Appendix Table 6 presents the results when we estimate equation (1) using these alternative measures of net wealth as our variables of interest. The IHS estimates for own-birth children (Columns 1 and 3) suggest an intergenerational elasticity of about 0.25—the results are relatively constant whether the data are trimmed or not. Among adoptees, (Columns 2 and 4), we find coefficients of 0.08 on biological parents' wealth and 0.24 on adoptive parents' wealth, and these relative patterns change little when we trim the data (although the adoptive effect increases to 0.33).[42]

Columns 5-8 show the relationship between parental and child net wealth when wealth is simply reported in levels. The levels estimate among own-birth children is about 0.2 in the full sample but jumps to 0.3 when we exclude wealth levels in the bottom and top 5% of the distribution of ranks (Columns 5 and 7). This large change reflects the underlying non-linearities in the data. Finally, when we consider adoptees, the adoptive parent coefficient is 0.21 and the biological coefficient is 0.03 in the full sample; once we trim the data, the coefficient on biological parental

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[40] Appendix Table 5 provides a breakdown of the proportions of sample members who have positive and negative net wealth. In the sample of own-birth children, 25% have negative wealth. For adoptive children, this number is 31%. As discussed by Boserup et al. (2014), standard life-cycle theory would predict negative wealth for young persons with increasing earnings profiles. Unsurprisingly, the proportions with negative wealth are lower for parents, both because they are older and because we are adding the wealth of the father and the mother. Among parents of own-birth children, 9.4% have negative wealth; this percentage is 4.4% for adoptive parents and 26.1% for biological parents of adoptees. This provides further evidence that biological parents of adoptees are negatively selected.

[41] The IHS is advocated by Pence (2006) as a superior alternative to using logs when studying wealth data.

[42] Due to the nature of the transformation, IHS estimates vary depending on the units of wealth used but the general conclusions stand. For example, if wealth is measured in 1000 Krona rather than Krona, the IHS estimate for biological parents in the trimmed sample equals 0.1 and the adoptive estimate equals 0.4.

wealth almost triples to 0.09 compared with 0.22 for adoptive parental wealth. We place limited credence on the untrimmed estimates for the levels specification, however, given the sensitivity to outliers.[43] Overall, our conclusions of the greater importance of adoptive parent's wealth relative to that of biological parents are robust to the choice of specification for net wealth.

Missing Fathers

As described above, we are missing information on a substantial number of biological parents because the identity of the father was not recorded at the time of the adoption. To assess whether our results are sensitive to this missing information, we have run the regression estimating only the adoptive coefficient for all adoptees, regardless of whether the information for the biological father is present. The results, presented in Appendix Table 7 Columns 1 and 2, show that the environmental effects are similar in the less selected sample.

Other Robustness Checks

We report further robustness checks in Appendix Table 7. Column 3 presents the baseline results for the trimmed sample from Table 2 Column 2 for comparison. In Column 4, we consider whether our conclusions are sensitive to correlations between wealth and residence. It may be that the wealth of parents and children are correlated because both live in an area that has high wealth levels -- for example, they may both live in an area with high property values. To examine this, in Column 4, we add controls for county of residence of parents in 1999 and children in 2006. This has no effect on the estimates.

While our wealth data are high quality and unlikely to suffer from significant measurement

[43] We have tried implementing median regression, which is less sensitive to outliers, and found estimates for the level of biological and adoptive parental wealth that are similar to OLS, even when using the full untrimmed sample.

error, there could be transitory shocks to wealth that lead our estimates based on single years of wealth data to be misleading. Therefore, in Column 5 of Appendix Table 7, we measure child wealth as the average in 2004-06 and parental wealth as the average over 1999-2001. We find that the averaging makes no appreciable difference to the estimates.[44]

6. Why Does Parental Wealth Matter?

While we have established the relative importance of environment over nature for the intergenerational transmission of wealth, the exact mechanisms of wealth transmission are more difficult to ascertain.

Wealthier parents tend to be better educated and earn higher earnings--among adoptive parents, the correlation between wealth rank and earnings rank is 0.22 and that between wealth rank and average education is 0.28. Higher parental education and income could lead to the increased wealth of their children through, for example, teaching them about investment opportunities or providing the right opportunities in the labor market. However, as we saw in Column 3 of Appendix Table 2, the inclusion of controls for adoptive parents' education and within-cohort earnings rank, included separately for mothers and fathers, has negligible effects on the coefficients on adoptive parental wealth, suggesting that adoptive parental wealth is not simply proxying for other parental characteristics that correlate with child wealth.

In Table 6, we examine how parental wealth relates to other child outcomes that may affect child wealth. Wealthy parents may invest more in their child's education, which could then lead to higher child wealth accumulation--either directly through increased educational attainment or

[44] Given we only have wealth data for 7 years, we cannot follow some of the earnings literature that has compared estimates from earnings averaged over the whole life course to estimates using a smaller time span (e.g. Nybom and Stuhler, 2017). However, wealth is very highly correlated across years. Our conclusions are insensitive to using different years of data or averaging over all 7 years of wealth data, suggesting again that they are not driven by transitory shocks to wealth.

indirectly through higher earnings. Similarly, wealthy parents could help their children obtain better (high earning) jobs, either directly through networks or indirectly through investments in education. If so, we would expect positive relationships between adoptive parental wealth and child educational attainment, earnings, and income. We show the effects of parental wealth on these outcomes in the first three columns of Table 6. Interestingly, while the effect of adoptive parental wealth on these variables is positive, it is not very large and is smaller than the effect of biological parental wealth.

Wealthy parents may also affect the financial decision-making behavior of their children. Wealth of parents and children may be correlated because wealthy parents teach their children to save a larger fraction of their income, thereby leading them to accumulate more wealth. To examine this, we study the savings rate of the child's household.[45] In Column 4 of Table 6, we see that a child's savings rate rank is actually *negatively* related to adoptive parent's wealth; children of wealthy parents save less for a given level of disposable income, perhaps anticipating future gifts or bequests from their adoptive parents.

Another possible mechanism is through investment behavior. Wealthier parents may teach their children to invest their assets differently, which could over time lead to different levels of wealth accumulation.[46] To examine this, we calculate the within-cohort rank of the share of children's assets in each of four different categories: Safe financial wealth, Risky financial wealth, Residential wealth, and Other real estate wealth. We can also directly calculate the return on investment in financial assets using our detailed asset-level information on the securities held. We see in Columns 5 to 9 of Table 6 that, among adoptees, wealthier biological and adoptive parents

[45] Note that we have fewer observations for the measure of the savings rate as it is derived from consumption and we cannot calculate consumption for all households (see Appendix 2 for details).
[46] Fagereng et al. (2016) show that there is a mild positive correlation between the return on wealth of parents and children in Norway.

tend to have children who invest more in risky financial assets and have a higher return on their financial investments.[47]

Can these effects of parental wealth on various child outcomes "explain" the effects on child wealth? This is difficult to answer given the endogeneity of all these variables, but we can get some idea by adding controls for these child outcomes into the regression of child wealth on parental wealth and seeing what effect this has on the parental wealth coefficients. When we do this, we can "explain" almost 50% of the effect of the biological parent's wealth effect on children's wealth, while we are able to "explain" only about 28% of the adoptive parent's wealth effect.[48] Given that most of the environmental effect remains unexplained by earnings, savings rates, and investment returns, direct financial transfers from parents to children are a likely explanation for much of the environmental effect.[49] Unfortunately, we do not have data on financial transfers that would allow us to study this directly.

7. How Is Wealth Different?

Given the strong environmental component of the intergenerational transmission of wealth, how does this fit into our understanding of the role of environment in intergenerational mobility more broadly? We next provide a more comprehensive picture of the role of nature versus nurture

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[47] This is consistent with the findings of Charles and Hurst (2003) as well as recent research of our own showing that financial risk-taking has both nature and nurture components (Black, et al, 2017).

[48] Note too that this 28% figure reflects what we can account for in a mechanical sense; it does not imply that we have unearthed causal pathways. For example, the reduction in the adoptive coefficient when we include child's asset allocation does not necessarily result from a higher return on investment for the child. It could just reflect the fact that wealthier people tend to have higher portfolio shares in risky financial wealth and in non-residential real estate and so these variables, in part, proxy for child wealth.

[49] Inter-vivos transfers from adoptive parents to their children after 1999 (when parental wealth is measured) will show up in the measured wealth of both parents and children, prior to 1999, it will appear in only the children's wealth. Conceptually, inter-vivos transfers from adoptive parents to their children that took place before 1999 could lead us to estimate either a higher or lower environmental effect. If it is the relatively wealthy parents who give to already relatively wealthy children, this selection effect of who gives will tend to increase the positive correlation between the wealth rank of adoptive parents and that of their children. Offsetting this, any transfer will reduce parental wealth rank and increase child wealth rank, leading to a tendency towards a negative relationship. If the selection effect dominates, inter-vivos transfers will lead to larger environmental effects.

in intergenerational mobility by examining how this conclusion compares to those for other child outcomes. In this section, we examine how the wealth results compare to estimates for a variety of characteristics and outcomes, some previously considered in other papers using adoption data, but using a common sample and methodology. To ensure comparability with our wealth estimates, we impose the same sample restrictions that we used in the wealth analysis.

Intergenerational correlations can arise for a number of reasons. These include pathways related to genetics (nature), such as genetic transmission of abilities (e.g. IQ) and /or preferences (e.g. time preferences and attitudes towards risk), as well as pathways related to environment. Environmental factors (nurture) can include parental investments in children (through time or resources), parental influences on behavior through role model effects or imitation, parental non-financial assistance in labor or financial markets such as information provision, contacts, networks, and career advice, or parental financial assistance such as gifts and loans. We expect the relative role of nature and nurture to vary across outcomes based on the relative importance of these channels for each particular outcome. For human capital, genetic transmission of IQ and time preferences are likely to be important, as are parental investments and role model effects. We might expect environmental influences to be more important for earnings/income than for human capital as career help from parents through contacts and networks becomes more relevant. For wealth, we expect a larger environmental effect as there is the additional channel of parents giving direct financial assistance to children, and this effect should become stronger after bequests. The relative role of nature and nurture for risky market investment should depend partly on the relative importance of genetic inheritance of risk attitudes versus the role of parents in providing information and shaping attitudes towards risk. Likewise for the savings rate, findings should depend in part on the relative importance of genetic transmission of time preferences versus raising parental influence on attitudes towards saving and on the child's financial situation.

We first examine educational attainment. When we consider the average years of schooling of parents (Table 7 Column 1), we find that child education is more closely related to the education of the biological rather than the adoptive parents. This finding—that nature is more important for human capital accumulation than is nurture—is consistent with the earlier work by Björklund, Lindahl and Plug (2006).

When we examine income and earnings ranks of fathers (Columns 3 and 4), we find that nurture is more important--the adoptive effect is about 50% larger than the biological one and the differential for income is similar.[50] We find similar but more precise estimates when we increase the sample size by not restricting to persons in our wealth sample (Appendix Table 8). For these variables, Björklund, Lindahl and Plug (2006) also find larger adoptive than biological effects but they find bigger differences, particularly for income.[51]

We next turn to the intergenerational correlation in investment behavior. The variables we consider are an indicator for risky market participation (whether either parent owns stocks or mutual funds with a stock component) and the share of financial assets held in these risky assets (Columns 4 and 5). When we study risky market participation, we find somewhat larger effects for adoptive parents than for biological parents, but the difference is not statistically significant. When we examine the share of financial wealth invested in risky assets, we focus on the intensive margin by restricting the sample to children who hold risky assets and controlling for indicator variables for whether the parents' have any investments in risky financial assets. We find that the adoptive effects are much larger than the biological effects; these estimates are consistent with our

[50] We study fathers' earnings and income because labor force participation was relatively low for mothers during this period (Björklund, Lindahl and Plug (2006) also focus on earnings and income of fathers).

[51] Our measures are somewhat different from theirs as we use ranks while they use logs. We have replicated their estimates using their sample period (1962-1966) and sample restrictions and we find estimates that are very close to theirs. These results are available from the authors upon request.

earlier work (Black et al. 2017) where we used a broader range of cohorts (1950-1980).

Finally, in Columns 6 and 7 of Table 7, we consider the intergenerational relationships for two variables that have not previously been studied in this literature – household savings rates and consumption.[52]

Since Friedman (1953), variation in the savings rate has been considered an important determinant of cross-sectional variation in wealth accumulation; as a result, understanding the determinants of an individual's savings rate provides insight into the causes of the substantial wealth inequality we observe in society. Lusardi (1998) shows that savings behavior is linked to individual characteristics including time and risk preferences. But are these preferences genetic or are they shaped by nurture as parental behaviors lead to transmission of their own preferences to their children? Importantly, when we study the savings rate rank of the household (Column 6), we find no evidence that it is biological but find a clear environmental effect, suggesting a strong role for raising parents in influencing savings behavior.[53]

Finally, we complete the picture by examining the intergenerational transmission of consumption—a summary measure of economic well-being—and distinguish the role of nature versus nurture. The results when we regress the rank of child's household consumption on that of the children's adoptive and biological parents are presented in Column 7. Given child consumption is likely to be strongly influenced by household size, in addition to the usual controls, we include an indicator variable for whether the child is married and a control for the family size of the child. Among own-birth families, our estimate is 0.18. Panel 2 presents the results from our

[52] As noted earlier, consumption can vary significantly by year due to the purchase of durables, so we average consumption across the 2000 to 2006 period for each household. Because consumption is fundamentally measured at the household level (and savings rates are calculated using consumption), we place an additional restriction on our sample that parents and children not live in the same household and only measure consumption for those years in which both parents are still alive. If parents are not living together in the same household, we average saving rates and consumption across both households.

[53] This result is quite different from Cronqvist and Siegel (2015) who argue that genetic differences explain a substantial fraction of the variation in savings propensities in a study of fraternal and identical twins.

sample of adoptees. The rank correlation for adoptive parents and children is 0.13, a little larger than that of 0.09 for biological parents, suggesting again a stronger role for environment over biology.

Nonlinearities and Nature/Nurture Interactions in Other Outcomes

Given the existing attention to non-linearities and complementarities in childhood investments (See, for example, Cunha, Heckman, Lochner, and Masterov 2006; Cunha and Heckman 2007), a natural next question is whether these effects are nonlinear and whether nature and nurture interact. Is the effect of adoptive parental income on child income, for example, higher when children have biological parents with relatively high income? In Tables 8a and 8b, we allow for quadratics and nature/nurture interactions in these models. While there are some non-linearities, consistent with our earlier findings for wealth, across all these variables there is very little evidence that nature/nurture interactions are important, with none of the interactions being statistically significant. This finding remains when we examine education, earnings, and income using the largest sample available (Appendix Table 9), suggesting the statistical insignificance is not purely due to lack of power in the wealth samples. This finding differs from Björklund, Lindahl and Plug (2006) but is consistent with the recent analysis of the Swedish register data by Branden et al. (2018) who find that nature/nurture interaction terms for education and income/earnings tend to be very small or negative.[54]

Taken together with our new estimates for wealth, these findings paint an interesting picture. In Figure 6, we plot the biological and adoptive coefficients for the variables we study,

[54] When we restrict the analysis to the exact same cohorts used in Björklund, Lindahl and Plug (2006), we are able to replicate their result of a positive nature/nurture interaction found in some specification. These results are available on request. Since Björklund, Lindahl and Plug (2006) only use cohorts born during the latter part of our study period (1962-1966), one interpretation is that the interaction may have become more important over time. Future research should revisit the issue of nature/nurture interactions using larger samples and in other settings.

also including the 45-degree line. Points above the line imply a larger adoptive coefficient; points below the line have greater biological coefficients. Human capital linkages between parents and children appear to have stronger biological than environmental roots, suggesting a potentially important role for innate ability. However, despite this, earnings and income are, if anything, more environmental, suggesting that persistence in earnings and income across generations is not pre-ordained but a function of opportunity at birth. Outcomes and behaviors that are more directly related to wealth, such as savings and investment behavior, are disproportionately environmental, with wealth including inheritances at the extreme. The difference in results between the transmission of wealth and human capital is striking, and the greater environmental contribution in the transmission of wealth is consistent with dynasties that transfer wealth and labor market advantages across generations regardless of abilities.

8. Conclusions

There is an extensive body of research documenting a correlation in wealth across generations, with limited understanding of the underlying causes of this relationship. Taking advantage of unique data from Sweden that link adopted children to both their biological and adoptive parents, we disentangle the role of nature versus nurture in the intergenerational transmission of wealth.

We find a substantial role for environmental influences with a smaller role for biological factors, suggesting that wealth transmission is not primarily because children from wealthier families are inherently more talented or more able. Instead, it suggests that pre-birth endowment is a relatively small factor in this intergenerational relationship.[55] We also find that the role of

[55] The adoption estimates remove transmission due to genetic factors as well as factors related to prenatal environment and the pre-adoption post-natal environment (if measured through biological parent's wealth). Hence, our finding of

adoptive parental wealth becomes much stronger when bequests are taken into account. Importantly, our conclusions are robust to a variety of specification and robustness checks.

We find that the intergenerational wealth relationship between children and their adoptive parents is unaffected by adding controls for adoptive parental earnings and education, suggesting that wealth is not just proxying for other parental characteristics. The relationship is only partly explained by child outcomes such as earnings, education, savings behavior, or investment returns. Indeed, the effect of adoptive parental wealth on child education and earnings are not very strong and savings rates are lower for children of wealthier parents. These results suggest that financial transfers from parents to children may be an important factor, even before children receive bequests. However, we have no information on financial gifts to study this directly.

We also provide a more comprehensive view of the determinants of intergenerational mobility more generally. In addition to wealth, we examine the role of nature versus nurture for intergenerational transmission of a range of variables that have been studied with the Swedish data before (years of schooling, earnings, income, risky market participation, and risky share) and two important variables that have not (savings rates and consumption). By using a common set of cohorts and methods, we determine that biology is relatively important for human capital accumulation but environment is more important for wealth-related variables such as investment behavior and savings rates and for wealth itself, particularly after bequests have transferred to children. We conclude that biology is important for skill transfers but less important for wealth, as dynasties can transfer wealth across generations regardless of their skills and abilities.

When we study consumption as an overall measure of welfare, we find that it is also more related to environment than to biology. As such, we conclude that environmental factors are

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a large environmental contribution to the overall wealth transmission is probably a lower bound of the total environmental contribution.

important for well-being. Overall, our results suggest that the children with wealthy, high-consuming parents benefit not just from good genetics but, more importantly, benefit from growing up with more advantages. As wealth and consumption become more unequally distributed, children from poorer families have fewer opportunities relative to children from wealthier families, suggesting a potential role for policy to equalize opportunities and to mitigate intergenerational disparities.

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Figure 1a: Within-Cohort Wealth Rank Relationship between Parents and Own-birth Children

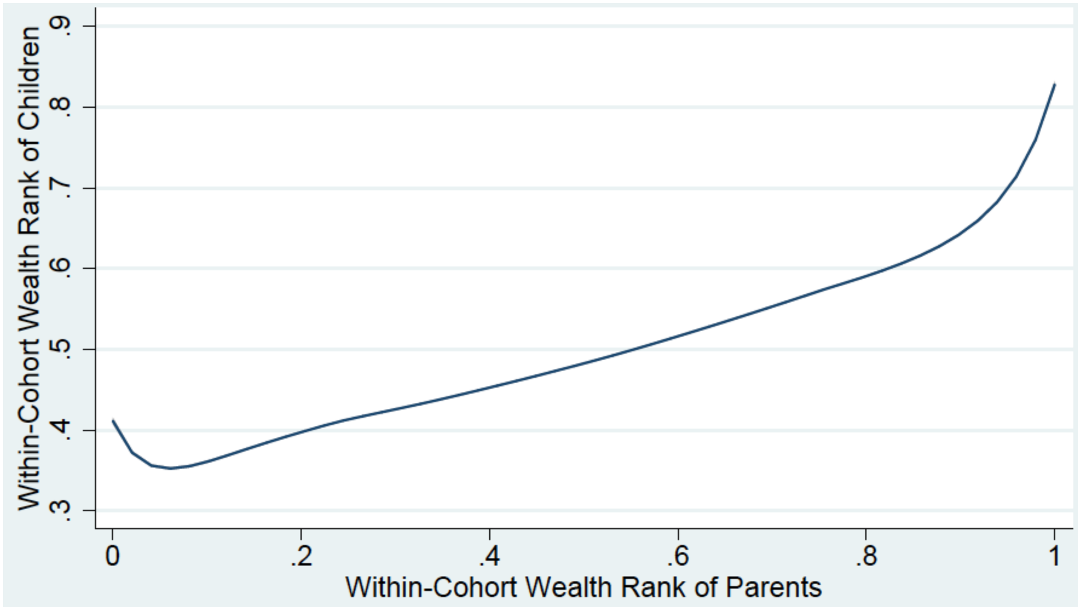
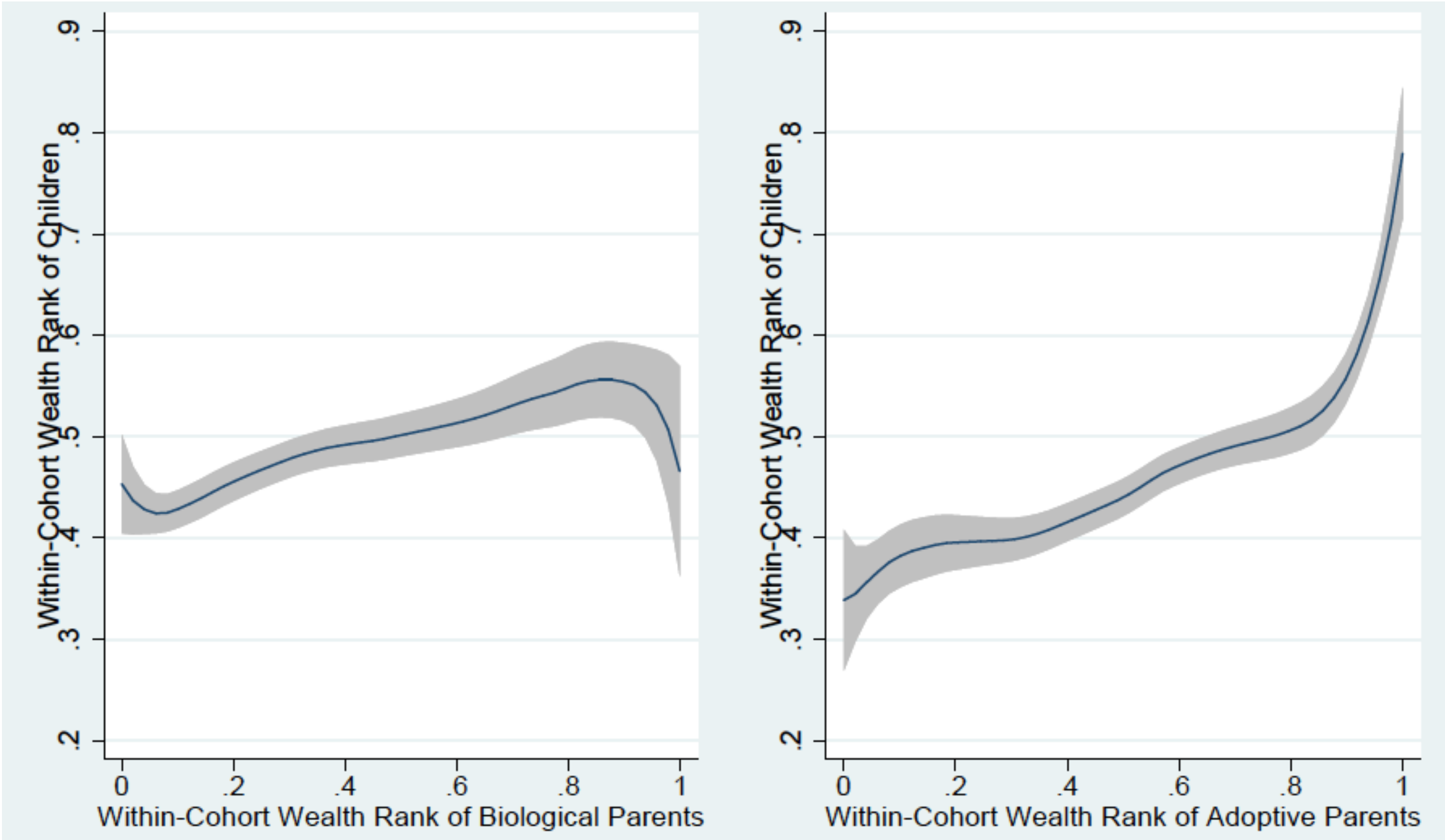


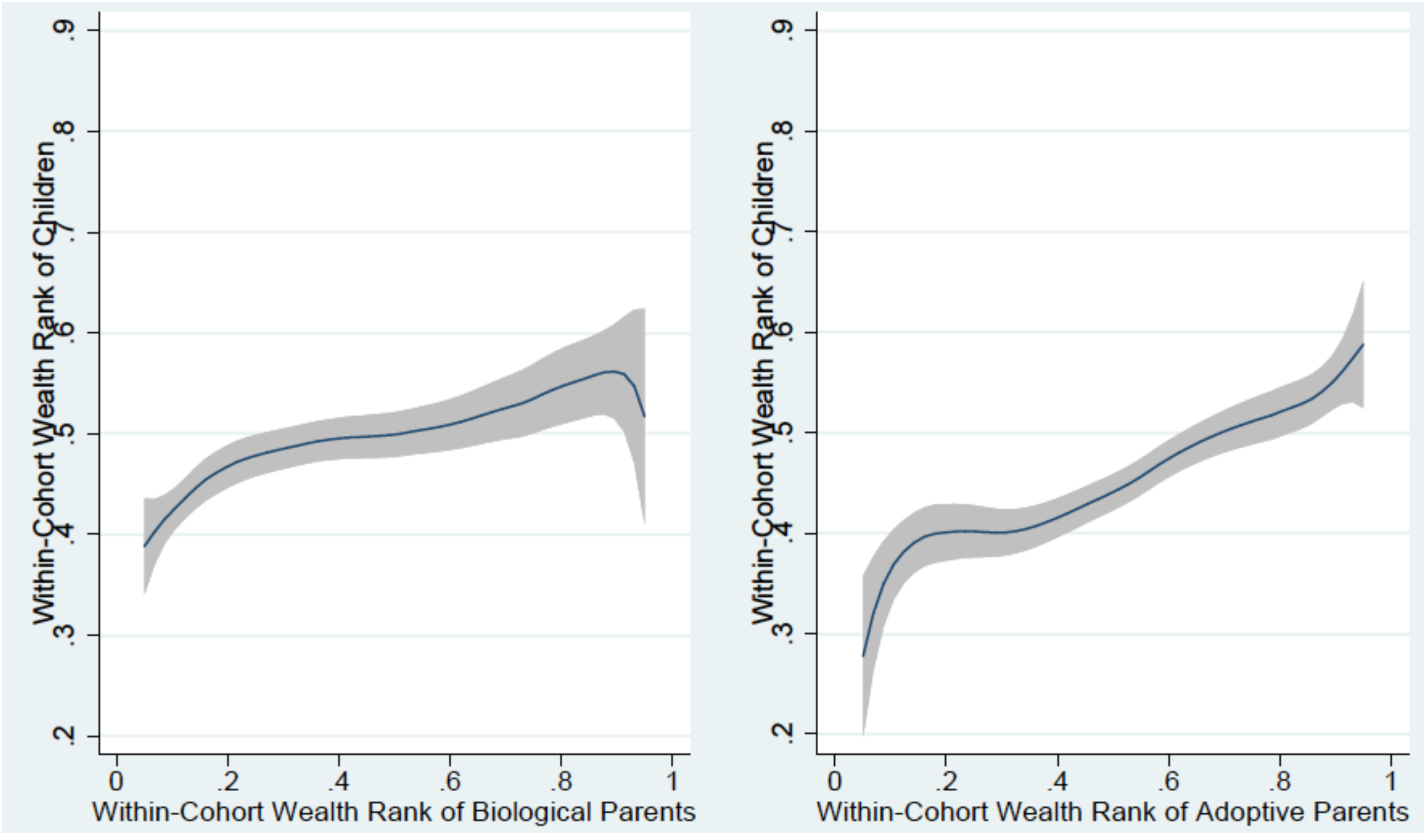
Figure 1b: Within-Cohort Wealth Rank Relationship between Parents and Own-birth Children
Parents in the top and bottom 5% of the within-cohort wealth distribution are dropped

Figure 2: Within-Cohort Wealth Rank Relationship between Adopted Children and Their Biological and Adoptive Parents



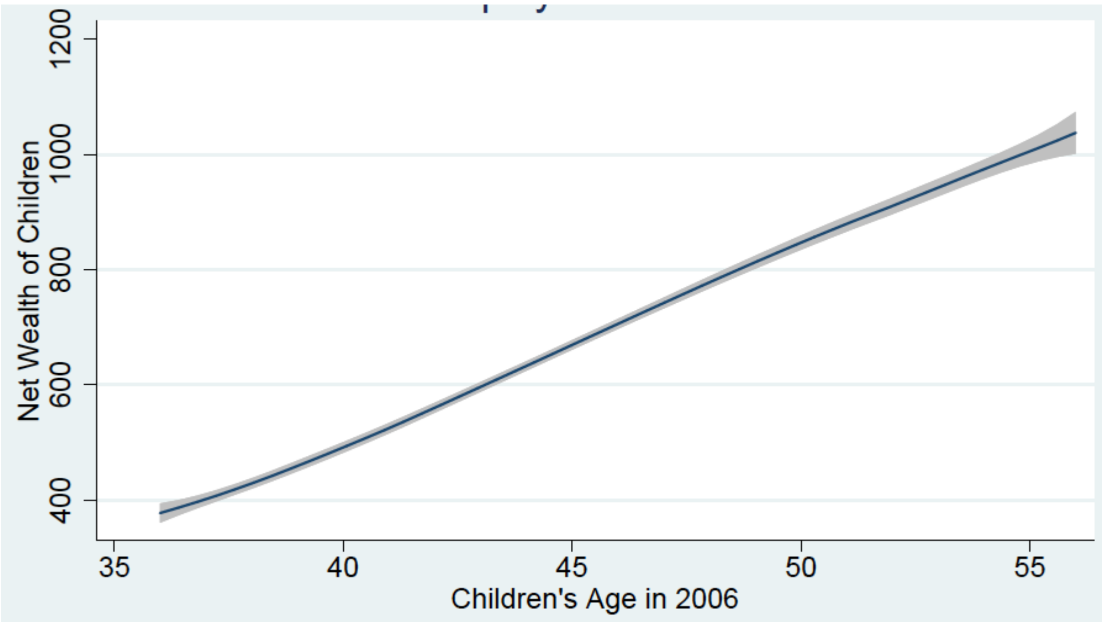
Notes: Line represents local linear approximation and shading represents the 95% confidence interval.

Figure 3: Within-Cohort Wealth Rank Relationship between Adopted Children and Their Biological and Adoptive Parents (Trimmed Sample)



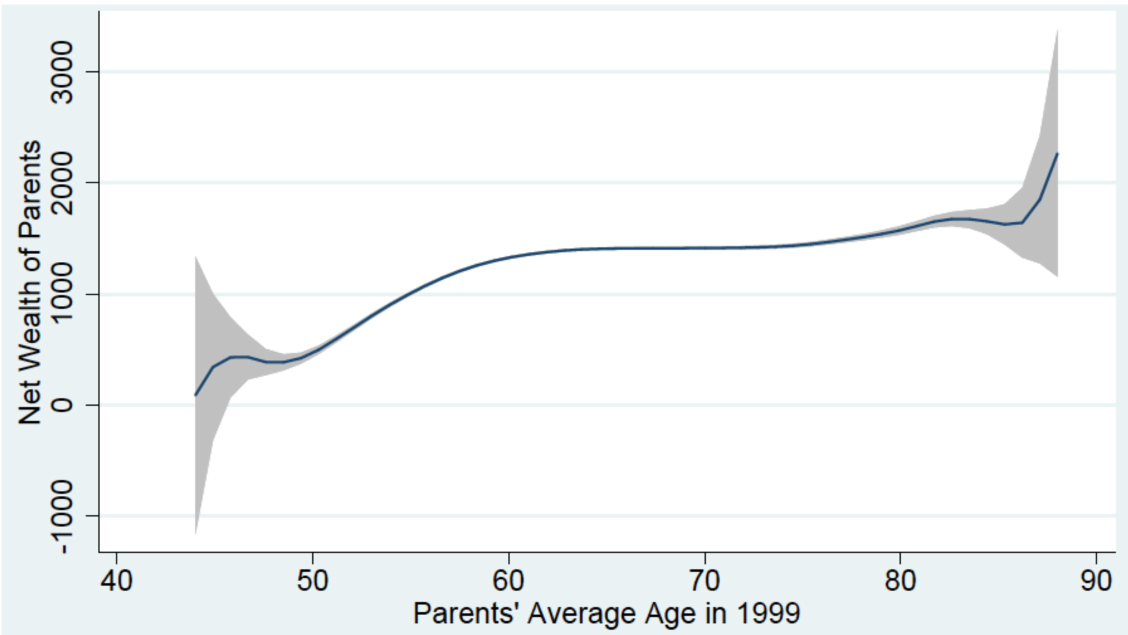
Notes: Line represents local linear approximation and shading represents the 95% confidence interval.

Figure 4a: Net Wealth by Age for Children Born between 1950 and 1970.



Notes: Child Net Wealth in 1000 SEK. Line represents local linear approximation and shading represents the 95% confidence interval.

Figure 4b: Net Wealth by Age for the Full Sample of Parents with Children Born between 1950 and 1970.



Notes: Parental Net Wealth in 1000 SEK. Line represents local linear approximation and shading represents the 95% confidence interval.

Figure 5: Distribution of Gross Wealth Across Four Main Categories

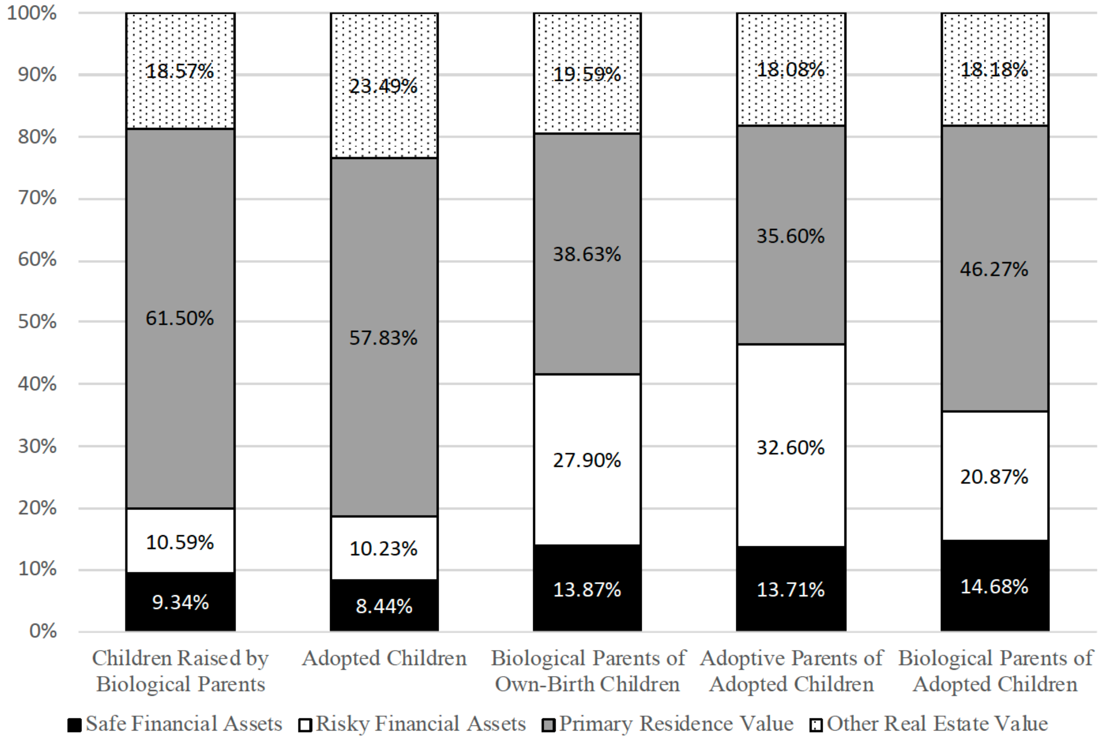
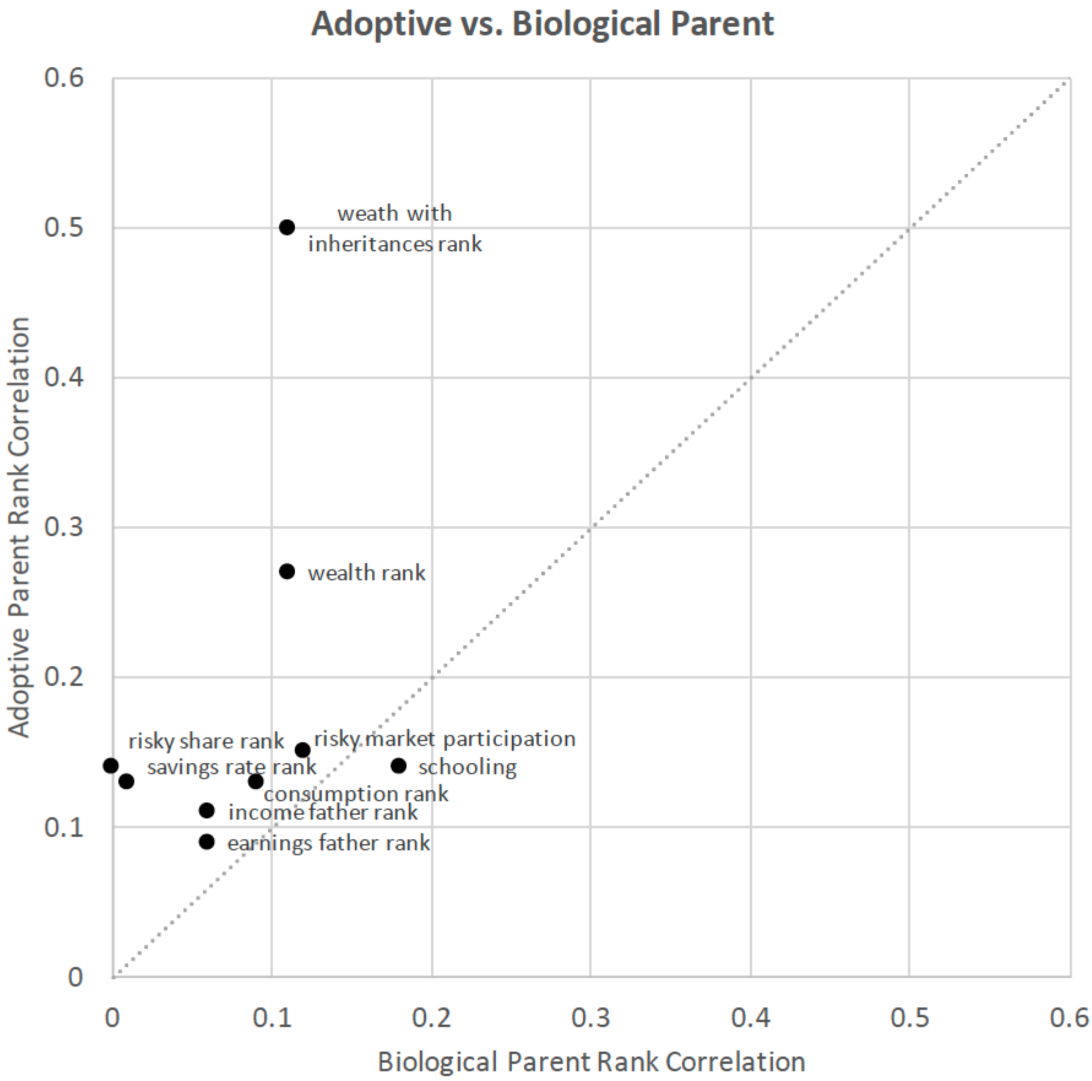
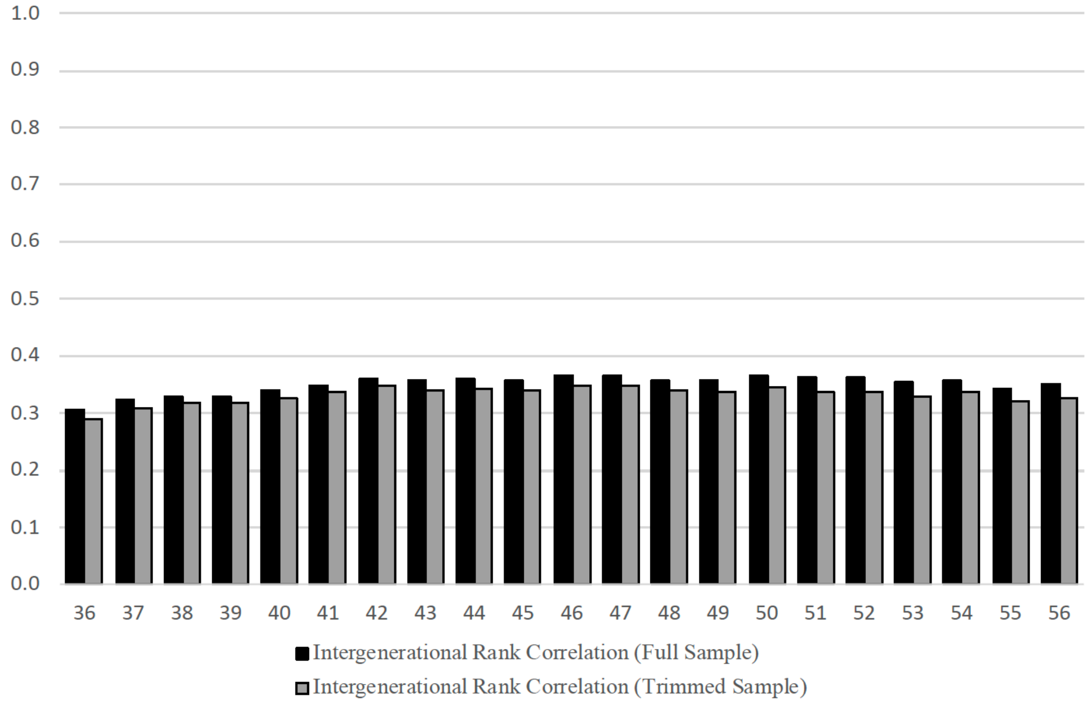


Figure 6: Coefficients on Adoptive versus Biological Parents



Appendix Figure 1a: Intergenerational Rank Correlations by Age of Child (Own-birth Children)



Appendix Figure 1b: Intergenerational Rank Correlations by Age of Parent (Own-birth Children)

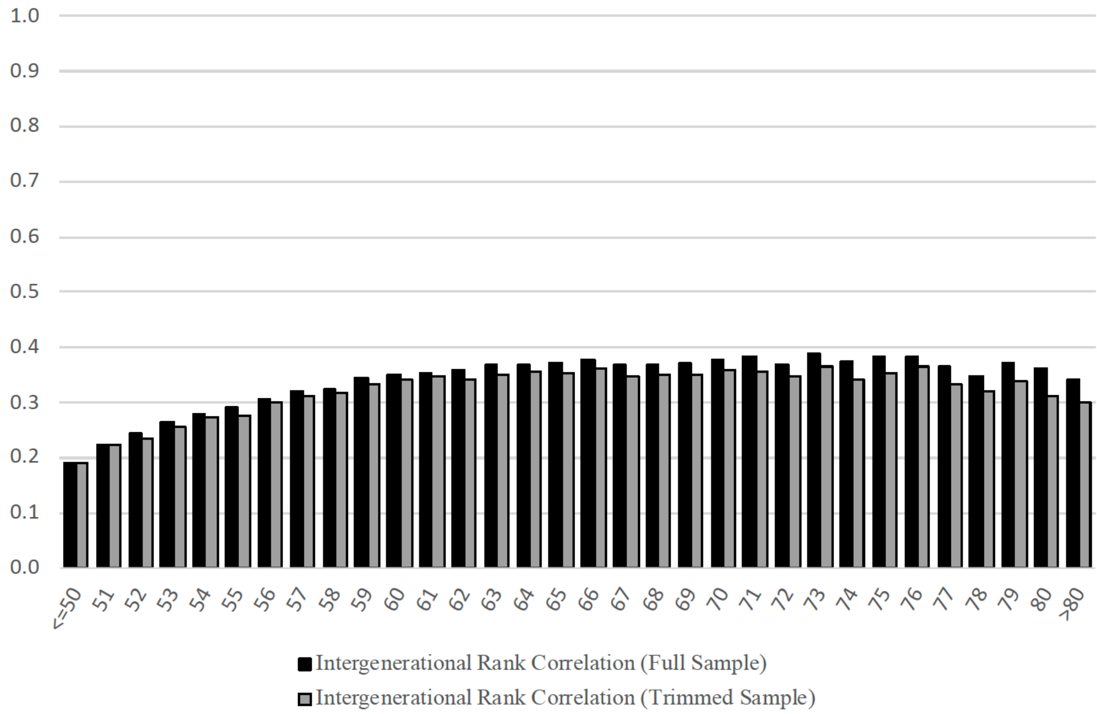


Table 1a: Summary Statistics

	Own-birth children		Adopted children	
	Mean	SD	Mean	SD
	Children			
Net Wealth Rank	0.50	0.29	0.48	0.30
Net Wealth*	634,413	3,138,855	610,218	1,650,647
Age in 2006	43.96	5.59	43.48	4.74
Years of Schooling	12.57	2.38	12.19	2.23
Female	0.51	0.50	0.53	0.50
Earnings	215,490	134,889	197,700	132,695
Income	225,433	492,036	207,098	157,081
Market Participation	0.57	0.49	0.50	0.50
Risky Share	0.29	0.34	0.24	0.33
Mean Saving rate	0.06	0.583	0.07	0.496
Mean Consumption	341,786	375,149	192,713	136,602
Observations	1,219,014		2,598	
	Biological parents			
Net Wealth Rank	0.50	0.29	0.34	0.27
Net Wealth	1,297,127	4,063,940	499,808	1,332,740
Average Age in 1999	64.16	7.46	60,04	6.69
Average Years of Schooling	10.12	2.62	9.63	2.08
Earnings, Father	235,539	112,483	189,810	75,505
Income, Father	237,750	140,266	194,663	80,754
Market Participation	0.75	0.43	0.57	0.50
Risky Share	0.40	0.35	0.27	0.33
Mean Saving rate	0.06	0.683	0.115	0.559
Mean Consumption	302,342	268,370	236,662	171,694
	Adoptive parents			
Net Wealth Rank			0.55	0.28
Net Wealth			1,660,851	4,415,320
Average Age in 1999			68.94	6.43
Average Years of Schooling			10.50	2.79
Earnings, Father			264,142	134,326
Income, Father			271,755	146,856
Market Participation			0.80	0.40
Risky Share			0.45	0.35
Mean Saving rate			0.05	0.728
Mean Consumption			325,667	287,940

Notes: Net wealth is measured as of December 31, 1999 for parents and December 31, 2006 for children. Monetary values are reported in Swedish Krona using December 31, 2000 values. At the time, the exchange rate was 1 USD = 9.42 SEK. Parental wealth is calculated as combined wealth of the mother and father. Market participation is defined as holding risky financial assets; stocks or mutual funds that include stock components. Risky share is the share of risky assets in financial wealth. Risky share is not conditional on participation. For parents, earnings and income are averaged over a twenty-year period running from 1970 to 1990. Earnings is the total earnings of the parents. Income is the total income of the parents. For children, we take a three-year average around age 36. Mean Consumption and Saving rates are measured as the average of the variable in the mother's household and the variable in the father's household between 2000 and 2006.

Table 1b: Summary Statistics: Components of Wealth

	Own-birth children		Adopted children	
	Mean	SD	Mean	SD
	Children			
Gross Wealth	1,069,256	3,465,159	1,017,804	1.888,072
Financial Wealth	210,003	1,972,627	189,126	928,391
Safe Financial Wealth	98,450	444,185	85,487	425,560
Risky Financial Wealth	111,554	1,829,687	103,639	761,949
Primary Residential Wealth	648,102	810,576	585,621	777,055
Other Real Estate Wealth	190,747	1,563,112	215,423	923,313
Observations	1,219,014		2,598	
	Biological parents			
Gross Wealth	1,560,176	4,574,511	767,173	1,560,646
Financial Wealth	605,782	2,922,245	259,873	677,786
Safe Financial Wealth	201,186	1,047,209	107,285	209,492
Risky Financial Wealth	404,596	2,602,400	152,588	590,928
Primary Residential Wealth	560,249	638,998	338,278	505,074
Other Real Estate Wealth	284,137	2,188,296	132,919	1,002,663
	Adoptive parents			
Gross Wealth			1,887,799	4,804,067
Financial Wealth			803,130	2,762,107
Safe Financial Wealth			237,804	485,547
Risky Financial Wealth			565,327	2,503,375
Primary Residential Wealth			617,358	630,090
Other Real Estate Wealth			313,506	1,943,038

Notes: Monetary variables are measured as of December 31, 1999 for parents and December 31, 2006 for children. Monetary values are reported in Swedish Krona using December 31, 2000 values. At the time, the exchange rate was 1 USD = 9.42 SEK. Parental wealth is calculated as combined wealth of the mother and father.

Table 2: Intergenerational Wealth Relationships
Dependent Variable: Child Rank in Within-Cohort Net Wealth Distribution

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Children						Male	Female
	Net Wealth w/o Pensions	Net Wealth w/o Pensions Trimmed	Net Wealth with Pensions	Net Wealth with Pensions Trimmed	Net Wealth w/o Pensions HH-level	Net Wealth w/o Pensions HH-level Trimmed	Net Wealth w/o Pensions Trimmed	Net Wealth w/o Pensions Trimmed
Own-birth Children								
Rank Parental	0.344	0.328	0.219	0.191	0.334	0.319	0.346	0.309
Net Wealth	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Observations	1,219,014	1,097,191	1,117,636	1,008,984	1,219,014	1,097,191	561,670	535,521
R-squared	0.152	0.124	0.100	0.083	0.142	0.115	0.128	0.116
Adopted Children								
Rank Biological	0.109	0.130	0.047	0.038	0.117	0.143	0.135	0.128
Parents' Net Wealth	(0.022)***	(0.026)***	(0.024)**	(0.028)	(0.021)***	(0.026)***	(0.039)***	(0.037)***
Rank Adoptive	0.273	0.227	0.237	0.192	0.250	0.199	0.214	0.249
Parents' Net Wealth	(0.021)***	(0.027)***	(0.024)***	(0.029)***	(0.021)***	(0.027)***	(0.037)***	(0.041)***
Sum Biological &	0.382	0.357	0.284	0.230	0.367	0.342	0.349	0.377
Adoptive Parents	(0.028)***	(0.035)***	(0.033)***	(0.039)***	(0.028)***	(0.035)***	(0.050)***	(0.054)***
Observations	2,598	2,027	2,059	1,684	2,598	2,027	1,069	958
R-squared	0.128	0.112	0.116	0.107	0.123	0.103	0.151	0.156

Notes: Columns 1 and 2 show the results where net wealth does not include pension wealth either for the parents or children. Columns 3 and 4 show the results for the same sample where we have an estimate of pension wealth for the parents in 1999 and net wealth includes the imputed pension wealth for both parents and children. In columns 5 and 6, we use the rank of children's household wealth as the outcome variable. In columns 7 and 8, we run the regressions separately for males and females. In columns 2, 4, 6, and 8 the top and bottom 5 percent of parental wealth distribution have been dropped. In Column 4, trimming is based on net wealth of parents that includes imputed pension wealth. All specifications include cohort dummies for parents and children and controls for 25 region dummies of where the parents lived in 1965. Specifications in Columns 1-6 include a control for child gender. Parental wealth is measured in 1999 and child wealth is measured in 2006. All parents are alive in 1999. Parental wealth is calculated as combined wealth of the mother and father. *** $p<0.01$, ** $p<0.05$. Standard errors clustered by raising family.

Table 3: Intergenerational Wealth Relationships -- The Role of Inheritance
Dependent Variable: Child Rank in Within-Cohort Wealth Distribution

	(1)	(2)
	Net Wealth w/o Pensions	
	Full sample	Trimmed sample
Own-birth Children		
Rank Parental Net Wealth	0.344	0.328
	(0.001)***	(0.001)***
Both Parents Died by 2006* Rank Parental Wealth	0.122	0.110
	(0.005)***	(0.006)***
Both Parents Died by 2006	-0.031	-0.024
	(0.003)***	(0.003)***
Observations	1,253,369	1,128,117
R-squared	0.154	0.125
Adopted Children		
Rank Biological Parents' Net Wealth	0.108	0.125
	(0.021)***	(0.025)***
Rank Adoptive Parents' Net Wealth	0.274	0.226
	(0.021)***	(0.027)***
Both Adoptive Parents Died by 2006* Rank Adoptive Parental Wealth	0.229	0.283
	(0.086)***	(0.095)***
Both Adoptive Parents Died by 2006	-0.024	-0.027
	(0.046)	(0.054)
Observations	2,728	2,131
R-squared	0.137	0.124

Notes: All specifications include controls for child gender, cohort dummies for parents and children and 25 region dummies of where the parents lived in 1965. Parental wealth is measured in 1999 and child wealth is measured in 2006. All parents are alive in 1999. Parental wealth is calculated as combined wealth of the mother and father. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Table 4: Non-linear Effects in Intergenerational Wealth Relationships

	Full sample		Trimmed Sample	
	(1)	(2)	(3)	(4)
Own-birth Children				
Rank Biological Parents' Net Wealth	0.344	0.102	0.328	0.187
	(0.001)***	(0.003)***	(0.001)***	(0.004)***
Rank Biological Parents' Net Wealth Squared		0.242		0.141
		(0.003)***		(0.004)***
Observations	1,219,014	1,219,014	1,097,191	1,097,191
R-squared	0.152	0.156	0.124	0.124
Adopted Children				
Rank Biological Parents' Net Wealth	0.088	0.139	0.075	0.034
	(0.045)*	(0.087)	(0.062)	(0.121)
Rank Biological Parents' Net Wealth Squared		-0.044		0.049
		(0.086)		(0.117)
Rank Adoptive Parents' Net Wealth	0.261	-0.022	0.193	0.164
	(0.033)***	(0.082)	(0.045)***	(0.120)
Rank Adoptive Parents' Net Wealth Squared		0.278		0.030
		(0.079)***		(0.115)
Rank Biological Parents*	0.037	0.014	0.097	0.093
Rank Adoptive Parents	(0.075)	(0.076)	(0.105)	(0.106)
Observations	2,598	2,598	2,027	2,027
R-squared	0.128	0.133	0.113	0.113

Notes: All specifications include controls for child gender, cohort dummies for parents and children and 25 region dummies of where the parents lived in 1965. Parental wealth is measured in 1999 and child wealth is measured in 2006. All parents are alive in 1999. Parental wealth is calculated as combined wealth of the mother and father. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Table 5: Measuring Wealth at Different Ages
Dependent Variable: Child Rank in Within-Cohort Wealth Distribution

	(1)	(2)	(3)	(4) Biological Parents' Wealth Measured in 2006
Rank Biological Parental Wealth	0.128	0.124	0.126	0.085
	(0.048)***	(0.040)***	(0.047)***	(0.027)***
Rank Adoptive Parental Wealth	0.261	0.230	0.261	0.246
	(0.046)***	(0.029)***	(0.046)***	(0.030)***
Rank Biological Parent Wealth * Child Aged 36-45	0.003		-0.005	
	(0.055)		(0.066)	
Rank Adoptive Parent Wealth * Child Aged 36-45	-0.052		-0.049	
	(0.057)		(0.059)	
Rank Bio Parent Wealth*Bio Parent Aged less than 60		0.010	0.013	
		(0.052)	(0.062)	
Rank Ad Parent Wealth *Ad Parent Aged less than 60		-0.037	-0.020	
		(0.079)	(0.082)	
Observations	2,027	2,027	2,027	1,541
R-squared	0.113	0.112	0.113	0.142

Notes: The top and bottom 5 percent of the parental wealth distribution have been dropped. All specifications include controls for child gender, cohort dummies for parents and children and 25 region dummies of where the parents lived in 1965. Column (1) included indicator variables for children being aged 36-45, Column (2) includes indicator variables for parents being aged less than 60, and Column (3) includes both these sets of indicators. Child wealth is measured in 2006. Parental wealth is measured in 1999 except in Column (4) where biological parental wealth is measured in 2006. All parents are alive in 1999 and at least one adoptive parent is alive in 2006. In Column (4), we require that both biological parents are alive in 2006. Parental wealth is calculated as combined wealth of the mother and father. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by adoptive family.

Table 6: Effects of Parental Wealth on Children's Education, Earnings, Portfolio Allocation, Savings Rate and Return on Financial Investments

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Years of Schooling	Earnings Rank	Income Rank	Saving Rate Rank	Safe Financial Wealth Share Rank	Risky Financial Wealth Share Rank	Value of Residential Wealth Share Rank	Value of Other Real Estate Wealth Share Rank	ROI Rank
Own-birth Children									
Rank Parental	1.907	0.118	0.139	-0.075	-0.085	0.229	0.022	0.080	0.101
Net Wealth	(0.008)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Observations	1,097,191	1,049,749	1,082,861	1,072,889	1,097,191	1,097,191	1,097,191	1,097,191	1,097,191
R-squared	0.082	0.215	0.224	0.016	0.007	0.057	0.010	0.012	0.017
Adopted Children									
Rank Bio. Parental	1.606	0.088	0.100	-0.037	-0.047	0.119	0.014	0.035	0.072
Net Wealth	(0.195)***	(0.024)***	(0.025)***	(0.027)	(0.029)	(0.025)***	(0.028)	(0.027)	(0.026)***
Rank Ad. Parental	0.950	0.049	0.052	-0.151	-0.101	0.119	0.041	0.049	0.070
Net Wealth	(0.200)***	(0.025)**	(0.025)**	(0.027)***	(0.030)***	(0.026)***	(0.029)	(0.026)*	(0.026)***
Sum Biological &	2.556	0.137	0.151	-0.188	-0.148	0.238	0.055	0.084	0.142
Adoptive Parents	(0.267)***	(0.034)***	(0.034)***	(0.037)***	(0.39)***	(0.033)***	(0.038)	(0.036)**	(0.035)***
Observations	2,027	1877	1.987	1,980	2,027	2,027	2,027	2,027	2,027
R-squared	0.120	0.196	0.187	0.070	0.062	0.079	0.054	0.047	0.065

Notes: The top and bottom 5 percent of parental net wealth distribution have been dropped. All shares represent share of gross wealth. In Column 4, the dependent variable is the average within cohort-year rank of child's household saving (disposable income minus consumption) divided by average disposable income between 2000 and 2006. Children who live with their parents in 2006 have been dropped from the sample. In Column 9, Return on Investment (ROI) is the average return on risky financial assets during the 1999 to 2006 period (those with no risky financial assets have been assigned a zero return). All specifications include controls for child gender, cohort dummies for parents and children and 25 region dummies of where the parents lived in 1965. Parental wealth is measured in 1999 and child wealth is measured in 2006. All parents are alive in 1999 and at least one of the (adoptive) parents of (adopted) biological children is alive in 2006. Parental wealth is calculated as combined wealth of the mother and father. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Table 7: Intergenerational Relationships for Various Outcomes
(Child Outcome Regressed on Equivalent Variable for Parents)

	(1) Years of Schooling	(2) Earnings Rank	(3) Income Rank	(4) Risky Market Participation	(5) Risky Share Rank	(6) Saving Rate Rank	(7) Consumption Rank
Own-birth Children							
Biological Parents	0.341	0.177	0.193	0.220	0.096	0.098	0.177
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Observations	1,219,014	1,162,512	1,202,401	1,219,014	702,598	1,161,161	1,161,161
R-squared	0.172	0.232	0.236	0.050	0.019	0.023	0.385
Adopted Children							
Biological Parents	0.184	0.063	0.064	0.116	-0.009	0.007	0.085
	(0.022)***	(0.020)***	(0.020)***	(0.020)***	(0.030)	(0.030)	(0.021)***
Adoptive Parents	0.143	0.092	0.108	0.147	0.138	0.129	0.134
	(0.016)***	(0.018)***	(0.018)***	(0.024)***	(0.025)***	(0.023)***	(0.023)***
Sum Biological & Adoptive Parents	0.327	0.156	0.172	0.263	0.129	0.135	0.220
	(0.025)***	(0.025)***	(0.025)***	(0.030)***	(0.039)***	(0.038)***	(0.031)***
Observations	2598	2379	2534	2,598	1287	2,363	2,363
R-squared	0.138	0.187	0.179	0.080	0.092	0.070	0.405

Notes: All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. Ranks are calculated within-cohort. For parents, earnings and income refer to fathers and are averaged over a twenty-year period running from 1970 to 1990. For children, we take a three-year average around age 36. Market participation is defined as holding risky financial assets; stocks or mutual funds that include stock components. Risky share is defined as share of financial wealth and we have included dummies for risky shares of parents being non-zero. In Columns 6 and 7, if the two parents do not live in the same household, we have used the average ranking of mother and father's household variables. In these columns, we also require that parents and children not live in the same household. In Column 7, we control for whether the child is married and family size of children. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Table 8a: Intergenerational Relationships for Various Outcomes - Non-linear Effects

	Years of Schooling		Earnings Rank		Income Rank	
	(1)	(2)	(3)	(4)	(5)	(6)
Own-birth Children						
Biological Parent	0.341	0.170	0.177	0.058	0.193	0.036
	(0.001)***	(0.006)***	(0.001)***	(0.003)***	(0.001)***	(0.002)***
Biological Parent Squared		0.008		0.120		0.165
		(0.001)***		(0.003)***		(0.002)***
Observations	1,219,014	1,219,014	1,162,512	1,162,512	1,202,401	1,202,401
R-squared	0.172	0.173	0.232	0.233	0.236	0.241
Adopted Children						
Biological Parent	0.129	-0.150	0.016	-0.018	0.011	-0.024
	(0.084)	(0.159)	(0.041)	(0.074)	(0.044)	(0.074)
Biological Parent Squared		0.017		0.050		0.057
		(0.008)**		(0.079)		(0.079)
Adoptive Parent	0.093	0.009	0.063	-0.031	0.070	-0.066
	(0.074)	(0.132)	(0.030)**	(0.076)	(0.030)**	(0.077)
Adoptive Parent Squared		0.006		0.096		0.134
		(0.006)		(0.071)		(0.071)*
Biological* Adoptive Parent	0.005	-0.001	0.079	0.060	0.109	0.084
	(0.007)	(0.008)	(0.063)	(0.065)	(0.066)*	(0.068)
Observations	2,598	2,598	2,379	2,379	2534	2534
R-squared	0.138	0.140	0.188	0.189	0.182	0.183

Notes: All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. Ranks are calculated within-cohort. For parents, earnings and income refer to fathers and are averaged over a twenty-year period running from 1970 to 1990. For children, we take a three-year average around age 36. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Table 8b: Intergenerational Relationships for Various Outcomes - Non-linear Effects

	Risky Market Participation	Risky Share Rank		Saving Rate Rank		Consumption	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Own-birth Children							
Biological Parent	0.220	0.096	0.007	0.098	0.281	0.177	-0.052
	(0.001)***	(0.001)***	(0.006)***	(0.001)***	(0.004)***	(0.001)***	(0.004)***
Biological Parent Squared			0.064		-0.180		0.198
			(0.004)***		(0.004)***		(0.003)***
Observations	1,219,014	702,598	702,598	1,161,161	1,161,161	1,161,161	1,161,161
R-squared	0.048	0.019	0.019	0.023	0.024	0.385	0.387
Adopted Children							
Biological Parent	0.113	-0.027	0.137	0.021	-0.042	0.011	0.008
	(0.043)***	(0.055)	(0.179)	(0.057)	(0.141)	(0.072)	(0.102)
Biological Parent Squared			-0.128		0.061		0.016
			(0.139)		(0.122)		(0.086)
Adoptive Parent	0.146	0.127	-0.150	0.147	0.357	0.088	-0.107
	(0.034)***	(0.040)***	(0.161)	(0.064)**	(0.105)***	(0.048)*	(0.121)
Adoptive Parent Squared			0.218		-0.212		0.161
			(0.125)*		(0.085)**		(0.090)*
Biological* Adoptive Parent	0.003	0.028	0.017	-0.033	-0.033	0.105	0.085
	(0.048)	(0.077)	(0.077)	(0.108)	(0.107)	(0.099)	(0.099)
Observations	2,598	1,287	1,287	2,363	2,363	2,363	2,363
R-squared	0.080	0.093	0.096	0.070	0.073	0.405	0.406

Notes: All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. Ranks are calculated within-cohort. Market participation is defined as holding risky financial assets; stocks or mutual funds that include stock components. Risky share is defined as share of financial wealth and we have included dummies for risky shares of parents being non-zero. In Columns 4-7, if the two parents do not live in the same household, we have used the average ranking of mother and father's household variables. In these columns, we also require that parents and children not live in the same household. In Columns 6 and 7, we control for whether the child is married and family size of children. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Appendix Table 1: Number of Adoptees by Birth Cohort

Year of Birth	Number of Adoptees
1950	16
1951	29
1952	33
1953	53
1954	56
1955	80
1956	76
1957	88
1958	96
1959	131
1960	148
1961	153
1962	183
1963	192
1964	240
1965	231
1966	228
1967	198
1968	139
1969	114
1970	114

Appendix Table 2: Addressing the Non-Random Assignment of Adoptees
Dependent Variable: Child Rank in Within-Cohort Wealth Distribution

	(1)	(2)	(3)
Rank Biological	0.130	0.105	0.130
Parental Wealth	(0.026)***	(0.028)***	(0.026)***
Rank Adoptive	0.227	0.224	0.224
Parental Wealth	(0.027)***	(0.027)***	(0.028)***
Observations	2,027	2,027	2,027
R-squared	0.112	0.117	0.115
Biological Parents' Chars	NO	YES	NO
Adoptive Parents' Chars	NO	NO	YES

Notes: The top and bottom 5 percent of parental wealth distribution have been dropped. All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. Parental wealth is measured in 1999 and child wealth is measured in 2006. All parents are alive in 1999. Parental wealth is calculated as combined wealth of the mother and father. Parental Characteristics include schooling and within-cohort earnings rank, entered separately for both mother and father. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by adoptive family.

Appendix Table 3: Non-linear Effects in Intergenerational Wealth Relationships
Including Adoptees with Missing Biological Father

	Full sample		Trimmed Sample	
	(1)	(2)	(3)	(4)
Adopted Children				
Rank Biological Parents' Net Wealth	0.119	0.089	0.170	0.056
	(0.035)***	(0.061)	(0.045)***	(0.082)
Rank Biological Parents' Net Wealth Squared		0.043		0.152
		(0.060)		(0.093)
Rank Adoptive Parents' Net Wealth	0.230	-0.008	0.221	0.145
	(0.025)***	(0.064)	(0.032)***	(0.087)*
Rank Adoptive Parents' Net Wealth Squared		0.226		0.138
		(0.058)***		(0.083)*
Rank Biological Parents*	0.003	-0.020	-0.038	0.079
Rank Adoptive Parents	(0.053)	(0.054)	(0.072)	(0.080)
Obs	5,504	5,504	4,397	4,397
R-squared	0.099	0.102	0.094	0.094

Notes: All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. Parental wealth is measured in 1999 and child wealth is measured in 2006. All parents are alive in 1999. We only use mothers' wealth to construct parents' ranks. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Appendix Table 4: Components of Wealth Analysis: Parent-Child Rank-Rank Relationship
Same Outcome for Parents and Children

	(1)	(2)	(3)	(4)	(5)	(6)
	Net Wealth	Gross Wealth	Safe Financial Wealth	Risky Financial Wealth	Value of Residential Wealth	Value of Other Real Estate Wealth
Rank Biological Parents	0.130	0.148	0.115	0.136	0.114	0.043
	(0.026)***	(0.025)***	(0.024)***	(0.023)***	(0.025)***	(0.027)
Rank Adoptive Parents	0.227	0.235	0.143	0.200	0.093	0.065
	(0.027)***	(0.028)***	(0.024)***	(0.022)***	(0.025)***	(0.021)***
Observations	2,027	2,027	2,027	2,027	2,027	2,027
R-squared	0.112	0.122	0.085	0.118	0.073	0.055

Notes: The top and bottom 5 percent of parental net wealth distribution have been dropped. All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. Parental wealth is measured in 1999 and child wealth is measured in 2006. All parents are alive in 1999 and at least one of the adoptive parents is alive in 2006. Parental wealth is calculated as combined wealth of the mother and father. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by adoptive family.

Appendix Table 5: Incidence of Negative Net Wealth

	Observations	Obs with Negative Net Wealth
Own-birth Children	1,219,014	308,313 (25.3%)
Parents of Own-birth Children	1,219,014	114,251 (9.4%)
Adoptees	2,598	808 (31.1%)
Biological Parents of Adoptees	2,598	678 (26.1%)
Adoptive Parents of Adoptees	2,598	115 (4.4%)

Appendix Table 6: Using Various Transformations of Wealth

	Inverse Hyperbolic Sine				Levels			
	Full Sample		Trim Bottom/Top 5%		Full Sample		Trim Bottom/Top 5%	
	Own-birth Children	Adoptees	Own-birth Children	Adoptees	Own-birth Children	Adoptees	Own-birth Children	Adoptees
IHS Biological Parental Wealth	0.251 (0.001)***	0.082 (0.022)***	0.272 (0.002)***	0.078 (0.030)***				
IHS Adoptive Parental Wealth		0.237 (0.044)***		0.328 (0.089)***				
Biological Parental Wealth					0.192 (0.001)***	0.028 (0.016)*	0.303 (0.002)***	0.088 (0.033)***
Adoptive Parental Wealth						0.205 (0.027)***		0.219 (0.036)***
Observations	1,219,014	2,598	1,097,191	2,027	1,219,014	2,598	1,097,191	2,027
R squared	0.057	0.080	0.050	0.075	0.071	0.335	0.051	0.117

Notes: All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. Parental wealth is measured in 1999 and child wealth is measured in 2006. All parents are alive in 1999 and at least one of the (adoptive) parents of (adopted) biological children is alive in 2006. Parental wealth is calculated as combined wealth of the mother and father. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Appendix Table 7: Robustness Checks
Dependent Variable: Child Rank in Within-Cohort Wealth Distribution

	(1)	(2)	(3)	(4)	(5)
	Baseline	Including Adoptees with Missing Biological Father	Baseline	County Dummies	Wealth averaged over 3 years
Rank Biological Parental Wealth			0.130	0.129	0.128
			(0.026)***	(0.026)***	(0.026)***
Rank Adoptive Parental Wealth	0.278	0.244	0.227	0.225	0.241
	(0.021)***	(0.015)***	(0.027)***	(0.027)***	(0.026)***
Observations	2,598	5,504	2,027	2,027	2,018
R-squared	0.107	0.079	0.112	0.121	0.112
Child County of Residence 06	NO	NO	NO	YES	NO
Parents County of Residence 99	NO	NO	NO	YES	NO

Notes: Column 1 only includes observations with non-missing information on biological fathers. Column 2 adds observations with missing information on biological fathers. In Columns 3-5, the top and bottom 5 percent of parental wealth distribution have been dropped. All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. In Columns 1-4, parental wealth is measured in 1999 and child wealth is measured in 2006. In Column 4, we add region dummies of where the parents lived in in 1999 and children in 2006. In Column 5, parental wealth is averaged over 1999-2001 and child wealth is averaged over 2004-2006. All parents are alive in 1999 and at least one adoptive parent is alive in 2006. Parental wealth is calculated as combined wealth of the mother and father. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by adoptive family.

Appendix Table 8: Intergenerational Relationships for Various Outcomes
Child Outcome Regressed on Equivalent Variable for Parents - Unrestricted Samples

	Years of Schooling	Earnings Rank	Income Rank
	(1)	(2)	(3)
Own Birth Children			
Biological Parents	0.356	0.173	0.185
	(0.001)***	(0.001)***	(0.001)***
Observations	1,872,248	1,773,141	1,842,890
R-squared	0.166	0.221	0.234
Adopted Children			
Biological Parents	0.193	0.061	0.079
	(0.014)***	(0.012)***	(0.012)***
Adoptive Parents	0.155	0.089	0.100
	(0.011)***	(0.011)***	(0.011)***
Sum Biological & Adoptive Parents	0.348	0.150	0.179
	(0.016)***	(0.015)***	(0.015)***
Observations	6790	6170	6614
R-squared	0.115	0.171	0.170

Notes: All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. Ranks are calculated within-cohort. For parents, earnings and income refer to fathers and are averaged over a twenty-year period running from 1970 to 1990. For children, we take a three-year average around age 36. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Appendix Table 9: Intergenerational Relationships for Various Outcomes - Nonlinear Effects
Child Outcome Regressed on Equivalent Variable for Parents - Unrestricted Samples

	Years of Schooling		Earnings Rank		Income Rank	
	(1)	(2)	(5)	(6)	(7)	(8)
Own-birth Children						
Biological Parent	0.356	0.242	0.173	0.045	0.185	0.020
	(0.001)***	(0.005)***	(0.001)***	(0.003)***	(0.001)***	(0.002)***
Biological Parent		0.005		0.129		0.177
Squared		(0.001)***		(0.003)***		(0.001)***
Observations	1,872,248	1,872,248	1,773,141	1,773,141	1,842,890	1,842,890
R-squared	0.166	0.167	0.221	0.222	0.234	0.240
Adopted Children						
Biological Parent	0.203	-0.015	0.053	0.012	0.056	0.032
	(0.051)***	(0.104)	(0.025)**	(0.045)	(0.027)**	(0.045)
Biological Parent		0.013		0.054		0.038
Squared		(0.006)**		(0.049)		(0.048)
Adoptive Parent	0.165	0.205	0.084	0.070	0.096	0.08
	(0.046)***	(0.082)**	(0.018)***	(0.045)	(0.017)***	(0.047)
Adoptive Parent		-0.001		0.017		0.087
Squared		(0.004)		(0.043)		(0.044)**
Biological*	-0.001	-0.005	0.013	0.004	0.044	0.029
Adoptive Parent	(0.005)	(0.005)	(0.039)	(0.040)	(0.040)	(0.041)
Observations	6790	6790	6170	6170	6614	6614
R-squared	0.115	0.116	0.171	0.171	0.173	0.174

Notes: All specifications include controls for child gender, parents' place of residence in 1965, and cohort dummies for parents and children. Ranks are calculated within-cohort. For parents, earnings and income refer to fathers and are averaged over a twenty-year period running from 1970 to 1990. For children, we take a three-year average around age 36. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by raising family.

Appendix 1: Data on Pensions

The Swedish pension system consists of three parts: public pensions, occupational pensions and private pension savings. In 1999, when we measure wealth of parents, the public pension system almost entirely consisted of a national pension plan financed on a pay-as-you-go basis (an individual account system known as the Premium Pension System (PPS) was introduced in 1999). In addition, most people receive an occupational pension from their employer. According to the Swedish Pensions Agency, about 90% of employees receive some pension benefits from their employer as a condition of employment. On average, around 4.5% of the employee's salary is put into employer provided schemes (Thörnqvist and Vardardottir, 2014). Swedish residents also have tax incentives to invest in private pension savings that are only accessible after retirement. However, as mentioned earlier, individuals still hold a substantial fraction of their wealth in non-retirement wealth. There is also a guaranteed pension for those who have had little or no income from work, and the size of this guaranteed pension is based on how long the person has lived in Sweden. In 2000, the maximum guaranteed pension, which applies to those who have lived in Sweden for at least 40 years, is 2394 SEK per month ($254) before taxes for those who are married, and 2928 SEK per month ($311) for a single person. A tax rate of 30 percent is then applied.

Public Pension

For most people in Sweden, total pension wealth is primarily comprised of public pension wealth. Sweden changed the structure of its public pension system in 1999; as a result, the parents we study are primarily covered by the old system and the children are covered by the new system.

The new public pension system was implemented gradually. People born before 1938 receive all their pension benefits from the old system. People born between 1938 and 1953 receive benefits partly from the old system and partly from the new system. Those born in 1938 receive 80 % of their benefits from the old system and 20 % from the new system, those born in 1939 receive 75 % from the old system and 25 % from the new system and so on. Therefore, those born in 1954 constitute the first cohort that fully participates in the new system.

The current Swedish public pension system, which includes an individual account system known as the Premium Pension System (PPS), was introduced in 1999. The mandatory contribution is 18.5 % of earnings, which are credited into two components: A defined contribution scheme funded on a pay-as-you-go basis (16 %) and funded individual accounts called the Premium Pension plan (2.5 %). The retirement age is flexible and retirement benefits can be claimed from the age of 61. The system keeps track of all the individual contributions to the system and individual pension payments depend on individual contributions.

Occupational Pensions

The second most important part of the Swedish pension system is the occupational pension, which in general is based on collective-bargaining agreements between labor-market organizations that cover about 90% of workers in Sweden (Sundén, 2006). On average, around 4.5% of the employee's salary is put into employer provided schemes (Thörnqvist and Vardardottir, 2014). The occupational pension primarily depends on sector, year of birth and years spent working. There are specific agreements for four sectors: national government workers, local government workers (municipality and county), private sector white-collar workers and private sector blue-collar workers. In contrast to the public pension scheme, in which contributions are limited by a ceiling, the occupational pension schemes provide pension rights for earnings above the ceiling. This is an important feature of the occupational pension which results in high-income workers receiving a larger share of their pension benefits from occupational pension schemes. However, even for the highest paying groups, occupational pensions account for less than 40 percent of total pension income. Because we impute parents' pension wealth from their retirement income stream, we are able to calculate the value of occupational pensions for parents. Unfortunately, we do not have a measure of occupational pension wealth for children.

Private Pensions

Swedish residents also have tax incentives to invest in private pension savings that are only accessible after retirement. This is a very small component of total pensions wealth (it constitutes about 5% of disbursements) and, unfortunately, we do not have information about it.

Below, we discuss how we create measures of pension wealth for children and parents.

Pension Wealth of Children

We have information on public pension wealth accumulated under the new public pension system by individuals who are not retired. This implies that we have information on accumulated public pension wealth for the children in our sample (who are born in 1950 or later) but not for the parents (who are predominantly born before 1950).[56] None of our children are retired by 2006, so we use accumulated public pension wealth as our measure of children's pension wealth. We have no information on occupational or private pension wealth of children.

Pension Wealth of Parents

Our parents are predominantly born before 1950 and so are covered by the older public pension system. Under that system, there was a much looser relationship between contributions to the system and pension entitlements, and there is no information on accumulated pension wealth for individuals. However, we observe most of our parents retired in our data and so can observe their actual pension receipts. We use this information to impute pension wealth (including both public and occupational pensions) for parents in our data. We use the following process:

1. First we determine whether the person is retired in 1999. In year 1999, a person is considered retired if she/he receives any type of public, occupational, or disability and injury pension income.[57]

2. If the person is retired in 1999, we use total pension income (including occupational pension income) in that year and multiply by an annuitization divisor to get a measure of pension wealth in 1999. The annuitization divisor is provided by the Swedish Pension Agency and incorporates life expectancy and a discount rate of 1.6%. This is the interest rate that Sweden uses in making pension calculations.

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[56] Our pension wealth for children born between 1950 and 1953 is incomplete but in practice this is not an important issue as almost all pension wealth for these cohorts is under the new system (80% for the 1950 cohort, 85% for the 1951 cohort, 90% for the 1952 cohort, and 95% for the 1953 cohort).

[57] Before 2005 it was possible to be “partly” retired. We do not count those on partial pension as retired, since imputing based on their pension income would be misleading. Instead, we treat them like other non-retired people and impute their pension wealth when they are fully retired.

3. Most people retire by age 65, so, for those not retired in 1999 but retired by age 65, we impute pension wealth at age 65 and discount this back to the year 1999 using an interest rate of 1.6% (the same rate as the one used in calculating the annuitization divisor).

4. If a non-retired person in 1999 is still not retired when we observe her/him at age 65, we follow that person until they retire, impute their pension wealth at their retirement, and then discount accordingly back to 1999.

5. If a parent does not retire by 2011 (the last year we observe information on pension payments), we are not able to impute pension wealth. As a result, the observation is dropped from the sample when we do the robustness check including pension wealth in net wealth.

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Pension Summary Statistics

	Own-birth children		Adopted children	
	Mean	SD	Mean	SD
	Children			
Pension wealth rank	0.50	0.29	0.44	0.29
Pension wealth*	1,022,581	342,320	975,590	333,827
Net wealth rank**	0.50	0.29	0.46	0.30
Net wealth*	1,689,891	3,041,622	1,596,234	1,692,227
Observations	1,114,045		2,047	
	Biological parents			
Average pension wealth ranking	0.51	0.29	0.56	0.29
Average pension wealth*	3,821,536	2,038,263	4,374,297	2,144,699
Average net wealth rank**	0.51	0.29	0.47	0.29
Average net wealth*	5,416,901	5,119,743	5,161,883	2,768,623
	Adoptive parents			
Average pension wealth ranking			0.55	0.28
Average pension wealth*			3,471,545	1,821,330
Average net wealth rank**			0.56	0.28
Average net wealth*			5,305,602	5,663,802

Notes: * Monetary values are reported in Swedish Krona on December 31, 2000. At the time, the exchange rate was 1 USD = 9.42 SEK. ** Net wealth includes pension wealth. Parental wealth is calculated as combined wealth of the mother and father. These statistics relate to children for whom we have an estimate of pension wealth for all their parents.

Appendix 2: Calculating Household Consumption

To impute household consumption (or, more accurately, expenditures) for children in our sample, we follow the approach proposed by Koijen, Van Nieuwerburgh and Vestman (2014). The idea behind this methodology is that more income that isn't invested or used to reduce debt leads to higher measured consumption, as do net increases in debt. Specifically, we impute consumption expenditure from the household budget constraint by combining information from the Swedish registry data on income, detailed asset holdings from the wealth register, and asset returns that we collect from third-party sources. For each household *i,* we employ the following identity to compute consumption:

$$c_{it} = y_{it} + d_{it} - \left(1 + r_{it}^{d}\right)d_{it-1} - a_{it} + \; a_{it-1}(1 + r_{it}^{a})$$

where y_{it} represents after-tax labor and financial asset income (plus transfers plus rental income from renting out owned houses) for household i in period t. It also includes the consumption value of residential real estate for the homeowners. (For homeowners there is an intangible gain from owning a property rather than renting the same property that needs to be imputed.[58])

In the equation above, d_{it} is the total debt at the end of year t and r_{it}^{d} is the household-specific interest rate on debt between t-1 and t. a_{it} represents the total value of the asset portfolio at the end of year t, and r_{it}^{a} represents the household-specific return on the asset portfolio between t-1 and t. Estimating a household-specific return on the asset portfolio is important, since one needs to measure the active portfolio rebalancing of households and

[58] See Fagereng and Halvorsen (2017) for more details.

not just a change in total portfolio value that could be the result of a passive return with no effect on consumption. In other words, if a household does not change its portfolio between t-1 and t, the change in total portfolio value should have no effect on the imputed consumption.

To compute the household-specific return on the asset portfolio, using each security's ISIN, we collect data on the prices and returns for each stock, coupons for each bond, and net asset values per share for each mutual fund in the database from a number of sources, including Datastream, Bloomberg, SIX Financial Information, Swedish House of Finance, and the Swedish Investment Fund Association (FondBolagens Förening). a_{it} also includes real assets and to get a reasonably accurate measure of expenditures one needs to 1) identify households that have been involved in real estate transactions (since a passive gain in real estate value should not contribute to the measure of consumption) and 2) have an accurate measure of real estate cash flow for those households. To do so, we merge our sample with the real estate transaction registry that lists real estate transactions and identifies the buyer(s) and seller(s) as well as the transaction value. Finally, we will also deduct contributions to private pension accounts from the disposable income.

One should note that since stock holdings are observed at an annual frequency, we have to ignore stock price changes and active portfolio rebalancing within a year, as well as gifts and transfers. However, as shown in Eika et al. (2017), conditional on having information on real estate transactions, accounting for stock transactions within each year does not reduce measurement error by much.

References:

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Appendix 3: Monte Carlo on Non-Random Assignment

As another test for the influence of non-random assignment of children into families, we conduct a Monte Carlo simulation in an effort to bound the effect of selection on our estimates.

When we estimate the following regression model,

$$W_{ij} = \beta_0 + \beta_1 W_i + \beta_2 W_j + \epsilon_{ij},$$

if ϵ_{ij} is uncorrelated with W_i (wealth rank of biological parents) and W_j (wealth rank of adoptive parents), then our β parameters are consistently estimated. The problem arises if the Ws are correlated with the error.

Abstracting from nature/nurture interactions, we can think of the error as having two components, $\epsilon_{ij} = \epsilon_i + \epsilon_j$, where ϵ_i refers to unobserved genetic endowments that affect wealth and ϵ_j refers to unobserved environmental factors that affect wealth. Because we are not attempting to isolate the causal effect of parent's wealth on child's wealth but instead are simply trying to isolate the correlation, we do not need the W_j to be uncorrelated with ϵ_j or W_i to be uncorrelated with ϵ_i. However, to estimate W_i, we *would* like to perfectly control for ϵ_j (or have these be uncorrelated with each other) and, to estimate W_j we would like to perfectly control for ϵ_i (or have these be uncorrelated with each other).

Ideally, we would have random assignment of biological children to adoptive parents, as this would remove the link between parental wealth and the other parent's unobserved characteristics.

In the absence of random assignment, we can simulate a simple model describing the likely bias introduced by the non-random assignment of children. In this simple model, the biological parents have some quality θ^b that we don't observe but the adoption agency does. Their child genetically inherits quality $\theta^c = \alpha_1\theta^b + \varepsilon_1$. Instead of random assignment, the adoption agency chooses adoptive parents that are similar to the biological parents such that $\theta^a = \alpha_2\theta^b + \varepsilon_2$ where θ^a is the quality of the adoptive parents and $\alpha_2 > 0$ ($\alpha_2 = 0$ would imply random assignment). Subsequently, the child gets an unobserved environmental endowment from their adoptive parents (θ^{ca}) so $\theta^{ca} = \alpha_3\theta^a + \varepsilon_3$. Each set of parents accumulate wealth based on their quality θ, such that $W^b = \theta^b + u_1$ and $W^a = \theta^a + u_2$.

Simulation of Adoptive Parent Coefficient

First, consider estimating the coefficient for adoptive parents. The model we would like to estimate is $W^c = \beta_0 + \beta_1 W^b + \beta_2 W^a + \beta_4\theta^c + u_3$, where θ^c is unobserved and u_3 is an i.i.d. error. That is, we want to estimate the effect of adoptive parent wealth, while controlling for the child's genetic inheritance. Without random assignment, the estimator of β_2 is biased because W^a is correlated with θ^c. To see the potential bias induced by this correlation, we consider four regression specifications: (1) just including W^a, (2) including W^a and W^b, (3) including W^a and θ^c, and (4) including W^a and W^b and θ^c. Note that, while we can control for θ^c in this Monte Carlo, it is not observable in our real data but can be proxied by controls for education and earnings of biological parents.

Simulation of Biological Parent Coefficient

Next, consider estimating the coefficient for biological parents. The model we would like to estimate is $W^c = \beta_0 + \beta_1 W^b + \beta_2 W^a + \beta_5\theta^{ca} + u_4$, where θ^{ca} is unobserved and u_4 is an i.i.d. error. That is, we want to estimate the effect of biological wealth, while controlling for the child's environmental endowment. Without random assignment, the estimator of β_1 is biased because W^b is correlated with θ^{ca}. To see the potential bias induced by this correlation, we consider four regression specifications (1) just including W^b, (2) including W^a and W^b, (3) including W^b and θ^{ca}, and (4) including W^a and W^b and θ^{ca}. Note that, while we can control for θ^{ca} in the Monte Carlo, it is not observable in our real data and can be proxied by controls for education and earnings of adoptive parents.

Monte Carlo Simulation

We have done a Monte Carlo simulation, choosing coefficient values that are similar to our wealth ones. We choose the true value of β_1 = 0.13 and the true value of β_2 = 0.23. The parameter values we chose are $\alpha_1 = \alpha_3 = 0.5$, $\alpha_2 = 0.15$, $\beta_4 = 0.1$, and $\beta_5 = 0.2$. These values imply the correlation between W^a and W^b is 0.075, which is what we observe in our data. We draw $u_1, u_2, u_3, \varepsilon_1, \varepsilon_2, \varepsilon_3, \theta^b$ from independent $N(0,1)$ distributions.

Rather than do a large number of Monte Carlo replications, we draw one extremely large sample (10 million observations) so that the sampling variation is negligible. Our estimates in each of the four specifications are as follows:

Monte Carlo Estimates

Adoptive Parent Coefficient

Variables Included	Coefficient on W^a (true value 0.23)
Including only W^a	.243
Including both W^a and W^b	.232
Including both W^a and θ^c	.238
Including W^a and W^b and θ^c	.230

Biological Parent Coefficient

Variables Included	Coefficient on W^b (true value 0.13)
Including only W^b	.155
Including both W^a and W^b	.134
Including both W^b and θ^{ca}	.144
Including W^a and W^b and θ^{ca}	.130

The last specification estimates the true parameter exactly, by design. What is interesting is that while there are sizeable biases due to non-randomness, these are almost completely eliminated when the other type of wealth is included in the regression. In fact, adding θ^c to the regression has almost no effect on the W^a coefficient once a control for W^b is included.