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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. When bequests are taken into account, the role of adoptive parental wealth becomes much stronger. We find no evidence that education or earnings of parents are important

drivers of the intergenerational wealth relationship between children and their adoptive parents and a limited role for child earnings, education, savings rates, and asset allocation in mediating the relationship. Indeed, savings rates are lower for children of wealthier parents. 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 also study consumption as an alternative measure of welfare and find both biological and environmental effects. However, the intergenerational consumption relationships largely disappear once we control for education, earnings, and wealth of parents and children.

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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 intergenerational transmission of education and income, much less is known about wealth, despite the fact that wealth is probably a better measure of economic success than income or education and is more easily transferred across generations.[3] Importantly, wealth is also much less equally distributed than education and income.

Several recent papers have generated estimates of the intergenerational correlation of wealth. Charles and Hurst (2003) use U.S. data and find elasticities of about 0.37 for net wealth.[4] More recently, Boserup, Kopczuk, and Kreiner (2014) and Adermon, Lindahl, and Waldenström (2016) have used register data (from Denmark and Sweden, respectively) to estimate multi-generational models of wealth transmission and found strong positive intergenerational rank correlations ranging from 0.27 in Denmark to as high as 0.4 in Sweden.[5]

But why is wealth correlated across generations? Is it nature or nurture?[6] The nature/nurture distinction is important as it distinguishes between fundamentally different

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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] See also Pfeffer and Killewald (2015) for a re-analysis using updated PSID data and Mulligan (1997) for earlier estimates of the intergenerational wealth elasticity in the U.S.

[5] Also noteworthy, Clark and Cummins (2014) use rare surnames and estate records to show strong transmission of wealth in England over many generations.

[6] There may also be nature-nurture interactions. We examine this later and show that these interactions are not important for wealth.

reasons for positive intergenerational wealth correlations.

One possible pathway is through biology (nature) -- genetic inheritance of skills, attitudes, and preferences that correlate with higher wealth in each generation.[7] 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 wealthy parents.

Another pathway is environment (nurture) -- wealthier parents may invest more in their children's human capital, help their children get better jobs, provide funding for business start-ups, or give financial gifts. 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. The 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.[8] In this paper, we attempt to disentangle the role of nature versus nature in the intergenerational transmission of wealth.

To do so, we take advantage of a unique feature of the Swedish adoption system whereby we observe both the biological and adoptive parents of adopted children. We use administrative data on the net wealth 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 disentangle the role of nature versus nurture in the intergenerational transmission of wealth by looking at how the wealth of adoptive children is related to that of both their biological and

[7] 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, forthcoming).

[8] 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.

adoptive parents. Adoption allows us to examine the effects of environmental factors in a situation where children have no genetic relationship with their (adoptive) parents.[9]

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.[10] In practice, we are constrained by data availability to study wealth of children aged around 45 and parents aged around 65. We show, however, that the intergenerational relationships we find are quite invariant to the exact ages of measurement of wealth.[11] We also focus primarily on pre-bequest wealth of children. Since children are likely to be well into middle age by the time they receive bequests, pre-bequest wealth of children may better reflect their wealth for most of their lives. However, we also examine the role of bequests on the intergenerational correlation.

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 adoptive parental wealth becomes even stronger.

When we examine potential mechanisms for this relationship, we find little evidence that

[9] 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).

[10] 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.

[11] Research by Boserup et al. (2015) has documented the relative insensitivity of intergenerational wealth correlations to age of measurement using data from Denmark, while work by Adermon et al. (2016) using Swedish data finds evidence that correlations are attenuated when children's wealth is measured when the children are younger.

the environmental transmission of wealth is driven by parental education or earnings. There is some evidence that parental wealth is related to children's wealth through children's education and earnings; including controls for child's education and earnings reduces the coefficient on adoptive parents' wealth by almost 10%. Differential allocation of wealth across assets can explain a substantial fraction of the nurture effects we observe, reducing the adoptive parent's coefficient by almost 30%. Differential savings rates actually work in the opposite direction, with children of adoptive parents with higher wealth saving a lower proportion of disposable income, consistent with the idea that children of wealthier parents need less precautionary savings. Most of the environmental effect remains unexplained by child education, income, savings rates, or investment choices, and this suggests that direct transfers from parents to children may have an important role to play.

Finally, we also consider another measure of well-being: consumption. According to economic theory, individuals should smooth consumption over their life-cycle, so consumption has the advantage that it may not be very sensitive to temporary fluctuations in income or wealth. It is important to note that, for any given level of potential wealth, actual wealth is inversely related to consumption (high wealth may result from living an austere life of very low consumption). Therefore, it is useful to study consumption in addition to wealth. However, the intergenerational transmission of consumption has not been well-studied due to the difficulty in obtaining information on consumption for multiple generations of families.[12] Using a novel method to calculate consumption in Sweden that builds upon our detailed information on assets, their prices, and income, we examine the intergenerational transmission of consumption and the role of nature versus nurture in this relationship. We find that the intergenerational transmission

[12] Important papers by Mulligan (1997), Waldkirch, Ng, and Cox (2004), and Charles et al (2014) estimate the correlation in consumption across generations, but we are unaware of any studies that attempt to distinguish between nature versus nurture effects in consumption.

of consumption has substantial biological and environmental components, with environment having a somewhat stronger influence. However, in contrast to wealth, we find that intergenerational correlations in consumption are almost entirely explained by parents' income, education, and wealth, as including these controls reduces the coefficients on adoptive parents' consumption to essentially zero.

Despite its importance, there is very little work examining the underlying causes of intergenerational wealth or consumption correlations. One literature has examined the genetic contribution to savings behaviors and wealth by comparing 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 decomposes the total variation in wealth into genetic and environmental factors by making relatively strong assumptions about the similarities in environment and genetics across fraternal and identical twins.[13] 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.

The closest paper to ours is contemporaneous work by Fagereng, Mogstad, and Rønning (2015), who use Korean adoptees in Norway to determine the effect of environment on child wealth and asset allocation. A key advantage of their work is that the assignment of children to families is arguably random. Consistent with our own results, they find evidence that

[13] The underlying assumption in the basic models is that any difference in twin correlations between monozygotic and dizygotic twins is attributable to genetics. However, this may be problematic if monozygotic twins experience a more common environment than dizygotic twins, for example if they are treated more alike.

environment is more important than nature in the intergenerational transmission of wealth. Some key advantages of our work are 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, we examine the role of inheritance, and, importantly, we are able to study consumption as well.[14] Overall, we view their study as a complement to our own and, in the conclusion, we discuss how our findings compare to theirs.

The structure of the paper is as follows. In the next section, we discuss the institutional background both in terms of financial markets and the adoption process. In Section 3, we outline the econometric methodology and, in Section 4, we describe the data. Section 5 provides our estimates for the intergenerational transmission of wealth, where we consider both net wealth as well as the various individual components of wealth. We examine possible mechanisms in Section 6. Section 7 then presents a variety of specification checks, including tests for non-random assignment of adoptees, the effects of varying the age of measurement of wealth, and different transformations of net wealth. Section 8 presents the results when we consider the intergenerational transmission of consumption, and Section 9 concludes.

2. Institutional Background

A. Wealth in Sweden

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.[15] However, even though our primary measure of wealth excludes pensions, it is important to understand the nature of the pension system in Sweden, as it can influence individual savings behavior. Relative to countries such as

[14] Other advantages of our work are that we can test for nature nurture interactions and our adoptees are older when wealth is measured. (Their adoptees are aged 25-46 compared to our 36-56 age range).
[15] As discussed later, we also test the sensitivity of our conclusions to the inclusion of pension wealth.

the U.S., Sweden's pension system would be considered quite generous. 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 year of birth of the individual. The longer one works, the higher the pension one receives. The retirement age is flexible and individuals can claim retirement benefits beginning at age 61.[16]

Because we study the individual wealth of children, it is important to understand whether there are incentives to transfer wealth holdings from one spouse to another. There do not appear to be any such incentives. 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.

B. The Adoption System[17]

The adoptees we study were born between 1950 and 1970. During this period, private adoptions were illegal, so all adoptions went through the state. 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

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[16] 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.

[17] See Nordlöf (2001), Bjorklund, Lindahl, and Plug (2006) and Lindquist, Sol, and Van Praag (2015) for more details.

do not observe how old the children were when they were adopted, about 80% of children were adopted in their first year of life.[18]

In order to adopt a child, a family had to satisfy 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.[19] Overall, the adoption criteria meant that the adoptive parents were positively selected relative to the general population.

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).[20] However, we will examine this issue in more detail later.

3. Empirical Strategy

A large body of literature in economics has used data on adoptees to disentangle the relative contribution of genes and environment to economic behavior. These studies have typically used information on foreign-born adoptees, where the characteristics of the biological parents are unknown to the researcher. These studies have therefore not been able to compare the relative influence of biological and adoptive parents.[21]

However, a recent literature has taken advantage of the unique Swedish register data that

[18] 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).
[19] 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).
[20] 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.
[21] See Sacerdote (2010) for a survey of this literature.

identify both biological and adoptive parents. The first was the seminal study by Björklund, Lindahl, and Plug (2006), which 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, 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.

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:

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

where W, our main variable of interest, is the rank of net wealth, i indexes the biological family, j indexes the adoptive family, and X refers to the set of control variables. These include a dummy variable for the gender of the child, 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. We measure child wealth at the individual level but measure parental wealth as the total of the mother's and father's wealth. As a robustness check, 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.[22] We use the child's rank in 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. Because ranks of parents and children are uniformly distributed, the regression coefficients from equation (1) can be interpreted as rank correlations.

A key assumption of our empirical strategy is that adoptees are randomly assigned to adoptive families at birth. If this 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. 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. Following this literature, we will conduct a battery of robustness checks, where we provide evidence suggesting that any violations of the assumption do not invalidate our estimates.

4. Data

We construct our database by merging a number of 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,

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

and other basic demographic information.[23] To this, we merge data from the Swedish multigenerational register, where we are able to identify Swedish-born adoptees by using information on both biological and adoptive parents of children.[24]

Our data on wealth come from the Swedish Wealth 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.[25] 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. Financial institutions provided information to the tax agency on their customers' security investments and dividends, interest paid or received, and deposits, including nontaxable securities and securities owned by investors, 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.[26]

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[23] We impute years of schooling based on the information on highest educational degree completed contained in the education register. 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.

[24] 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). In Section 7, we test the sensitivity of our conclusions to this restriction.

[25] 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.

[26] 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)

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.[27] We also observe the individual assets within the broad categories of wealth, which we combine with data on prices that we collect from third-party sources to calculate returns. 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.[28] As noted earlier, our primary analysis focuses on non-retirement wealth as it is transferable across generations; however, we also test for the robustness of our results to the inclusion of accumulated pension wealth.

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.[29] 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

[27] Stock market participation rates are higher in Sweden than in many other countries such as the United States (Guiso, Haliassos, and Jappelli, 2001).
[28] Statistics Sweden adjusts tax-assessed property values using information on both tax assessments and actual sales prices of houses so the aggregate value of the housing stock in the data is consistent with sales prices (Adermon et al. 2016).
[29] This is consistent with Calvet, Campbell and Sodini (2007) who find that 2 million out of a total of 4.8 million households do not have a reported bank account in 2002.

kronor.[30]

We measure income for our sample by using data from the Swedish Income Register. The register contains yearly income from 1968 onwards, and we use a measure of income that includes earnings from employed labor as well as self-employment income and taxable benefits.

We limit our analyses to children born 1950-1970 with all applicable parents alive in 1999 and for whom we have information on schooling, earnings, and wealth.[31] In our analyses, we measure net wealth of the children in 2006 and net wealth of the parents in 1999. In order to avoid the issue of inheritances, we further restrict 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 later test the sensitivity of our conclusions to this choice. 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. (2015), 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.

We have information on over 1.2 million children who are raised by their biological parents and 2479 adopted children for whom we have data available for both biological and adoptive mothers and fathers. Descriptive statistics for 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

[30] Details are available in Black, Devereux, Lundborg, and Majlesi (forthcoming, 2017). In practice, whether or not we impute small bank balances makes very little difference to the results.
[31] 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.

adoptive children. On average, biological children have 0.4 of a year more education and hold slightly higher net wealth (621K SEK vs. 597K 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.

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.[32] 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.

5. Results

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

[32] Appendix Table 2 provides a breakdown of the proportions of sample members who have positive and negative net wealth. In the sample of own-birth children, almost 26% have negative wealth. For adoptive children, this number is 31%. As discussed by Boserup et al. (2015), 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, 9.5% have negative wealth; this percentage is 4.6% for adoptive parents and 26.5% for biological parents of adoptees. This provides further evidence that biological parents of adoptees are negatively selected.

ranks. When we examine the data, it is clear that 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 measure of net wealth.

Figure 1a plots the relationship between the within-cohort rank of net wealth of parents and children for the large own-birth sample using a local linear kernel regression with an epanechnikov kernel and rule-of-thumb bandwidth.[33] 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. (2015), 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.[34]

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 trim the top and bottom 5% of the data, the relationship again becomes much more linear

[33] Adermon et al. (2016) 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.

[34] In this case, we rank all individuals within a given cohort (for parents, we calculate the cohort as the rounded average of the father and mother) and trim parents in the top and bottom 5%. As a result, adoptive parents, biological parents, and own-birth parents in the same cohort are all ranked within the same distribution.

(Figure 3). It is also clear that the slope is steeper for adoptive parents than for biological parents.

In Table 2, we report the regression results when we estimate equation (1) on the sample of own-birth children (Columns 1 and 3) and adoptees (Columns 2 and 4). As noted earlier, we include cohort dummies for parents and children as well as the gender of the child in all specifications.[35]

Columns 1 and 2 present the rank-rank coefficient for own-birth and adopted children, respectively. In the case of adopted children we control for the within-cohort rank of the net wealth of biological parents as well as that of adoptive parents. Among own-birth children (Column 1), 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 (Column 2), 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.[36]

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 Columns 3 and 4, 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

[35] Given wealth is measured in the same year for all parents and wealth is measured in the same year for all children, these 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.

[36] 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 parents. Not surprisingly, given the figures earlier, these exclusions do affect our estimates, with an increase in the effect of biological wealth and a decrease in the effect of adoptive wealth. Still, however, the adoptive coefficient is substantially larger than the biological one. 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 due to the fact that children from wealthier families are inherently more talented. Instead, it appears that, even in a relatively egalitarian society like Sweden, wealth begets wealth.

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 Table 3, we report the estimates for our preferred specification where we exclude children whose biological or adoptive parents have net wealth in the bottom or top 5% of the rank distribution. Columns 1 and 2 present the results by child gender. While the biological coefficient is larger for boys than for girls, the difference is not statistically significant. The adoptive coefficient is similar for both genders, suggesting there is not much evidence for gender differences in the nature/nurture split.

We next consider the potential role of inheritances when estimating intergenerational correlations in wealth.[37] 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 compare two extreme cases--in one, at least one parent was alive in 1999 but both parents are dead by 2006, suggesting that the child is likely to have received inheritances in the interim, and in the other case, both parents are alive in

[37] Piketty and Zucman (2014, 2015), among others, show that inheritance can have important effects on the distribution of wealth.

both periods, ruling out the possibility of inheritance. Column 3 of Table 3 presents the first scenario; 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.[38] The estimates are in Column 3 of Table 3. While we have added fewer than 100 extra adoptive families to the sample, we still find a statistically significant interaction effect of 0.40. This suggests that the rank correlation with adoptive parent wealth increases from 0.23 to 0.63 once inheritances are included.[39] This large effect is consistent with the findings of Adermon et al. (2016) who use wealth and inheritances data and find that inheritance appears to be the most important component of the intergenerational wealth elasticity in Sweden.

At the other extreme, we rule out the possibility that the child received an inheritance by restricting the sample to cases with both adoptive parents alive in 2006 (Column 4). While this reduces the sample size considerably, the estimates are largely unchanged from the baseline in Column 4 of Table 2. This is consistent with our expectation that bequests to children occur only after both parents are deceased.

Finally, we 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 the following categories of gross wealth -- financial wealth held in "safe" assets, financial wealth held in "risky" assets, wealth held in the primary home, and other real assets.[40] Figures 4a-e show the allocation of gross wealth across the four categories. As expected,

[38] We assume that biological parents of adoptive children will not have bequest motives for the children they gave up.

[39] 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 deductable (about $8000). This would tend to reduce the inheritance effect that we find.

[40] Risky assets include stocks, mutual funds with a stock component, shares in private companies (non-listed shares), options, and endowment insurance.

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 1 of 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 outcomes, 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 as a whole, 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.

6. Why Does Parental Wealth Matter?

While we have established the relative role of nature versus nurture, the exact mechanisms of wealth transmission are more difficult to ascertain. Wealthier parents tend to be better educated and earn higher incomes (among adoptive parents, the correlation between wealth rank and income rank is 0.22 and that between wealth rank and average education is 0.28), and these factors could lead to the increased wealth of their children, through, for example, teaching them about investment opportunities or providing the right opportunities. To investigate whether this can explain the patterns we observe, in Table 5, we have estimated our basic specification (Column 1, which uses the trimmed sample and focuses on the rank of net wealth of parents and children, equivalent to Table 2 Column 4) and then added controls for adoptive parents' education, included separately for mothers and fathers, and their within-cohort household earnings rank.[41] These results are presented in Column 2. The inclusion of these variables has negligible effects on the coefficients on adoptive parental wealth, suggesting that adoptive parental wealth has a direct effect on child wealth that does not come through other parental characteristics. Parental wealth is not simply proxying for other parental characteristics that correlate with child wealth.

Given this finding, we next examine the potential role of several child variables that may affect their wealth accumulation, including their education, earnings, savings rates, and investment choices by adding them as extra control variables. Our goal is to see to what extent including these can "explain" the effect of parental wealth by changing its coefficient. These may not necessarily reflect causal pathways, as some of them (such as child savings and investment behavior) may themselves be influenced by 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 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 and earnings and we show these effects in the first two columns of Appendix Table 3.[42] Interestingly, while the effect of adoptive parental wealth on these variables

[41] For parents' earnings, we calculate the 3-year average earnings between ages 54 and 56, dropping any year in which a parent has zero earnings (unless it is zero in all 3 years, in which case it gets the lowest rank.) For parents who are older than 55 in 1968, the first year we observe earnings, we use their earnings in 1968.

[42] Child's earnings are measured as the 3-year average earnings between ages 34 and 36, dropping any year in which the child has zero earnings.

is positive, it is not very large and is smaller than the effect of biological parental wealth.

In Column 3 of Table 5, we control for child's education as well as the child's within-cohort earnings rank in our intergenerational wealth regressions; including controls for child's education and earnings reduces the coefficient on adoptive parents' wealth by a bit less than 10%. The fact that the coefficient on biological parents' wealth decreases by more (almost 25%) is consistent with our findings in Appendix Table 3 and with work demonstrating that income and education have a significant biological component (Bjorklund, Lindahl, and Plug, 2006). It is also consistent with the finding of Charles and Hurst (2003) that income plays an important explanatory role for the intergenerational wealth correlation.

Wealth of parents and children may be correlated because they have similar propensities to save from their income. Therefore, next, we examine whether differential savings behavior can help explain the environmental effect of parental wealth on children's wealth. To do so, we include a control for the savings rate of the child's household, defined as 1-(Consumption/Disposable Income) where consumption and disposable income are averaged over the 2000 to 2006 period.[43] Interestingly, when we control for the savings rate, the effect of adoptive parental wealth actually increases. A child's savings rate is 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.[44]

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

[43] We describe how we measure consumption in Section 8. Note that we have fewer observations for the measure of the savings rate. We have verified, however, that the change in our estimates is not driven by the change in the sample.

[44] Appendix Table 3 reports the results when we examine the effect of parental wealth on child's education, earnings, asset allocation, the savings rate, and the return on investment directly. In Column 7 of that table, we see that children of wealthier adoptive parents have significantly lower savings rates.

levels of wealth accumulation.[45] To examine this, for children, we calculate the within-cohort rank of the share of 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 information on the securities held. We see in Appendix Table 3 that wealthier adoptive parents tend to have children who invest more in risky financial assets and have a higher return on their financial investments. When we include these variables (Table 5, Column 5) as controls in our intergenerational wealth regressions, we find that the differential returns and allocation of wealth across assets can explain a substantial fraction of both the nature and nurture effects we observe, reducing the biological parent's coefficient by more than 35% and the adoptive parent's coefficient by almost 30%.[46]

Column 6 of Table 5 presents the estimates when we control for all these possible mechanisms together. All together, 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 a bit more than 20% of the adoptive parent's wealth effect.[47] 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.[48]

[45] Fagereng et al. (2016) show that there is a mild positive correlation between the return on wealth of parents and children in Norway.

[46] 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 forthcoming, 2017).

[47] Note too that this 20% 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.

[48] 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

However, we do not have data on financial transfers that would allow us to study this directly.

7. Robustness Checks

Pension Wealth

The net wealth measure we have been using 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. This motivates our decision to focus on net wealth which equals total assets less total liabilities. An alternative approach would be to include accumulated pension wealth in our measure.

For the 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). The process is somewhat complicated and is subject to error but enables us to create a measure of net wealth that includes pension wealth for parents. For the children, we observe accumulated public pension wealth as of December 2006. We describe the details of the pension system and of our pension measures in Appendix 1. The descriptive statistics there show that accumulated pension wealth is very large relative to non-pension net wealth.[49]

Appendix Table 4 presents the results when we estimate our main specification on the trimmed sample using a net wealth measure that includes pension wealth. Because we do not have information on pension wealth for all parents (because some of the younger parents have

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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.

[49] We do not have information on private pension wealth. Accumulated public pension wealth (the pension wealth we measure for children) accounts for approximately 70% of pension wealth in Sweden.

not retired by 2011 so we do not observe the pension payments they receive), we first show, in Columns 1 and 2 that estimates without pensions are similar for the sample with pension information as they are for the standard sample. We find that including pension wealth (Column 3) 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.

Random Assignment of Adoptees

As noted earlier, our identification strategy relies on the random assignment of adoptees. However, although adoptees are not randomly assigned to parents (in our trimmed sample, the correlation between net wealth rank of adoptive and biological parents is 0.075), we can evaluate how this non-random assignment might be affecting our estimates. The primary 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. 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.

While earlier work using similar identification strategies and data suggest that bias is unlikely to be a serious problem, we follow the literature in conducting a number of robustness checks to verify this.

If there are correlations between the wealth of adoptive parents and unobserved characteristics of the biological parents that are also correlated with child wealth, the coefficients on wealth of adoptive parents may be sensitive to whether or not the wealth of biological parents is included in the regression. To test this, we estimate our model with and without controls for the wealth and other characteristics of the biological parents. The results when we do this are presented in Table 6.

Column 1 of Table 6 shows estimates with just the within-cohort rank of net wealth of the adoptive parents included. In Column 2, we add within-cohort rank of net wealth of the biological parents, which is the specification previously reported in Column 4 of Table 2. The coefficient on adoptive parent wealth changes very little when we include biological parent wealth, suggesting that the two variables are not highly correlated in a way related to child's wealth.

As another check for omitted variable bias, we next include a number of other controls for characteristics of the biological parents; these include education included separately for mothers and fathers and within-cohort household earnings rank. Column 3 of Table 6 includes wealth of adoptive parents and adds the further controls as proxies for general unobserved characteristics of biological parents. Comparing the coefficients on adoptive parent wealth in Column 3 to Column 1, the difference is again very small. Finally, in Column 4, we include both biological parents' wealth as well as controls for their schooling and their income rank. The resulting estimates are almost identical to those in Column 3. Overall, it appears that our adoptive estimates are unlikely to be significantly biased by non-random assignment.

Columns 5 to 8 of Table 6 carry out the analogous exercise for wealth of biological parents. In Column 5, we include only the wealth of biological parents and then systematically add controls for characteristics of adoptive parents. Column 6 includes controls for the wealth of adoptive parents, Column 7 includes controls for education and earnings rank, and Column 8 includes both sets of controls. While the coefficients on wealth of biological parents decrease somewhat in Columns 6-8 compared to Column 5, the differences are not very large. This suggests that non-random assignment of adoptees is unlikely to be a problem and, if anything, will lead to an overstatement of the role of biological parents relative to that of adoptive parents.[50]

Ages at Measurement of Wealth

While we chose 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 the career for many of these children, our measure of wealth may not be representative of their wealth at later ages. Figure 5a 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.[51] 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.[52] Appendix Figure 1a shows the

[50] 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. The methodology and results are discussed in detail in Appendix 2, but again we conclude that the bias is likely insignificant.
[51] Using Norwegian data, Fagereng, Gottlieb, and Guiso (2017) document life cycle patterns in stock market participation and portfolio allocation.
[52] Research by Boserup et al (2015) 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 (2016) show that, in the case of income, the intergenerational rank correlation is much more robust to age at measurement than is the intergenerational elasticity.

distribution of within-cohort net wealth rank correlations 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 5b 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 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 7, 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 statistically insignificant and the main effects are similar to those in Table 2 Column 4.[53] This suggests that our estimates are not sensitive to the age of child at wealth measurement.

In Column 2 of Table 7, we similarly test whether the coefficient estimates depend on

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

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 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 7 reports these estimates. Once again, we find that the estimates are invariant to the age of measurement – the estimates in Column 4 of Table 7 are similar to our main specification in Table 2 Column 4.

Different Transformations of Net Wealth

Thus far, we have used the within-cohort rank as our measure of net wealth—from our own analysis, it is clear that this transformation fits the linear model the best. 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.[54]

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

[54] Graphs of the relationship between parents and children's net wealth using these alternative transformations do not, in fact, look linear. These figures are available from the authors upon request.

wealth, and many individuals have non-positive net wealth. To avoid using a selected sample, we use the inverse hyperbolic sine transformation (IHS) rather than logs.[55] The IHS transformation of wealth, W, is $w = log\left(W + \sqrt{W^2 + 1}\right)$ and behaves as $\log(W)$ for positive values.[56]

Appendix Table 5 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, we find similar patterns (Columns 2 and 4), with coefficients of 0.09 on biological parents' wealth and 0.23 on adoptive parents' wealth, and these relative patterns change little when we trim the data.

Columns 5-8 show the relationship between parental and child net wealth when wealth is not transformed and 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 0.20 and the biological coefficient is 0.03 in the full sample; once we trim the data, the coefficient on biological parental wealth almost triples to 0.12 compared with 0.18 for adoptive parental wealth. We place little credence on the untrimmed estimates for the levels specification, however, given the sensitivity to outliers. Overall, our conclusions of the relative importance of adoptive parent's wealth relative to that of biological parents are robust to the choice of specification for net wealth.

Other Robustness Checks

[55] The IHS is advocated by Pence (2006) as a superior alternative to using logs when studying wealth data.
[56] We have verified in our data that the relationship between parent and child net wealth using the IHS is exactly the same as that using logs once all negative values have been excluded.

We report further robustness checks in Appendix Table 6. Column 1 presents the baseline results from Table 2 Column 4 for comparison. In Column 2, 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 2, we add controls for county of residence of both parents and children in 2000.[57] This has no effect on the estimates.

We have also 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.[58] We present the results when we allow for an interaction between biological and adoptive parents in Column (3) of Appendix Table 6. The interaction term is positive but statistically insignificant and so provides no evidence for a nature/nurture interaction.

While our wealth data are high quality and unlikely to suffer from significant measurement 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 (4) of Appendix Table 6, 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.

In Column (5) of Appendix Table 6, we measure child wealth at the household level. 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

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[57] Sweden is divided into 20 regional county councils. Their main responsibilities are to provide and organize health care and public transportation.

[58] There are mixed findings in the literature about these types of interactions – Bjorklund, Lindahl, and Plug (2006) find evidence of these interactions for mothers' education and fathers' earnings but 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.

estimates). Consistent with less than perfect assortative mating, the nurture coefficient is a little smaller than when we measure child wealth at the individual level but the conclusions are similar to before.[59]

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 Panel A of Appendix Table 7, show that the environmental effects are very similar in the less selected sample.

8. Consumption

Consumption is another measure of well-being that captures the standard of living enjoyed by the household. Importantly, individuals may smooth consumption throughout their lifetime, making consumption a potentially less-volatile metric than wealth or income. We thus augment our analysis of wealth by studying the intergenerational persistence in consumption.

A key difficulty with this type of analysis, however, is the difficulty obtaining data on consumption. We are able to take advantage of the detailed nature of the Swedish administrative data to impute household consumption for both parents and children. Our research thus adds to a literature that focuses primarily on the intergenerational correlations in consumption. Work by Mulligan (1997), Waldkirch, Ng, and Cox (2004), and Charles et al (2014) all find evidence of substantial persistence in consumption behavior across generations. However, we are unaware

[59] Charles, Hurst, and Killewald (2013) show that, in the U.S., wealthier individuals are likely to marry wealthier spouses.

of any studies that attempt to distinguish between nature and nurture effects on consumption.

Parents can influence their children's consumption behavior through a number of mechanisms. The first is genetic; ability and preferences can be transferred from parents to children, and these factors can affect consumption directly or indirectly through outcomes such as income and education. In terms of environmental forces, parents can influence their child's consumption behavior on a number of dimensions. Parents can invest in children, which may influence the child's educational attainment, income, and wealth, all of which in turn may influence consumption. Parents can also influence children's consumption through financial gifts, which would increase children's wealth and lead to higher consumption. Finally, parents may influence children's consumption through behavioral channels—consumption behavior can be learned by example.

To distinguish nature versus nurture in the determinants of the intergenerational transmission of consumption behavior, we use a novel methodology to impute consumption in Sweden. To impute consumption at the household level, we apply a methodology detailed in work by 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.[60] This calculation requires the detailed information on asset

[60] In other words, more income that isn't invested or used to reduce debt leads to higher measured consumption, as do net increases in debt. More specifically, $c_{it} = y_{it} + d_{it} - (1 + r_{it}^d)d_{it-1} - a_{it} + a_{it-1}(1 + r_{it}^a)$ where y_{it} represents total disposable income for household i in period t, d_{it} is the total debt at the end of year t, 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. 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). Estimating a household-specific return on the asset portfolio is important, since one needs to measure the active portfolio rebalancing of households and not just a change in total portfolio value that could be the result of a passive return with no effect on

portfolios that we have in our data. The authors 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.[61]

Because consumption can vary significantly by year due to the purchase of durables, we average consumption across the 2000 to 2006 period for each household. As with wealth, in our primary specification we focus on within-cohort ranks, as this approach is likely to be most robust to the variation in ages in our sample. Because consumption is fundamentally measured at the household level, we place additional restrictions on our sample in that we require (i) parents and children not live in the same household and (ii) both raising parents live together.[62] Biological parents of adoptees are complicated to deal with in this context as very few of the biological mothers are in the same household as the biological fathers. Therefore, in our primary specification, we only include consumption of the raising parents. However, we also show estimates where we average consumption across the two biological households as a measure of the consumption of biological parents.

Table 8 presents the summary statistics for our consumption sample. Similar to the wealth sample, average annual consumption is slightly lower for adopted children relative to own-birth children, although they are quite similar. In this case, however, both biological and adoptive parents have lower mean consumption relative to that of parents of own-birth children.

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consumption. We identify households with real estate transactions using a real estate transaction registry. See Koijen, Van Nieuwerburgh, and Vestman (2014) for more details.

[61] Koijen, Van Nieuwerburgh, and Vestman (2014) 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.

[62] We only measure consumption for those years in which both parents are still alive and present in the household.

Consistent with net wealth, though, the rank of adoptive parents is slightly higher than that of biological parents who raise their own children, while that of biological parents of adopted children is slightly lower.[63]

The results when we estimate our basic specification regressing rank of child's consumption on that of the children's adoptive and biological parents are presented in Table 9. As in earlier results, all specifications include a dummy variable for the gender of the child, 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. We also include an indicator variable for whether the child is married and a control for the family size of the child. Column 1 of Table 9 presents the results when we regress the rank of the child's consumption on that of the biological parents for the sample of children who were raised by their biological parents. Our estimate of 0.25 is quite close to the equivalent estimate of .29 in Charles et al. (2014) using U.S. data. Columns 2 and 3 present the results from our sample of adoptees. Column 2 shows the rank correlation between children and their adoptive parents of 0.17 without controls for biological parents' consumption. In Column 3, we see that this coefficient remains approximately 0.17 when we control for biological parents' consumption. Biological parent's consumption also predicts children's consumption, but relatively less than adoptive parents' consumption, with point estimates of 0.10 for biological parents' consumption and 0.17 for adoptive parents' consumption.

The second panel of Table 9 presents the results when we trim the top and bottom 5% of parental consumption. Here, we see that the overall rank correlation for the children raised by their biological parents declines slightly when we use the trimmed sample. This is the case for

[63] Mean consumption is lower for adoptive parents than biological parents of own-birth children but the within-cohort rank of consumption is higher for the adoptive parents. This is because adoptive parents are, on average, older and consumption is somewhat lower for older age groups.

the estimates on the adoption sample as well, with the estimate for the coefficient on the biological parents' consumption declining to 0.09 and the adoptive parents' consumption declining to 0.12.[64]

Finally, there is some concern that consumption measures may be a poorer measure of well-being when individuals are older. This may be, for example, because they are incurring additional health expenses. To test the sensitivity of our conclusions, we regress the children's consumption rank on the parents' net wealth rank; these results are presented in the last two columns of Table 9. These results are again consistent with both nature and nurture affecting children's consumption, but nurture being relatively more important.

Potential Mechanisms

We next investigate the potential mechanisms underlying this relationship. Parents who consume more are wealthier, better educated, and earn higher incomes, all of which could lead to higher consumption by their children. Similar to our analysis of net wealth, in Table 10 we have estimated our basic specification (Column 1, which uses the trimmed sample and is equivalent to Table 9 Column 6) and then added controls for adoptive parents' education separately for fathers and mothers and within-cohort household earnings rank. We also include the within-cohort rank of adoptive parental net wealth. These results are presented in Column 2. When we include these variables, we see that the biological coefficient is relatively unchanged but the estimate of the coefficient on the adoptive parents' consumption declines by over 80% to a statistically insignificant 0.02, suggesting that these parental characteristics may be the underlying mechanisms through which adoptive parental consumption is related to child consumption.

When we examine the potential role for child's education, earnings rank, and wealth

[64] In Appendix Table 7, we show that the adoptive estimate is robust to using the full sample that includes adoptees where the biological father is unknown.

rank, by including them in the regression (Column 3), the coefficient on biological parents' consumption declines to 0.02 and is statistically insignificant, while the coefficient on adoptive parents' consumption declines to 0.05. These results suggest that a substantial part of the intergenerational transmission of consumption—both nature and nurture—is working through parent's influence on children's education, earnings, and wealth. Again, the fact that the coefficient on biological parents' consumption decreases by more is consistent with work demonstrating that income and education have a significant biological component (Bjorklund, Lindahl, and Plug, 2006).

Finally, in Column 4, we estimate a specification when we include all of these potential mediators at the same time. When we do so, we find that both biological and adoptive coefficients are statistically insignificant and close to zero.[65] Overall, we conclude that the intergenerational transmission of consumption has substantial biological and environmental components. These relationships appear to be driven in large part by parental and child education, income, and wealth and there is little evidence for behavioral explanations (such as habit formation) that imply direct effects of adoptive parental consumption on child consumption.

9. 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

[65] Waldkirch et al. (2004) show that both parental consumption and income are related to child consumption. Like us, Charles et al. (2014) find that the intergenerational consumption relationship falls substantially once controls are included for income of parents and children.

adoptive parents, we are able to 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. We also find that when bequests are taken into account the role of adoptive parental wealth becomes much stronger. Importantly, our conclusions are robust to a variety of specification and robustness checks.

When we study mechanisms, we find that the intergenerational relationship in wealth between children and their adoptive parents is only partly explained by child outcomes such as earnings, education, savings behavior, or investment returns. 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.

Our findings are broadly similar to those of Fagereng et al. (2015) who use data on Korean adoptees in Norway. While they focus on financial wealth, they report rank correlations for net wealth that are 0.18 for own-birth children and 0.08 for adoptive parents and adoptive children (they do not have information on biological parents). So, while they find positive post-birth effects, their magnitudes are much smaller than ours. Like us, they find that other parental characteristics cannot explain the intergenerational wealth relationship and they find very little role for child education and earnings as mediating variables. Interestingly, they have information on direct transfers from adoptive parents to their children (if reported to the tax authorities) and find they explain some but not much of the intergenerational wealth relationship. As a result, they speculate that differential savings rates may play an important role. Unlike them, we can calculate savings rates and find that children of wealthier parents actually have lower (not higher) savings rates in Sweden.

How do our estimates compare to taking a behavioral genetics approach that decomposes the variance of outcomes between genes and environment? To assess this, we compare the correlations in wealth between (1) adoptive children and their siblings (genetically unrelated but raised together) and (2) own-birth children and their biological siblings (genetically related and raised together). Using the simplest behavioral genetics model – the ACE model (Cesarini et al., 2010; Cronqvist and Siegel, 2015) – the proportion of the variance due to shared environment equals the first correlation and the proportion of the variance due to genetics equals twice the difference between the second correlation and the first.[66] We find that, for net wealth, the first correlation is 0.288 (0.047) and the second correlation is 0.343 (0.001) implying that the shared environmental component accounts for 29% and the genetic component for 11% of the variance of the rank of net wealth of children.[67] This finding is consistent with our main results using regression analysis. Our findings of strong environmental effects contrast with those from existing behavioral genetics estimates using variation induced by twins that shows little role for shared environmental elements in determining wealth at retirement (Cronqvist and Siegel, 2015). While, the difference may partly result from the non-random assignment of adoptees, we find substantial environmental effects even if we allow for a small genetic correlation between adoptees and their siblings. It is worth noting again that the twins approach makes relatively strong assumptions.[68]

[66] The ACE model decomposes child outcomes into a linear sum of genetic factors, shared environmental factors, and unshared environmental factors. The relative role of genetic versus shared environment depends on how closely adoptive and non-adoptive siblings resemble each other (compared to how closely two biological siblings resemble each other). See Cesarini et al., 2010 or Cronqvist and Siegel, 2015 for details.

[67] In contrast, when we study schooling, the shared environmental component accounts for 22% and the genetic component for 37% of the variance. This greater role for genes in determining education levels is consistent with some prior literature using this approach with adoptees (Sacerdote, 2007).

[68] For the twin methodology, one important assumption is that monozygotic and dizygotic twins are not treated differently by parents and society in general so higher correlation in outcomes of monozygotic twins are solely due to their greater genetic likeness. This assumption has been questioned on the basis that identical twins communicate

When we examine an alternative measure of well-being—consumption—we again find important roles for both biological and environmental effects in explaining the intergenerational transmission of consumption behavior. However, unlike wealth, we are able to explain almost all of this relationship with controls for parental wealth, earnings, and education.

Overall, our results suggest that the children with wealthy parents benefit not just from good genetics but, more importantly, benefit from growing up with more advantages. As wealth becomes more and 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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more (Betermier, Calvet, and Sodini, 2017) or because they are treated more similarly in the environment in which they grow up (Björklund, Jäntti, and Solon, 2007). Björklund, Jäntti, and Solon (2005) show that relaxing this assumption lowers the estimated genetic effect on earnings and increases the estimated effect of shared environment.

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

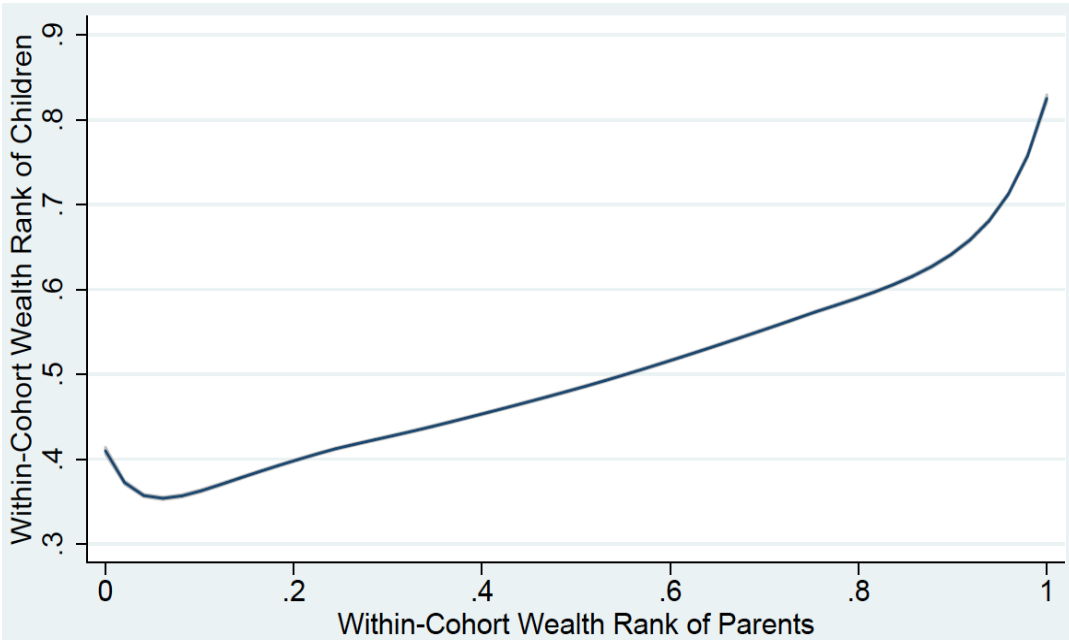


Figure 1b: Within-Cohort Wealth Rank Relationship between Parents and Own-birth Children
Parents in the top and bottom 5% of the within-cohort wealth distribution are dropped

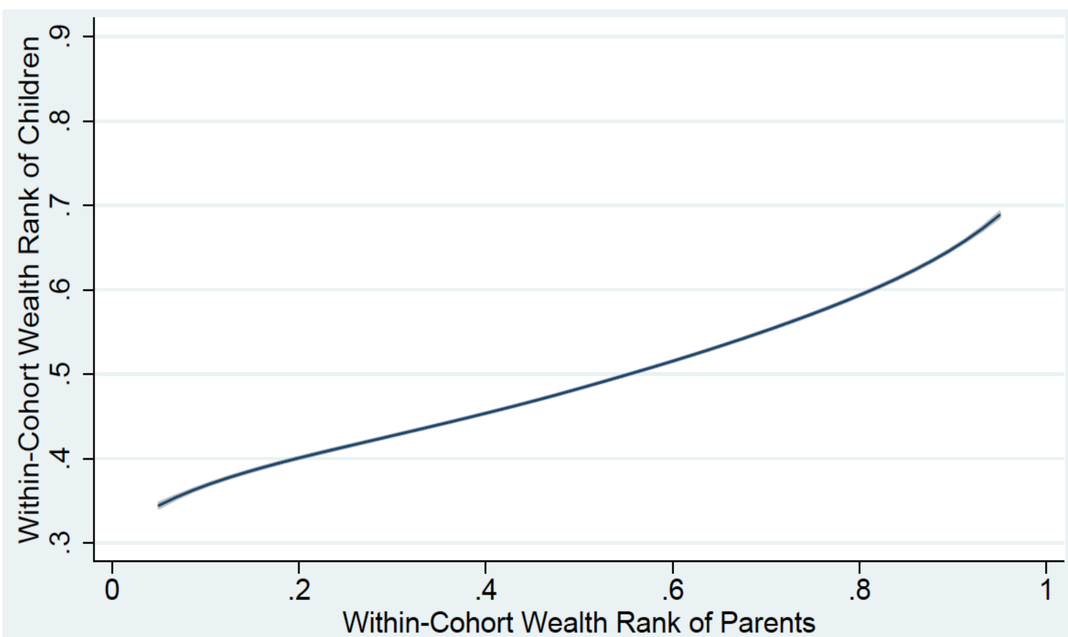
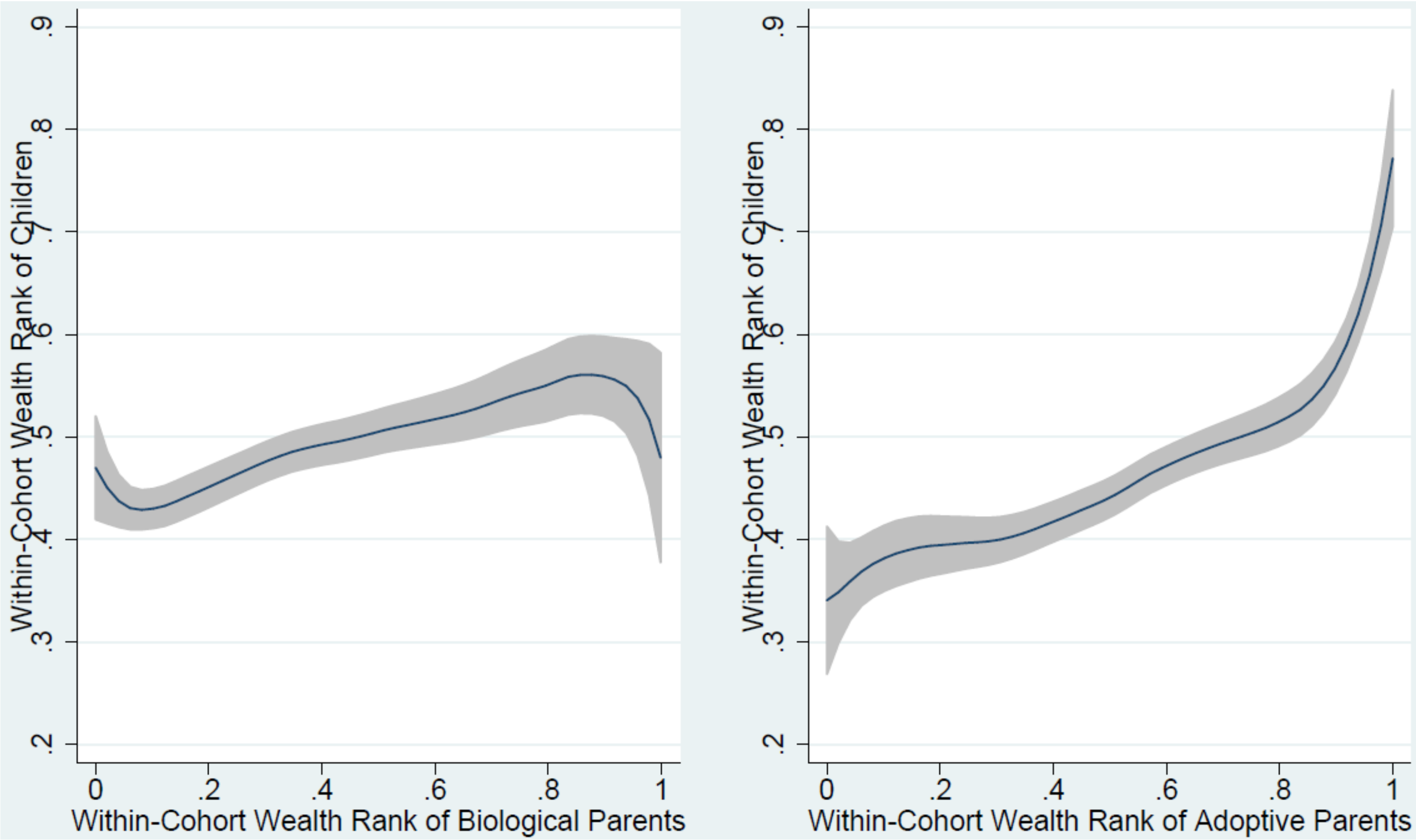
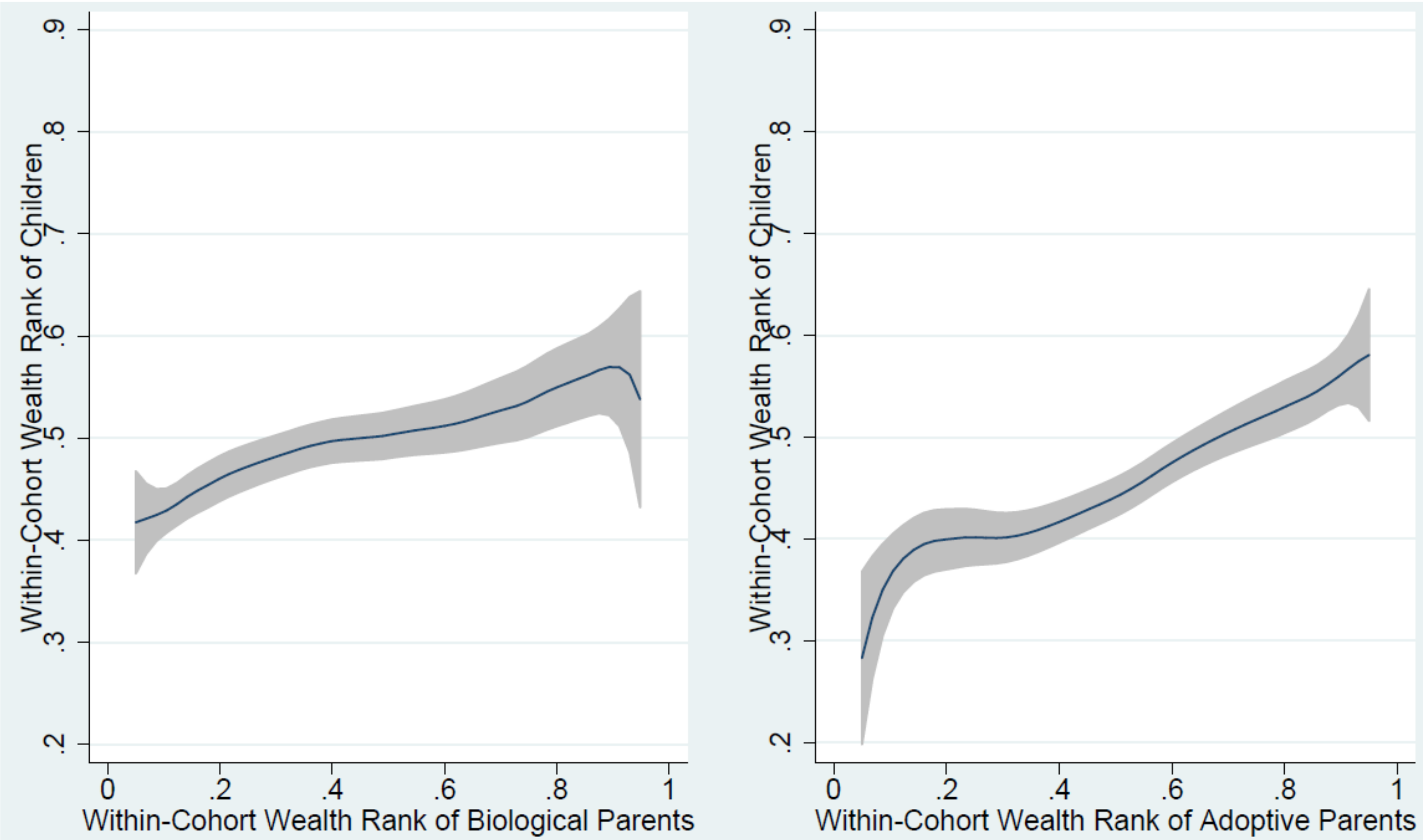


Figure 2: Within-Cohort Wealth Rank Relationship between Adopted Children and Their Biological and Adoptive Parents



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 4: Distribution of Gross Wealth across Four Main Categories

Figure 4a:
Children Raised by Biological Parents

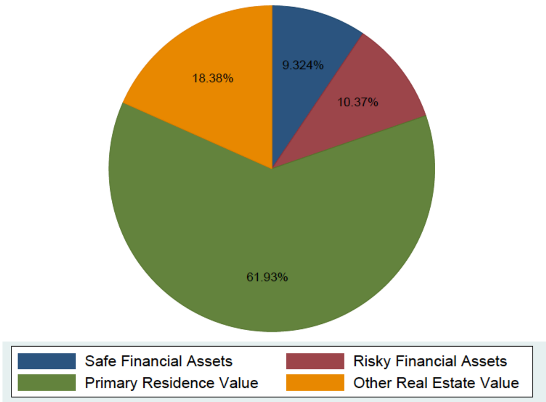


Figure 4b:
Adopted Children

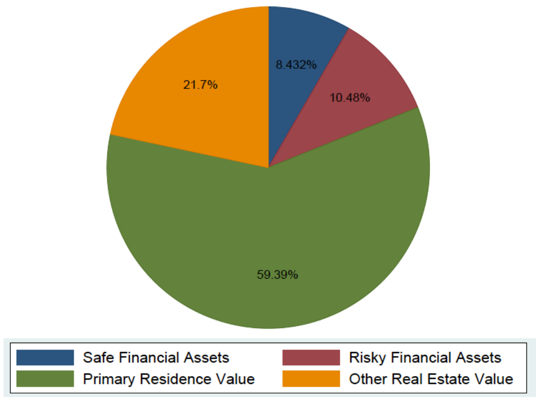


Figure 4c:
Biological Parents of Own-Birth Children

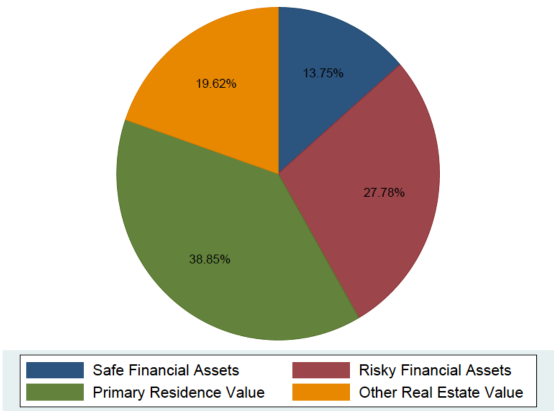


Figure 4d:
Adoptive Parents of Adopted Children

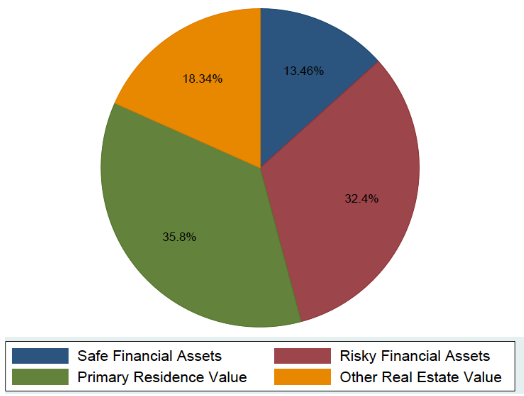


Figure 4e:
Biological Parents of Adopted Children

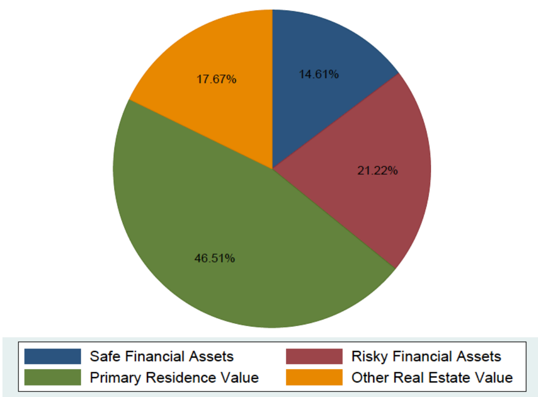
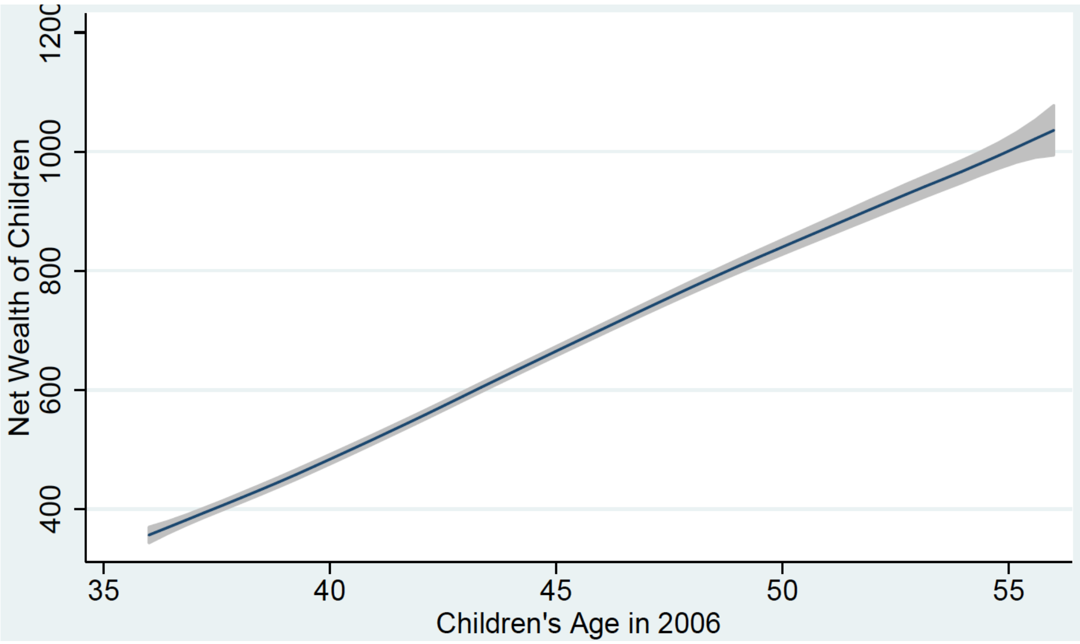
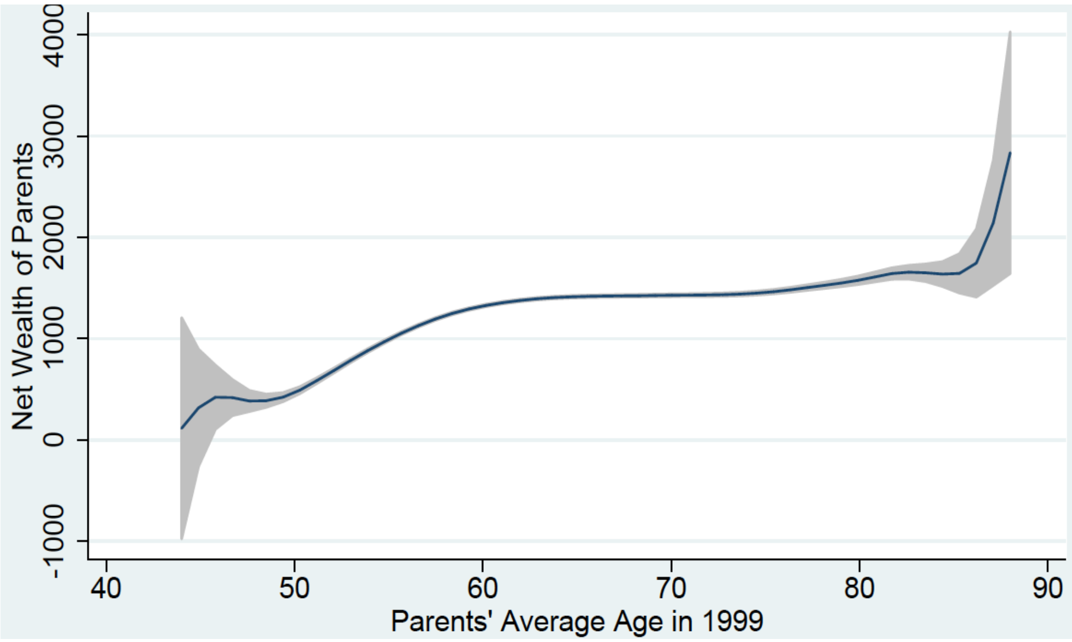


Figure 5a: Net Wealth by Age for Children Born between 1950 and 1970.



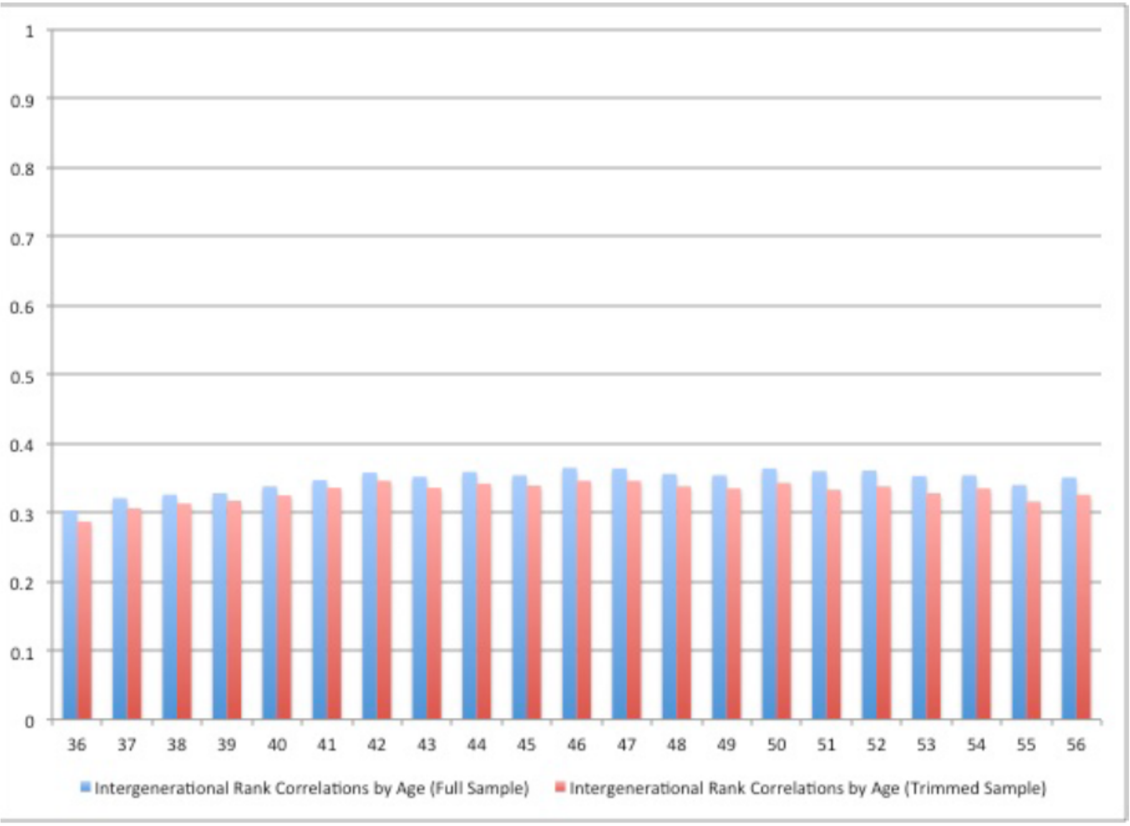
Notes: Child Net Wealth in 1000 SEK. Line represents local linear approximation and shading represents the 95% confidence interval.

Figure 5b: 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.

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)

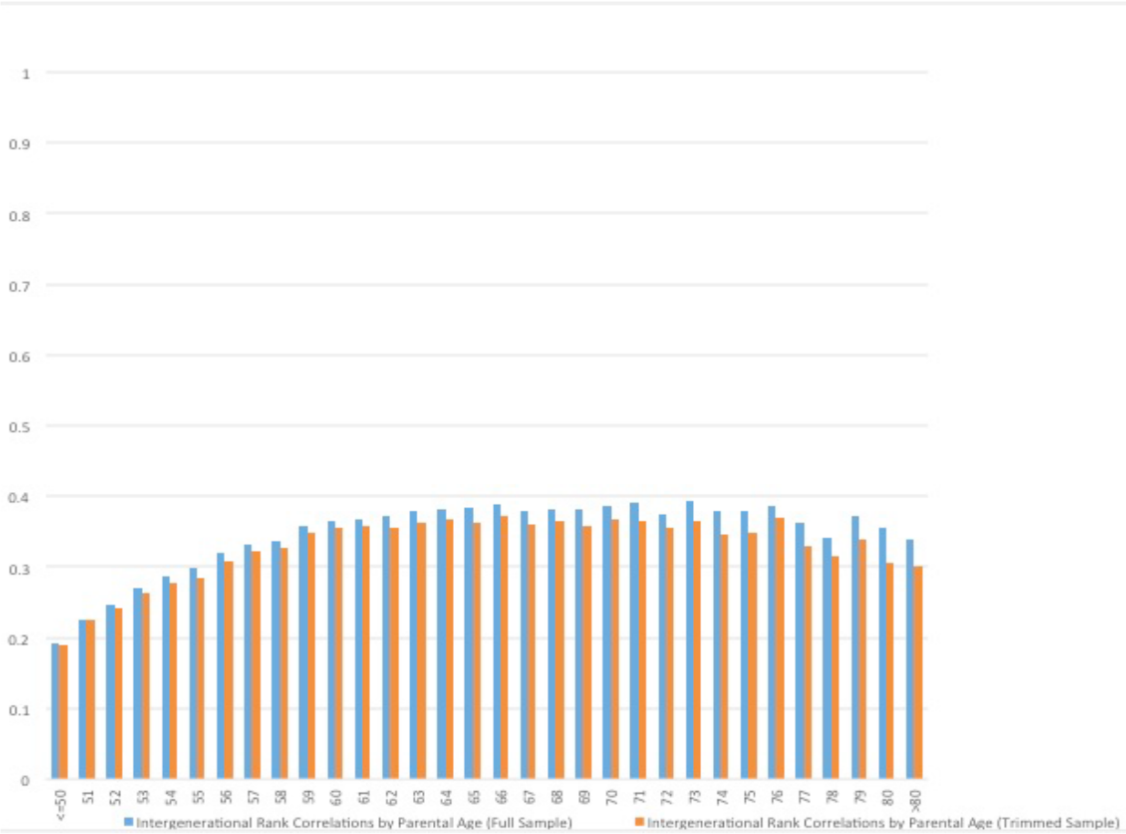


Table 1a: Summary Statistics

	Own-birth children		Adopted children	
	Mean	SD	Mean	SD
	Children			
Net wealth rank	0.50	0.29	0.48	0.30
Net wealth*	620,757	2,893,464	597,297	1,606,521
Age in 2006	43.82	5.59	43.19	4.73
Years of schooling	12.37	2.30	11.98	2.12
Female	0.51	0.50	0.53	0.50
Observations	1,200,835		2,479	
	Biological parents			
Net wealth ranking	0.50	0.29	0.34	0.27
Net wealth*	1,281,604	4,016,106	503,788	1,341,805
Average age in 1999	63.94	7.43	59.66	6.62
Average years of schooling	10.13	2.62	9.65	2.08
	Adoptive parents			
Net wealth ranking			0.55	0.28
Net wealth*			1,678,574	4,497,835
Average age in 1999			68.62	6.44
Average years of schooling			10.51	2.82

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 1b: Summary Statistics: Components of Wealth

	Own-birth children		Adopted children	
	Mean	SD	Mean	SD
	Children			
Gross Wealth	1,055,841	3,225,930	1,005,053	1.818,580
Financial Wealth	205,070	1,604,881	189,044	944,057
Safe Financial Wealth	97,083	439,142	84,289	432,274
Risky Financial Wealth	107,987	1,458,495	104,755	775,709
Primary Residential Wealth	644,772	804,147	593,662	787,036
Other Real Estate Wealth	191,367	1,562,246	216,945	919,498
Observations	1,200,835		2,479	
	Biological parents			
Gross Wealth	1,556,739	4,523,950	769,339	1,575,167
Financial Wealth	601,366	2,858,622	262,606	689,235
Safe Financial Wealth	199,067	998,339	107,077	207,222
Risky Financial Wealth	402,299	2,540,075	155,529	603,186
Primary Residential Wealth	562,585	638,321	340,893	508,028
Other Real Estate Wealth	284,145	2,176,985	129,512	1,012,726
	Adoptive parents			
Gross Wealth			1,914,093	4,892,641
Financial Wealth			808,072	2,811,130
Safe Financial Wealth			237,109	491,586
Risky Financial Wealth			570,962	2,546,862
Primary Residential Wealth			630,820	644,344
Other Real Estate Wealth			323,220	1,983,386

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

	Full Sample		Trim Bottom/Top 5%	
	Biological Children	Adoptees	Biological Children	Adoptees
Rank Biological Parental Net Wealth	0.347	0.108	0.331	0.127
	(0.001)***	(0.022)***	(0.001)***	(0.026)***
Rank Adoptive Parental Net Wealth		0.270		0.230
		(0.021)***		(0.027)***
Observations	1,200,835	2,479	1,080,646	1,945
R squared	0.147	0.128	0.120	0.115

Notes: All specifications include 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.

Table 3: Heterogeneous Effects
Dependent Variable: Child Rank in Within-Cohort Wealth Distribution

	(1) Males	(2) Females	(3) Inheritance	(4) Both Adoptive Spouses Alive in 2006
Rank Biological Parental Wealth	0.157 (0.040)***	0.114 (0.038)***	0.122 (0.026)***	0.128 (0.030)***
Rank Adoptive Parental Wealth	0.219 (0.037)***	0.243 (0.041)***	0.229 (0.027)***	0.240 (0.031)***
Both adoptive parents died by 2006* Rank Adoptive Parental Wealth			0.400 (0.091)***	
Observations	1,030	915	2,018	1,513
R-squared	0.158	0.166	0.131	0.129

Notes: The top and bottom 5 percent of parental net wealth distribution have been dropped. All specifications include 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. In Columns (1) and (2) at least one adoptive parent is alive in 2006. Column (3) also includes an indicator variable for whether both adoptive parents are dead by 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 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	0.127	0.141	0.105	0.137	0.112	0.050
	(0.026)***	(0.026)***	(0.024)***	(0.023)***	(0.026)***	(0.028)*
Rank Adoptive Parents	0.230	0.232	0.139	0.178	0.091	0.049
	(0.027)***	(0.028)***	(0.025)***	(0.021)***	(0.025)***	(0.022)***
Observations	1,945	1,945	1,945	1,945	1,945	1,945
R-squared	0.115	0.120	0.092	0.109	0.071	0.051

Notes: The top and bottom 5 percent of parental net wealth distribution have been dropped. All specifications include 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 adoptive family.

Table 5: Potential Mechanisms
Dependent Variable: Rank of Child Net Wealth

	(1)	(2)	(3)	(4)	(5)	(6)
Rank Biological Parental Wealth	0.127	0.125	0.089	0.131	0.081	0.066
	(0.026)***	(0.027)***	(0.026)***	(0.029)***	(0.023)***	(0.026)***
Rank Adoptive Parental Wealth	0.230	0.228	0.209	0.237	0.166	0.178
	(0.027)***	(0.028)***	(0.026)***	(0.029)***	(0.023)***	(0.026)***
Observations	1,945	1,945	1,945	1,670	1,945	1,670
R-squared	0.115	0.115	0.158	0.124	0.348	0.362
Control for Adoptive Parents' Earnings Rank	NO	YES	NO	NO	NO	YES
Control for Adoptive Parents' Education	NO	YES	NO	NO	NO	YES
Control for Children's Earnings Rank	NO	NO	YES	NO	NO	YES
Control for Children's Education	NO	NO	YES	NO	NO	YES
Control for Children's Savings Rate Rank	NO	NO	NO	YES	NO	YES
Control for Children's Asset Alloc. & ROI Rank	NO	NO	NO	NO	YES	YES

Notes: The top and bottom 5 percent of parental net wealth distribution have been dropped. All specifications include cohort dummies for parents and children. Child wealth is measured in 2006. All parents are alive in 1999 and at least one adoptive parent is alive in 2006. Education comes from the year 2000 Education Register and the education level of each adoptive parent is added separately. Child earnings rank is the within-cohort rank of the 3-year-average earnings between ages 34 and 36, dropping any year in which the child has zero earnings. Parental earnings rank is the within-cohort rank of the 3-year-average earnings between ages 54 and 56, dropping any year in which a parent has zero earnings (unless it is zero in all three years). For parents who are older than 55 in 1968, the first year we have the income register, we use their earnings in 1968. Children's Asset Allocation is the within-cohort rank of the share of assets in each of the four categories: Safe financial wealth, Risky financial wealth, Residential wealth, and Other real estate wealth. ROI is the rate of return on financial investments between 1999 and 2006. Savings rate is the rate of average savings out of average disposable income between 2000 and 2006. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by adoptive family.

Table 6: Addressing the Non-Random Assignment of Adoptees
Dependent Variable: Child Rank in Within-Cohort Wealth Distribution

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rank Biological		0.127		0.117	0.150	0.127	0.139	0.125
Parental Wealth		(0.026)***		(0.028)***	(0.027)***	(0.026)***	(0.027)***	(0.027)***
Rank Adoptive	0.239	0.230	0.233	0.228		0.230		0.228
Parental Wealth	(0.026)***	(0.027)***	(0.027)***	(0.027)***		(0.027)***		(0.028)***
Observations	1,945	1,945	1,945	1,945	1,945	1,945	1,945	1,945
R-squared	0.090	0.115	0.096	0.118	0.042	0.115	0.046	0.115
Biological Parents' Chars	NO	NO	YES	YES	NO	NO	NO	NO
Adoptive Parents' Chars	NO	NO	NO	NO	NO	NO	YES	YES

Notes: The top and bottom 5 percent of parental wealth distribution have been dropped. All specifications include 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 adoptive parent is alive in 2006. Parental wealth is calculated as combined wealth of the mother and father. Parental earnings rank is the within-cohort rank of the 3-year-average earnings between ages 54 and 56, dropping any year in which a parent has zero earnings (unless it zero in all three years). For parents who are older than 55 in 1968, the first year we have the income register, we use their earnings in 1968. Parental Characteristics include Schooling and Income. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by adoptive family.

Table 7: 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	0.126	0.127	0.098
	(0.048)***	(0.041)***	(0.050)***	(0.029)***
Rank Adoptive Parental Wealth	0.251	0.238	0.252	0.226
	(0.048)***	(0.029)***	(0.047)***	(0.030)***
Rank Biological Parent Wealth * Child Aged 36-45	-0.001		-0.004	
	(0.057)		(0.067)	
Rank Adoptive Parent Wealth * Child Aged 36-45	-0.031		-0.021	
	(0.058)		(0.060)	
Rank Bio Parent Wealth*Bio Parent Aged less than 60		0.001	0.004	
		(0.053)	(0.062)	
Rank Ad Parent Wealth *Ad Parent Aged less than 60		-0.076	-0.069	
		(0.076)	(0.079)	
Observations	1,945	1,945	1,945	1,474
R-squared	0.115	0.115	0.116	0.150

Notes: The top and bottom 5 percent of the parental wealth distribution have been dropped. All specifications include cohort dummies for parents and children. 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 8: Consumption Summary Statistics

	Own-birth children		Adopted children	
	Mean	SD	Mean	SD
	Children			
Mean Consumption rank	0.50	0.27	0.49	0.28
Mean Consumption	299,634	472,656	288,366	206,088
Observations	859,725		2,122	
	Biological parents			
Mean Consumption rank	0.51	0.21	0.46	0.21
Mean Consumption	265,290	443,290	204,006	162,566
	Adoptive parents			
Mean Consumption rank			0.55	0.28
Mean Consumption			258,893	241,201

Notes: Monetary values are reported in Swedish Krona using December 31, 2000 values. At the time, the exchange rate was 1 USD = 9.42 SEK. Consumption is calculated as the average consumption in the household across the 2000 to 2006 period. Ranks are calculated within-cohort.

Table 9: Intergenerational Relationships
Dependent Variable: Child Rank in Within-Cohort Consumption Distribution

	Full Sample			Trimmed Sample			Trimmed Sample	
	Biological Children	Adoptees	Adoptees	Biological Children	Adoptees	Adoptees	Biological Children	Adoptees
Rank Biological Parents' HH Consumption	0.247		0.104	0.220		0.092		
	(0.001)***		(0.024)***	(0.001)***		(0.026)***		
Rank Adoptive Parents' HH Consumption		0.173	0.165		0.131	0.122		
		(0.028)***	(0.029)***		(0.032)***	(0.032)***		
Rank Biological Parents' HH Net Wealth							0.333	0.107
							(0.001)***	(0.026)***
Rank Adoptive Parents' HH Net Wealth								0.259
								(0.026)***
Observations	859,725	2,122	2,122	787,550	1,801	1,801	787,550	1,801
R-squared	0.288	0.332	0.350	0.280	0.356	0.375	0.118	0.127

Notes: All regressions include controls for family size of children and an indicator variable for whether the child is married. Consumption data in Columns 4-8 is trimmed at the 5th and 95th percentile of parental consumption (by cohort). All specifications include cohort dummies for parents and children. Consumption is calculated as the average consumption in the household across the 2000 to 2006 period. Ranks are calculated within-cohort. Parental wealth is measured in 1999. 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 raising family.

Table 10: Potential Mechanisms
Dependent Variable: Rank of Child Consumption

	(1)	(2)	(3)	(4)
Rank Biological Parents' HH Consumption	0.092	0.084	0.024	0.024
	(0.026)***	(0.027)***	(0.023)	(0.023)
Rank Adoptive Parents' HH Consumption	0.122	0.022	0.049	0.025
	(0.032)***	(0.040)	(0.028)*	(0.036)
Observations	1,801	1,801	1,801	1,801
R-squared	0.375	0.384	0.518	0.463
Control for Adoptive Parents' Earnings Rank	NO	YES	NO	YES
Control for Adoptive Parents' Education	NO	YES	NO	YES
Control for Adoptive Parents' Net Wealth Rank	NO	YES	NO	YES
Control for Children's Earnings Rank	NO	NO	YES	YES
Control for Children's Education	NO	NO	YES	YES
Control for Children's Net Wealth Rank	NO	NO	YES	YES

Notes: All regressions include controls for family size of children and an indicator variable for whether the child is married. Consumption data is trimmed at the 5th and 95th percentile of parental consumption (by cohort). All specifications include cohort dummies for parents and children. All parents are alive in 1999 and at least one adoptive parent is alive in 2006. Education comes from the year 2000 Education Register and the education level of each adoptive parent is added separately. Child earnings rank is the within-cohort rank of the 3-year-average earnings between ages 34 and 36, dropping any year in which the child has zero earnings. Parental earnings rank is the within-cohort rank of the 3-year-average earnings between ages 54 and 56, dropping any year in which a parent has zero earnings (unless it zero in all three years). For parents who are older than 55 in 1968, the first year we have the income register, we use their earnings in 1968. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by adoptive family.

Appendix Table 1: Number of Adoptees by Birth Cohort

Year of Birth	Number of Adoptees
1950	14
1951	28
1952	28
1953	44
1954	47
1955	73
1956	72
1957	75
1958	87
1959	118
1960	136
1961	139
1962	169
1963	179
1964	226
1965	224
1966	220
1967	203
1968	147
1969	124
1970	126

Appendix Table 2: Incidence of Negative Net Wealth

	Observations	Obs with Negative Net Wealth
Own-birth Children	1,200,835	306,092 (25.5%)
Parents of Own-birth Children	1,200,835	114,186 (9.5%)
Adoptees	2,479	769 (31.0%)
Biological Parents of Adoptees	2,479	656 (26.5%)
Adoptive Parents of Adoptees	2,479	114 (4.6%)

Appendix Table 3: 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)
	Years of Schooling	Earnings 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	Saving Rate Rank	ROI Rank
Rank Bio. Parental	1.438	0.105	-0.036	0.112	0.004	0.046	-0.030	0.070
Net Wealth	(0.188)***	(0.025)***	(0.029)	(0.026)***	(0.028)	(0.027)*	(0.029)	(0.026)***
Rank Ad. Parental	0.902	0.052	-0.099	0.098	0.038	0.055	-0.175	0.070
Net Wealth	(0.186)**	(0.025)**	(0.030)***	(0.026)***	(0.029)	(0.027)**	(0.029)***	(0.025)***
Observations	1,945	1,945	1,945	1,945	1,945	1,945	1,670	1,945
R-squared	0.107	0.174	0.063	0.081	0.060	0.046	0.081	0.067

Notes: The top and bottom 5 percent of parental net wealth distribution have been dropped. In column (7), 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. In column (8), Return on Investment (ROI) is the average return on financial assets during the 1999 to 2006 period. All specifications include 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 4
Intergenerational Rank Correlations with and without Estimated Pension Wealth
(Trimmed Sample)

	(1)	(2)	(3)
	Net Wealth No Pensions	Net Wealth No Pensions	Net Wealth Includes Pensions
		Panel A: Biological Children	
Rank Biological Parental Net Wealth	0.331	0.338	0.175
	(0.001)***	(0.001)***	(0.001)***
Observations	1,080,961	988,912	988,912
R-squared	0.120	0.121	0.077
		Panel B: Adopted Children	
Rank Biological Parental Net Wealth	0.127	0.150	0.055
	(0.026)***	(0.030)***	(0.028)*
Rank Adoptive Parental Net Wealth	0.230	0.239	0.178
	(0.027)***	(0.030)***	(0.029)***
Observations	1,945	1,518	1,518
R-squared	0.115	0.134	0.120

Notes: The top and bottom 5 percent of parental wealth distribution have been dropped. Column 1 shows the results for the full sample in which net wealth does not include pension wealth either for the parents or children. Column 2 shows the results for the sample in which we have an estimate of pension wealth for all parents in 1999 and net wealth does not include pension wealth either for the parents or children. Column 3 shows the results where net wealth includes pension wealth for both parents and children. All specifications include 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. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by adoptive family.

Appendix Table 5: Using Various Transformations of Wealth

	Inverse Hyperbolic Sine				Levels			
	Full Sample		Trim Bottom/Top 5%		Full Sample		Trim Bottom/Top 5%	
	Biological Children	Adoptees	Biological Children	Adoptees	Biological Children	Adoptees	Biological Children	Adoptees
IHS Biological Parental Wealth	0.250 (0.001)***	0.089 (0.022)***	0.270 (0.002)***	0.093 (0.030)***				
IHS Adoptive Parental Wealth		0.228 (0.044)***		0.277 (0.085)***				
Biological Parental Wealth					0.198 (0.001)***	0.032 (0.016)**	0.305 (0.002)***	0.115 (0.030)***
Adoptive Parental Wealth						0.204 (0.026)***		0.179 (0.025)***
Observations	1,200,835	2,479	1,080,646	1,945	1,200,835	2,479	1,080,646	1,945
R squared	0.057	0.082	0.050	0.080	0.086	0.360	0.053	0.141

Notes: All specifications include 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 6: Robustness Checks
Dependent Variable: Child Rank in Within-Cohort Wealth Distribution

	(1) Baseline	(2) County Dummies	(3) Nature-Nurture	(4) Wealth averaged over 3 years	(5) Child Wealth at Household Level
Rank Biological Parental Wealth	0.127	0.127	0.062	0.124	0.136
	(0.026)***	(0.027)***	(0.062)	(0.026)***	(0.026)***
Rank Adoptive Parental Wealth	0.230	0.228	0.189	0.245	0.199
	(0.027)***	(0.027)***	(0.045)***	(0.026)***	(0.026)***
Rank Biological Parental Wealth* Rank Adoptive Parental Wealth			0.116		
			(0.104)		
Observations	1,945	1,945	1,945	1,938	1,945
R-squared	0.115	0.122	0.116	0.115	0.179
Child County of Residence	NO	YES	NO	NO	NO
Parents County of Residence	NO	YES	NO	NO	NO

Notes: The top and bottom 5 percent of parental wealth distribution have been dropped. All specifications include cohort dummies for parents and children. In Columns 1-3, parental wealth is measured in 1999 and child wealth is measured in 2006. In Column 4), parental wealth is averaged over 1999-2001 and child wealth is averaged over 2004-2006. In Column 5 we include controls for family size and an indicator variable for whether the child is married. 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 7: Robustness to Exclusion of Missing Biological Fathers

	(1) Baseline Sample	(2) Including Adoptees with Missing Biological Father
	Panel A: Net Wealth	
Rank Adoptive Parents' Net Wealth	0.270	0.274
	(0.020)***	(0.015)***
Observations	2,479	5,067
R squared	0.103	0.098
	Panel B: Consumption	
Rank Adoptive Parents' Consumption	0.173	0.174
	(0.028)***	(0.022)***
Observations	2,122	4,331
R squared	0.332	0.319

Notes: All specifications include cohort dummies for parents and children. Column 1 only includes observations with non-missing information on biological fathers. Column 2 adds observations with missing information on biological fathers. Parental wealth is measured in 1999 and child wealth is measured in 2006. In Panel B we include controls for family size and an indicator variable for whether the child is married. 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. Consumption is calculated as the average consumption in the household across the 2000 to 2006 period. *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by adoptive family.

Appendix 1: Data on Pensions

The Swedish pension system consists of three parts: public pensions, occupational pensions and private pension savings.

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).[69] 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:

[69] 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).

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.[70]

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.

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.

References

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Thörnqvist, T., & Vardardottir, A. (2014). Bargaining over Risk: The Impact of Decision Power on Household Portfolios. Manuscript.

[70] 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.

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*	1,019,757	340,285	973,980	329,884
Net wealth rank**	0.50	0.29	0.46	0.30
Net wealth*	1,672,663	3,041,622	1,586,236	1,708,611
Observations	1,098,818		1,942	
	Biological parents			
Average pension wealth ranking	0.51	0.29	0.56	0.29
Average pension wealth*	3,842,600	2,043,348	4,391,879	2,152,919
Average net wealth rank**	0.51	0.29	0.48	0.29
Average net wealth*	5,187,723	4,717,403	4,959,848	2,555,553
	Adoptive parents			
Average pension wealth ranking			0.55	0.28
Average pension wealth*			3,535,500	1,844,161
Average net wealth rank**			0.56	0.28
Average net wealth*			5,222,773	2,555,553

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: 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 and is 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 is 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. The estimates are also quite similar to those we find in Table 6 where we explore the impacts of non-random assignment for our estimates, suggesting that this simple assignment model may capture key features of the process.