BETTER PARENTS OR RICHER PARENTS: UNDERSTANDING INTERGENERATIONAL TRANSMISSION OF HUMAN CAPITAL*

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August 18, 2019

Abstract

There are two essential mechanisms in the canonical model of the transmission of human capital across generations – parental income and parental education. We provide novel empirical evidence to disentangle the significance of these two factors in determining children's human capital. Two reforms in Sweden provide us with natural experiments to separately identify the effects of parental income versus parental education: an educational reform that exogenously changed the level of compulsory schooling and quality of education of the parent generation; and a tax reform that exogenously altered parents' net income. Using Swedish administrative data, we first find that a 1,000 SEK increase in parental human capital leads to a 190 SEK increase in children's human capital. Second, exploiting the tax reform, we show that a 117 SEK increase in children's human capital – that is, slightly over 60% of the overall effect – is due to the parental education channel. Third, by *explicitly* measuring the effect of parental education channel, we verify that our results are robust to the estimation methods employed. Fourth, we highlight heterogeneity in the results across various sub-populations and show that parental income channel is the main driver of differences in children's outcomes when we focus on the sample of parents with similar levels of education. Considering heterogeneity of the effects based on children's gender, we additionally emphasize that parental education channel has a larger impact on daughters with the effect being estimated at over 70%.

JEL Codes: J62, I28, I24, J13, H24, H31.

*We are truly grateful to Sven Oskarsson and Rafael Ahlskog from Uppsala University for sharing the data with us and guiding us in using it. We also thank the department of government at Uppsala University, where much of this research was conducted, for their hospitality. Moreover, we are extremely grateful to Ananth Seshadri, Christopher Taber, Enghin Atalay, Corina Mommaerts, and Matthew Wiswall for all their guidance and support. Additionally, we are deeply grateful to Sir Richard Blundell, David Cesarini, Steven Durlauf, Susan Dynarski, Federico Gutierrez, Randall Kania, Miles Kimball, Adrien Matray, Kristin Paul, Adam Smith, Adam Spencer, Bruce Weinberg, and Zhen Ye for all their feedback that immensely improved the paper. We thank seminar participants at the Ohio State University, University of Arizona, University of Wisconsin-Madison, and Georgetown Center for Economic Research Biennial Conference for constructive suggestions. We gratefully acknowledge financial support from the Alice Gengler Wisconsin Distinguished Graduate Fellowship. We take responsibility for all the mistakes.

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1 Introduction

How do parents affect their children? Does parental human capital operate through parental income, parental education, or both? The answer to this question is of significance to any researcher interested in policies aimed at increasing intergenerational mobility as it can shed light on what an optimal policy should include to have long-lasting effects on future generations. For instance, it can help us arbitrage between policies aimed at improving equality of opportunities for children: an income transfer policy for parents with children and an educational policy that alters parents' education.

Parental human capital, in our analysis, consists of parental income and parental education. The former captures modifications in children's human capital following a change in parental income *alone*. The latter is determined by both years of schooling and the quality of education parents receive and incorporates all other effects of parental human capital on children.[1] Given these two dimensions of parental human capital, estimating which one has a larger impact on children, however, is a challenging task since parental education affects both parental income and parental education. Hence, to separate the two effects, we need exogenous shifters of parental education *and* parental income.

We address this challenge by using administrative data that covers the entire Swedish population for the period from 1960 to 2014. Parents in our analysis were born between 1943 and 1960 and were on average 40 years old in 1990 and their children were born between 1973 and 1984. Taking advantage of these data, we separate the overall effect of parental human capital into those that run through parental income and those that operate through parental education using two reforms.

The first one is an educational reform in the 1960s in Sweden that affected the group of parents in our study when they were children and exogenously changed their human capital, i.e., it altered *both* income and education of the parents. This exogenous shift in parents' human capital, in turn, also had an impact on children's human capital both because more educated parents are wealthier and because they are a different type of

[1] We are aware that parents can affect children by other dimensions of who parents are such as their genetics, but these differences are not the object of this study.

parents due to changes in their education[2] (Thomas et al. 1991; Guryan et al. 2008). Using the educational reform we are therefore able to estimate the total effect of increased parental human capital on that of the children.

In order to disentangle the impact of parental income from the total effect of parental human capital, it is necessary to separately instrument for parental income. The tax reform of 1991 offers us the second reform to analytically separate the effect of parental income from parental education. The tax reform had an impact on parents while they were working and exogenously altered their income. By taking advantage of the tax reform, we subsequently are able to evaluate how changes in parental income *alone* affect children's human capital. The effect of parental education on children is then calculated as the difference between the overall effect of parental human capital and parental income.[3] Therefore, using these reforms we can *separately* identify the importance of parental education and parental income in affecting children's human capital.

Given this framework, we begin by estimating the total effect of parental human capital on children's human capital using the educational reform that took place in Sweden in the 1960s. Like many educational reforms that were implemented in European countries during that period, the educational reform in Sweden was rolled out across the country during the 1960s and 1970s. This reform, however, was unique in that it not only increased compulsory schooling from seven or eight years[4] to nine years, but also changed the quality of education both by abolishing placement based on academic achievement into an academic or nonacademic stream after grade six and by imposing a nationally unified curriculum. Thus, unlike other reforms that only increased compulsory schooling (and possibly introduced universal curricula) and affected only marginal children, this reform influenced *every* child who attended school under the new system either by increasing the number of years of education or by changing the set of school peers/teachers each student was exposed to. Using this reform as a source of exogenous variation in parental human capital, we first exploit regional and time variation in the implementa-

[2] A change in the education of parents, for example, might affect the choice of a spouse, the choice of residential neighborhood, the investment patterns into children, and the amount/quality of time an individual spends with their children, among others.

[3] In Appendix A, we show how this identification strategy works for children's human capital production function in general.

[4] Compulsory schooling spanned eight years instead of seven in some large municipalities.

tion of the reform to instrument for parental human capital. Second, we proxy for both parents' and children's human capital using their average gross income between the ages of 30 and 40. Finally, we estimate how *both* a mother's and a father's human capital affects that of their children – unlike other papers that have looked at the effect of each parent separately. This creates an omitted variable bias we are able to avoid by including both parents in the estimation. As a result, we find that a 1,000 SEK increase in the mother's human capital increases her children's human capital by 244 SEK on average whereas the same increase in the father's human capital leads to only a 136 SEK increase. Therefore, our estimates suggest that both the mother's and father's human capital matter for that of their children with the effect of maternal human capital being the larger of the two. Overall, our estimates show that a 1,000 SEK increase in a parent's human capital leads to a 190 SEK increase in the children's human capital.

Accounting for significant intergenerational spillovers of human capital, we next turn to disentangling two distinct mechanisms – parental income and parental education – through which parental human capital affects that of children. The mutual dependence between these channels, however, makes it challenging to separately identify how important each channel is in affecting children's human capital. Consider, for example, a change in the parental education channel – as a result of the educational reform – that leads to parents spending more time with children. This change also affects the income channel as more time spent with one's children might imply less time at work and vice versa. To penetrate this interdependence, we consider a tax reform that took place in Sweden in 1991 and exogenously altered parents' income. The Swedish tax reform of 1991 is known for dramatically reducing marginal income tax rates as well as eliminating various tax shelters. Since a substantial decrease in marginal tax rates would lead to significant tax revenue losses, the reform also took measures to maintain the overall tax revenue: it implemented a new system of taxing capital income; broadened the value added tax to include goods and services previously exempted or granted lower rates; and eliminated loopholes and preferential rules for taxing earned income.

Observing the effects of the tax reform of 1991,[5] which increased net income of parents

[5]Overall, the tax reform reduced the marginal tax rate by 24%-27% for most full-time employees (Agell et al. 1996). See Agell et al. (1996) for a thorough review of the reform.

in our sample by 10% on average, we estimate how an exogenous increase in parental income affects children's human capital. Particularly, we estimate how family net income,[6] measured as the sum of the mother's and father's net incomes when children are between 0 and 18 years old, affects children's human capital. Parental incomes were combined into one in this analysis since we can not reject that their effects on children's outcomes are the same.[7] The identification of the causal effect of family net income comes from the exogenous change in the relationship between net and gross incomes of the parents due to the tax reform. Considering that our measure of human capital is proxied using average *gross* income between the ages of 30 and 40, we also convert our family net income into gross income for consistency. Subsequently, we show that a 1,000 SEK increase in average family gross income during an individual's childhood leads to a 73 SEK increase in children's human capital. Considering that a 1,000 SEK increase in parental human capital as a result of the educational reform resulted in a 190 SEK increase in children's human capital, we can thus conclude that 117 SEK[8] out of 190 SEK – that is, over 60% of the overall changes in children's human capital – comes from changes in parental education.

To check robustness of our results, we re-estimate our findings by *explicitly* measuring the effect of parental education channel in a different two-step approach. Particularly, we change the order in which the reforms are used and first determine the impact of parental income on children's human capital using the tax reform. In the second step, controlling for estimates of parental income, we instrument for parental education channel using the educational reform and are thus able to explicitly identify the impact of the education channel on children. Using this method, we demonstrate that the effect of parental education channel is estimated at 114 SEK, i.e., it accounts for 60% of the overall effect of parental human capital. The latter, in turn, highlights that the results are robust to the estimation methods we employ. Overall, our analysis provides evidence that *both* parental income and education are important mechanisms through which parents affect their children's human capital.

[6]The net income measure can be thought of as the gross income excluding any taxes, alimony payments, and repayments of student loans.

[7]Table C.4 in Appendix C shows that the effect on children's human capital of the mother's income is the same as the father's.

[8]This measure was calculated as the difference between the 190 SEK increase in children's human capital due to a change in parental human capital and the 73 SEK increase in children's human capital due to an increase in parental income.

One potential concern related to the decomposition above is that the results from the tax reform might be mainly driven by highly educated parents while the ones from the educational reform come from the whole sample. If that's the case, it would be difficult to interpret the relative importance of each channel we obtain from the decomposition. To address this concern, we next turn to estimating how – if at all – these effects differ when we focus only on the highly educated group. Looking at parents with similar levels of education,[9] we find that the income channel is responsible for over 90% of the overall effect. The latter is consistent with what we would expect since – when we control for parental education channel – the only difference in children's outcomes should be coming from differences in parental incomes. This finding, however, also implies that there is non-linearity in the estimates with the impact of parental education depending on the sub-population we are considering. Given heterogeneity in the results, we additionally look at how the effects differ based on children's gender and find that parental education channel is more important for women with the impact estimated at a bit over 70%. This, in turn, can also be informative for policies aimed at reducing the gender gap favoring men in children's human capital.

Our paper contributes to multiple strands of the literature. Our analysis using Swedish compulsory schooling laws relates to literature on the use of various educational reforms as instruments to determine how parental schooling affects children's outcomes (Black et al. 2005; Björklund and Salvanes 2011; Black and Devereux 2011; Holmlund et al. 2011; Lundborg et al. 2014). For example, Black et al. (2005) used the educational reform in Norway that changed the level of compulsory schooling and found little evidence of a causal relationship between fathers' and children's education. Similarly, using the educational reform in Sweden, Lundborg et al. (2014) found no causal effect of paternal education – despite positive causal effect of maternal education – on child outcomes. We view our paper as being complementary to this line of research. We contribute to this literature by being the first paper that looks at how *both* a mother and a father affect children's human capital instead of looking at the effect of each parent separately. As a result, we show that both mothers and fathers have a significant effect on their

[9]We limit the sample to parents whose parents, i.e., grandparents of the children in our sample, have more than compulsory level of education.

children's human capital, with the effect being strongest for mother-child pairs. The latter is consistent with findings by both Black et al. (2005) and Lundborg et al. (2014).

Our results highlighting the importance of the income channel are in line with a vast literature that considers how exogenous variations in parental income affect children's outcomes (Milligan and Stabile 2011; Dahl and Lochner 2012; Løken et al. 2012; Cesarini et al. 2016; Bastian and Michelmore 2018). Our estimates of the impact of parental human capital on cognitive IQ scores of boys are, for example, consistent with those obtained by Løken et al. (2012) using the initial discovery of oil in Norway as a source of exogenous variation in family income. The analysis that focuses on differences in how important parental education channel is based on children's gender, on the other hand, relates to literature that studies the impact of family background on children's adult outcomes (Riphahn and Schwientek 2015; Lundberg 2017; Brenøe and Lundberg 2018; Autor et al. 2019). Brenøe and Lundberg (2018), for example, using Danish administrative data showed that gender gaps in both earnings at age 31 and the likelihood of being employed are increasing in parental education, benefiting daughters. Similar to Brenøe and Lundberg (2018), but using permanent income of individuals as the outcome of interest, we find that parental education channel has a larger impact on daughters' adult outcomes and thus reduces the gender gap favoring men.

Our main contribution to the literature on intergenerational mobility, in addition to the ones mentioned above, is being the first paper that separately quantifies the effect of parental income versus parental education on children's human capital. The difference in the effects can first shed light on the bias in the estimates that are present in the vast literature that proxies for permanent parental income using education. More importantly, disentangling these two effects is central to policy design: the importance of each channel can inform us what type of policy one should consider if one aims to increase income of the next generation, given a limited amount of resources. Particularly, it can help us evaluate if an income transfer policy for parents with children increases equality of opportunity more than an educational policy that changes parental human capital. Analysis of benefits of an educational and tax reforms in our work suggests that an educational reform might potentially have a bigger long-term effect on intergenerational income mobility compared

to an income transfer reform.[10]

The rest of the paper is organized as follows. Section 2 provides institutional background on the educational reform and the tax reform of 1991; then Section 3 describes the dataset used in the paper. Section 4 outlines how the intergenerational transmission of human capital occurs. Section 5 describes the tax reform that took place in Sweden in 1991 and also shows how an unexpected increase in parental income affects human capital of the children. Section 6 presents a set of robustness checks. Finally, Section 7 concludes. Additional materials can be found in Appendices.

2 Institutional Background of the Reforms

2.1 *Institutional Background of the Swedish Compulsory School Reform*

This subsection briefly discusses the Swedish compulsory school reform that was gradually rolled out across the country's municipalities during the 1960s and 1970s.[11] In the pre-reform school system, students went through grades one to four or one to six (depending on their municipality) in the *folkskolan* (common basic compulsory school). After grade four or six, high-performing students were selected based on their grades to attend *realskolan* (five-year or three- to four-year junior secondary school, which was a requirement for the upper secondary school and subsequent higher education at the university) and the remaining students stayed in the *folkskolan* until they completed their seven-year compulsory education.[12]

The prevailing system, based on directing more and less able students into different tracks, was extensively debated and criticized throughout the interwar period. Education started being viewed as the key to abolishing class-based society and promoting democratically minded citizens, especially within the ruling social democratic party (Husén 1986; Oftedal Telhaug et al. 2006). Thus, a parliamentary committee was appointed in 1946 with the task of proposing guiding principles for the future compulsory school

[10] Unfortunately, we were not able to collect data on the cost of the educational reform for full policy implications given its lengthy implementation as well as various administrative costs it involved.

[11] A more detailed discussion of the reform is provided by Marklund (1981); Meghir and Palme (2005); Holmlund (2008); Hjalmarsson et al. (2015); and Lindgren et al. (2017) and the references cited therein.

[12] In some municipalities, mainly the largest cities, compulsory schooling was extended to eight years before the comprehensive school reform.

system. The final report was released two years later and had two main objectives: to increase equality of opportunity by postponing tracking and to meet the growing demand for education among the baby boom cohorts of the mid-1940s. The main recommendations were to increase compulsory schooling by two years and to postpone educational tracking so that children with different levels of skills or educational ambition would be kept in the same classroom until ninth grade. The committee also proposed important changes to the curriculum with particular focus being placed on the study of English and civics.

The committee proposal led to a large-scale nationwide evaluation between 1949 and 1962 during which the reform was implemented in various municipalities (Marklund 1981). A modest 14 municipalities in 12 different counties were selected for the first year of the evaluation (1949/1950).[13] The number of municipalities joining the evaluation program grew steadily in the subsequent years until 1962, when the parliament decided to implement the reform throughout the country. The municipalities then had until 1969 to implement the new system for all affected cohorts.

The way municipalities were selected to take part in the evaluation was as follows. Municipalities that were interested in participating in the reform had to report on different characteristics – such as population growth, tax revenues, local demand for education, and availability of teachers and school premises – to the central authorities. After receiving the applications, the National Board of Education decided which municipalities would implement the reform in a given year. The main objective of the Board in their decision-making process was to obtain a certain amount of variation across municipality types in order to facilitate the ongoing assessment of the reform.[14] Given the institutional details of the educational reform, the next subsection focuses on the details of the tax reform.

2.2 *Institutional Details of the Tax Reform*

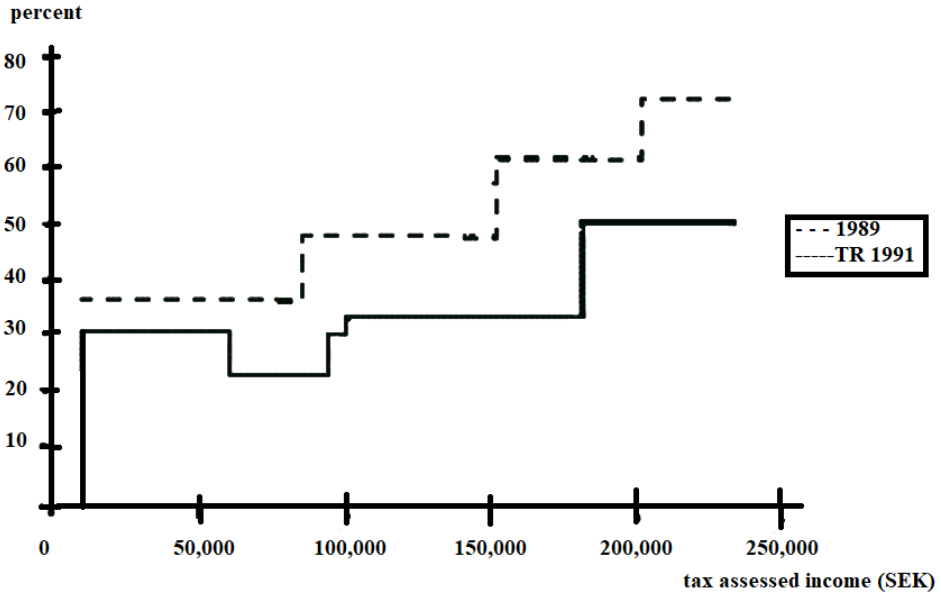
The Swedish tax reform of 1991 is known for dramatically reducing marginal income tax rates as well as eliminating various tax shelters. Given that a substantial decrease in

[13] There is a total of 1,037 municipalities in our analysis during this period.

[14] Table A.1 in Appendix A demonstrates how the year the reform was implemented in a certain municipality depends on its characteristics and shows that there was no selection of municipalities based on characteristics.

marginal tax rates[15] would lead to significant tax revenue losses, the reform also took measures to keep the overall tax revenue the same: it implemented a new system of taxing capital income; broadened the value added tax to include goods and services previously exempted or granted lower rates; and eliminated loopholes and preferential rules for taxing earned income. Some of the most notable changes brought about by the tax reform of 1991 are changes to the marginal taxation of labor, capital and corporate income.[16] Particularly, in the case of income tax, if before the tax reform the countrywide average of the local income tax of 31% was accompanied by a national income tax of 20% for incomes exceeding 185,000 SEK,[17] the tax reform reduced the marginal rate by 24%-27% for most full-time employees (Agell et al. 1996).

Figure 1: Marginal Tax Rate 1989-91 at Different Levels of Tax Assessed Income



Notes: Source: Agell et al. (1996). The figure above compares how the income tax schedule affected full-time employees in Sweden in 1989 and 1991. All income measures are presented in year 1991 prices.

Figure 1 above taken from Agell et al. (1996) compares how the income tax schedule affected full-time employees in Sweden in 1989 and 1991. In the case of the corporate income tax, the statutory tax rate was reduced from 57% to 30% whereas the new pro-

[15]For example, the top marginal tax rate decreased from over 70% to slightly above 50% as a result of the tax reform (Stenkula et al. 2014).

[16]The reader is referred to Agell et al. (1996) for a more in depth explanation of the tax reform and to Stenkula et al. (2014) for more information on changes to the marginal taxation of labor income in Sweden during the tax reform.

[17]This is equivalent to $33,500 using 1991 exchange rate.

portional capital income tax was set at 30%. The latter prevented capital tax avoidance through tax arbitrage when, for example, parents in high income tax brackets shifted their income to children with little or no earned income to decrease their capital income tax burden. Overall, the tax reform exogenously increased net income of individuals in our sample by almost 10%.

3 Data and Sample Selection

3.1 *Data for Parents*

The educational reform started in 1949 and ended in 1969 when the compulsory schooling of nine years was permanently introduced throughout the country. As a general rule, for a given municipality, all students who were in grades one to five in the year the reform was implemented were exposed to the reform whereas those in grades six and up were not.[18] Hence, the first cohorts affected by this reform were born between 1938 and 1955, as Swedish children usually start school at the age of seven, and they make up our initial sample. For these individuals we have data from censuses for every 5 years between 1960 and 1990 and annually from 1990 until 2014 from Statistics Sweden. The data contains information on a range of demographic and socioeconomic characteristics from various administrative registers. Because we do not observe municipality of residence until 1960, we further limit our initial sample and drop cohorts born before 1943 – since by 1960 they were likely to have moved from the municipality in which they were born/attended compulsory school (Holmlund 2008). Moreover, given that we want to estimate the effect of the educational reform on the education and income of individuals, in each municipality we expand our initial dataset to include cohorts born 6 years before and 5 years after the first cohort affected by the reform. We use this time span instead of a longer one to exclude the effect of other macroeconomic shocks. Additionally, we exclude the cohort preceding the first cohort affected by the reform to avoid potential issues related to some children starting school a year later than usual or repeating a year and due to measurement error in the exact timing of the reform in particular municipalities (Fredriksson and Öckert

[18]The first graders were immediately exposed to the reform, whereas those in the second, third, and fourth grades were exposed from the fifth grade and up.

2014). Thus, our final sample consists of individuals born between 1943 and 1960.

For individuals in our main sample we have information on municipality of residence, date of birth, place of birth, and the level of educational attainment as well as information on both gross and net income, professional status, employment status, and an indicator for whether an individual was subject to the reform.[19] From the military records, we also have information on the cognitive scores of boys for the cohorts born between 1952 and 1960, which was measured by written tests of logical, verbal, spatial, and technical skills. The cognitive score used in the paper is the overall cognitive score of individuals – a standardized version of the measures calculated by the military enlistment service – and ranges from one to nine. We supplement this dataset with information on parents of individuals in the main sample taken from the Multi-Generation Registry of Statistics Sweden.

Table 1: Descriptive Statistics for Individuals Subject to the Educational Reform

	Total sample		Reform = 0		Reform = 1	
	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Reform (Dummy)	0.55	0.50	0.00	0.00	1.00	0.00
Male (Dummy)	0.51	0.50	0.51	0.50	0.51	0.50
Age in 1960	9.62	4.31	12.61	2.85	7.15	3.71
Parental Education	8.35	2.05	8.18	1.94	8.47	2.12
Parental Age in 1960	40.00	7.76	43.30	6.93	37.30	7.34
Parent Non-Manual Worker	0.27	0.44	0.25	0.44	0.28	0.45
Parent Manual Worker	0.51	0.50	0.49	0.50	0.52	0.50
Parent Self-Employed	0.11	0.31	0.12	0.32	0.10	0.30
Parent Farmer	0.12	0.33	0.14	0.34	0.11	0.31
Observations	996,109		451,189		544,920	

Notes. The table above presents descriptive statistics for our main sample, which includes individuals born 6 years before and 5 years after the first cohort affected by the reform in each municipality (excluding the preceding cohort). Columns 3 and 4 reflect the results for those who went to school under the old system whereas columns 5 and 6 display results for individuals affected by the reform. Estimates that are statistically different from each other at 1% are highlighted in red. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Our final sample consists of 996,109 individuals, 544,920 of whom attended school in the new system. Table 1 above presents descriptive statistics for the sample and emphasizes that parents of the individuals not subject to the reform were, on average, 6 years older than the parents of individuals who went to school under the new system. Moreover, children in the old system were, on average, 5.46 years older than the children in the new system. Both of these facts can be explained given the nature of the reform

[19] We are deeply grateful to Helena Holmlund for sharing the code used to create the reform participation dummy.

in which individuals born earlier attended school in the old system, with the slow roll out of the reform affecting a younger generation of individuals. 51% of children in the sample have parents who were manual workers whereas only 12% have parents who were farmers. Average parental educational attainment level was 8.35 years and the average age of parents in the sample was 40. 51% of our sample of children is male and they were, on average, almost 10 years old in 1960. Overall, the Table shows that 55% of our main sample was subject to the educational reform and went to school under the new system.

Overall, the reform participation had a significant effect on various outcomes of individuals in the main sample. Particularly, Table 2 below demonstrates that the reform increased average years of education in Sweden by 0.3 years. Moreover, it not only increased the probability of getting at least nine years of schooling, but also increased the probability of getting more than the new level of compulsory schooling by 4%.

Table 2: The Effect of the Reform on Years of Education

	All	All	Men	Women
Reform (Dummy)	0.287***	0.450***	0.524***	0.368***
	(0.015)	(0.014)	(0.023)	(0.019)
Reform × Grandparent Educ		-0.131***	-0.147***	-0.114***
		(0.003)	(0.005)	(0.004)
Grandparent Education	0.416***	0.498***	0.526***	0.467***
	(0.003)	(0.004)	(0.004)	(0.005)
Observations	873,574	873,574	446,909	426,665
Adjusted R^2	0.146	0.148	0.165	0.134

Notes. The table above presents the effect of the reform on level of educational attainment of individuals. The table also controls for an indicator for being born in a Nordic country, gender, and birth cohort fixed of individuals as well as municipality fixed effects. Columns 2-4 display the impact of the reform for individuals by parental educational attainment level, with the baseline category being parents who have the previous compulsory schooling requirement of 7 years. The results are displayed for individuals born between 1943 and 1960, i.e., born 6 years before and 5 years after the reform for each municipality (excluding the preceding cohort). All income measures are presented in year 2000 prices. Standard errors are in parenthesis and are clustered at the 1960 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table 3 below, on the other hand, looks at individuals' human capital – proxied using logarithm of their average gross income between the ages of 30 and 40 – as the outcome of interest and demonstrates that the overall effect of the reform was small at about 0.7%. However, there is significant heterogeneity in the results with individuals whose parents have the previous compulsory schooling requirement of 7 years benefiting the most from the reform in the magnitude of 1.4%. Similar to the findings by Lundborg et al. (2014), Column 4 shows that women experienced a larger increase in their human capital as a result of the reform compared to men. Additionally, Figure 2 below depicts

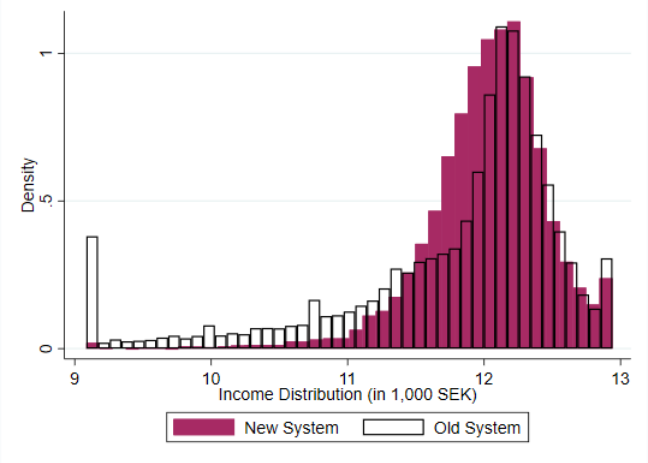
how the reform participation affected income distribution in Sweden. Particularly, using income of individuals born in 1943 (only 12% of individuals went to school in the new system) and in 1960 (everyone went to school in the reformed system), we highlight that the reform narrowed the distribution of income in Sweden. Specifically, it did so by increasing income in the bottom of the distribution. Thus, the reform was instrumental in decreasing income inequality in Sweden.

Table 3: The Effect of the Reform on Human Capital (in logs)

	All	All	Men	Women
Reform (Dummy)	0.007***	0.014***	0.006*	0.023***
	(0.003)	(0.003)	(0.003)	(0.004)
Reform × Grandparent Education		-0.006***	-0.001	-0.012***
		(0.001)	(0.001)	(0.001)
Grandparent Education	0.026***	0.030***	0.026***	0.034***
	(0.000)	(0.001)	(0.001)	(0.001)
Observations	854,610	854,610	441,200	413,410
Adjusted R^2	0.196	0.196	0.033	0.078

Notes. The table above presents the effect of the reform on human capital of individuals – proxied by logarithm of the average gross income between the ages of 30 and 40. The table also controls for an indicator for being born in a Nordic country, gender, and birth cohort fixed of individuals as well as municipality fixed effects. Columns 2-4 display the impact of the reform for individuals by parental educational attainment level, with the baseline category being parents who have the previous compulsory schooling requirement of 7 years. The results are displayed for individuals born between 1943 and 1960, i.e., born 6 years before and 5 years after the reform for each municipality (excluding the preceding cohort). All income measures are presented in year 2000 prices. Standard errors are in parenthesis and are clustered at the 1960 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Figure 2: Income Distribution Based on the Educational Reform Participation



Notes: The Figure above highlights changes in the income distribution as a result of the educational reform. "New System" indicates income distribution of individuals born in 1960 (all individuals went to schools under the new system) whereas it is 1943 (12% of individuals went to school in the new system) for the "Old System."

The individuals in our main sample comprise the sample of parents in our estimations.

The next subsection presents data for children of these individuals.[20]

3.2 *Data for Children*

We complement the data for parents with data on their children that was taken from the Multi-Generation Registry from Statistics Sweden. We have the same information for children as we do for their parents: children's municipality of residence, date of birth, place of birth, cognitive and non-cognitive IQ scores, and the level of educational attainment as well as information on both gross and net income, professional and employment status. Moreover, for the children's generation, we have data on their grades at the end of ninth grade taken from the government authority for education, *Skolverket*.

In both our intergenerational and tax reform analyses we limit children to those born after 1972 and thus exclude some children who were born earlier. The main reason for this exclusion comes from the fact that we are limiting children to those who are 18 years old and younger during the tax reform of 1991 since we want to estimate the impact of an increase in parental income on children's outcomes for children who are residing with their parents. To ensure that this limitation is not driving the results, however, in Section 6 we compare our results of the causal effect of parental human capital on children using all children born after 1969[21] to those born after 1972.

Table 4: Descriptive Statistics for Children of Individuals Subject to the Reform

	Mean	St. dev.
Child's Age in 1990	8.26	5.35
Child is Male	0.51	0.50
Mother's Age in 1990	38.22	4.01
Father's Age in 1990	38.81	4.08
Mother's Income in 1990	146,567	71,076
Father's Income in 1990	238,959	98,219
Mother's Education	11.65	2.43
Father's Education	11.53	2.63
Observations	1,121,126	

Notes. The table above presents descriptive statistics for children of individuals subject to the educational reform who were born after 1972. All income measures are presented in year 2000 prices.

Table 4 above presents descriptive statistics for children in our sample. There is data on 1,121,126 individuals whose parents belong to the main sample described in the

[20] It should be noted that parents of these sample are grandparents of the children sample.
[21] We excluded a small portion of children who were not subject to the educational reform.

previous subsection. Children, on average, were 8 years old in 1990 with parents who were, on average, 39. Slightly above half of the children in our sample are male. Fathers in the sample earned more with an annual gross income of 239,959 SEK compared to mothers who, on average, made 146,567 SEK measured in year 2000 prices.[22]

Outcome measures used for the sample of children are their level of educational attainment; human capital, calculated as the average gross income when a child is between 30 and 40 years old; grades at the end of ninth grade; and the cognitive IQ scores of boys. Grades at the end of ninth grade represent a standardized measure of the average of grades for all subjects taken in ninth grade whereas cognitive IQ scores are defined in a similar way to that of the parents. We specify all income measures in levels (unless mentioned otherwise) to be consistent with the literature. However, in Section 6 we also present how our results would change if we used logs instead.

4 The Impact of Parental Human Capital on Children's Human Capital

In this section we quantify the effect of parental human capital on outcomes of the next generation. In such a case, the returns to a policy that affects human capital of individuals in one generation would extend beyond the individual to also include all succeeding members of his family, resulting in long-lasting effects.

4.1 *The Empirical Model and Its Identification*

In this section we want to estimate the effect of parental human capital on children's human capital. To do so, let $\boldsymbol{X}_i^K$, $\boldsymbol{X}_i^M$, and $\boldsymbol{X}_i^F$ reflect observable permanent characteristics of a child in family i (whether the child was born in Sweden, the child's gender, and the child's birth year) and each of his parents (whether the parent was born in Sweden), respectively. Moreover, let α_c^P and α_m^P denote birth-cohort and municipality fixed effects for each parent $P = M, F$. Additionally, let H_i^K be human capital of a child in family i and let H_i^M and H_i^F be that of his parents where an individual's human capital is proxied in our analysis using his average gross income between the ages of 30 and 40. Finally, let

[22]This is equivalent to $32,452 for fathers and $19,822 for mothers in 2019.

ϵ_i reflect measurement error. Then a child's human capital, H_i^K, can be given as:

$$H_i^K = \alpha_0 + \alpha_1 H_i^M + \alpha_2 H_i^F + \alpha_c^M + \alpha_m^M + \alpha_c^F + \alpha_m^F + \alpha_3 \boldsymbol{X}_i^K + \alpha_4 \boldsymbol{X}_i^M + \alpha_5 \boldsymbol{X}_i^F + \epsilon_i \quad (1)$$

where parental human capital affects that of the children through both parental income *and* education channels. The former captures modifications in children's human capital following a change in parental income *alone*. The latter is determined by both years of schooling and the quality of education parents receive and incorporates all *other* effects of parental human capital on children.[23] Hence, the difference between parental human capital and income channel, although we proxy for human capital using income, is that parental human capital is altered due to *both* the direct effect of changes in parental education on parental income – since more educated parents are wealthier – and the indirect effect – since changes in an individual's education also affect what type of parent he is[24] (Thomas et al. 1991; Guryan et al. 2008).[25] Parental income channel, on the other hand, incorporates changes to parental income that keep parental education and other parental characteristics the same.[26] Given these mechanisms, parental human capital can thus be represented as a function of parental income, Y_i^P, and parental education channel, E_i^P:

$$H_i^P = \delta_0^P + \delta_1^P Y_i^P + \delta_2^P E_i^P + \nu_i^P$$

for $P = M, F$. Accounting for these two dimensions through which parents affect their children, we can also rewrite equation (1) as follows:

[23] We are aware that parents can affect children by other dimensions of who parents are such as their genetics, but these differences are not the object of this study.

[24] A change in the education of parents, for example, might affect the choice of a spouse, the choice of residential neighborhood, the investment patterns into children, and the amount/quality of time an individual spends with their children, among others.

[25] Thomas et al. (1991), for example, showed that parental education benefits children's height through access to information such as newspapers, watching television, and listening to the radio. Guryan et al. (2008), on the other hand, found that higher-educated, high-wage parents spend more time with their children.

[26] If given higher income parents, for example, decide to pursue more education, this effect will be included in the income channel in our estimations since the change was caused by additional income. Thus, the income channel captures all modifications in parental behavior resulting from a change in parental income.

$$H_i^K = \alpha_0 + \alpha_1^M Y_i^M + \alpha_1^F Y_i^F + \alpha_2^M E_i^M + \alpha_2^F E_i^F + \alpha_c^M + \alpha_m^M + \alpha_c^F + \alpha_m^F + \alpha_3 \boldsymbol{X}_i^K + \alpha_4 \boldsymbol{X}_i^M + \alpha_5 \boldsymbol{X}_i^F + \epsilon_i \quad (2)$$

where $\alpha_1^M = \alpha_1 \times \delta_1^M$ and $\alpha_1^F = \alpha_2 \times \delta_1^F$. Given equations (1) and (2) above, we utilize two two-step methods to *separately* identify the effect of parental income and education channels on children's human capital.

The first approach is defined as follows. First, taking advantage of the educational reform that exogenously altered parental human capital, we identify the causal effect of parental human capital on that of the children. Second, we estimate the causal effect of parental income – while controlling for parental education channel – using the tax reform. The difference between these two effects, i.e., $\alpha_2^M = \alpha_1 - \alpha_1^M$ for mothers and $\alpha_2^F = \alpha_2 - \alpha_1^F$ for fathers, then determines the impact of parental education channel on children.

In the second method we change the order in which the reforms are used which, in turn, allows us to explicitly estimate the effect of parental education channel. Particularly, we begin by determining the impact of parental income on children's human capital using the tax reform. Then we identify the effect of the education channel by rewriting equation (2) as follows:

$$H_i^K - \alpha_1^M Y_i^M - \alpha_1^F Y_i^F = \alpha_0 + \alpha_2^M E_i^M + \alpha_2^F E_i^F + \alpha_c^M + \alpha_m^M + \alpha_c^F + \alpha_m^F + \alpha_3 \boldsymbol{X}_i^K + \alpha_4 \boldsymbol{X}_i^M + \alpha_5 \boldsymbol{X}_i^F + \epsilon_i \quad (3)$$

where α_1^M and α_1^F are estimated in the first step and α_2^M and α_2^F are identified in the second step given the educational reform.

In the paper we present findings from both of the methods outlined above. The only difference between the methods is that the first approach estimates the effect of the educational channel implicitly whereas the second one does so explicitly. As expected, however, this will be shown not to affect our results and thus highlights robustness of the findings to the methods used. In the rest of this section we focus on estimating the first step of the first approach.

We start of by estimating equation (1) above to get a sense of how parental human

capital affects that of children. This, however, leads to biased estimates since omitted variables such as parental genes might be driving both parents' and children's human capital. Therefore, to eliminate this source of bias, we take advantage of the educational reform that took place in Sweden in the 1960s. As mentioned in Section 2, the timing of the reform varied across municipalities which, in turn, resulted in variation in reform exposure both within and between cohorts. Hence, exploiting an exogenous change in parental human capital as a result of the reform, we instrument for H_i^P in equation (1) as follows:

$$\begin{aligned}\hat{H}_i^P = \beta_0^P + \beta_1^P R_i^P + \beta_c^P + \beta_m^P + \beta_3^P S_i^{G,P} + \beta_4^P \boldsymbol{X}_i^P + \beta_5^P \boldsymbol{X}_i^K + \upsilon_i^P \\ + \gamma_1^{-P} R_i^{-P} + \gamma_c^{-P} + \gamma_m^{-P} + \gamma_3^{-P} S_i^{G,-P} + \gamma_4^{-P} \boldsymbol{X}_i^{-P}\end{aligned} \tag{4}$$

where $P = M, F$ for mothers and fathers and $-P$ signifies the spouse of the parent, i.e., $-P = M$ if $P = F$ and vice versa. R_i^P is a dummy for parental reform participation that takes a value of 1 if the parent went to school under the new system and 0 otherwise. β_c^P and β_m^P are parental cohort and municipality fixed effects, respectively. $S_i^{G,P}$ represents educational attainment level of a grandparent in family i, i.e., parent of the parent P, and is equal to 0 if the grandparent has the old level of compulsory schooling of 7 years and increases by 1 for each additional year of schooling.[27] $\boldsymbol{X}_i^P$ and $\boldsymbol{X}_i^K$ are permanent observable characteristics of parents and children, respectively.

Both maternal and paternal variables are included in the first-stage of our estimations above since we are instrumenting for *both* the mother's and father's human capital. This is an improvement on the previous literature that estimated the causal effect of parental human capital on that of children *separately* for each parent. The latter, in turn, leads to overestimation of the effect when human capital of the parents is positively correlated. Indeed, comparison of the causal effects of parental human capital on children in Tables B.2 and B.3 in Appendix B with the ones presented in Table 5 in the next subsection reveals a substantial bias in the estimates in the magnitude of two resulting from exclusion of one of the parents.

[27] Educational attainment level of a grandparent is defined in the estimation as the average of the sum of the mother's and father's parents' levels of education. Unfortunately, there is no available detailed data on income of the grandparents.

Accounting for the significance of inclusion of both parents in the estimation, we then instrument for both maternal and paternal human capital using parent's reform participation, defined in equation (4). However, in this case our instruments turn out to be weak.[28] Thus, we modify our instrument to also include parental reform participation interacted with grandparents' education. Although the inclusion of the interaction term leads to an overidentifying assumption,[29] it increases the efficiency of our IV estimation.[30] Hence, our modified first-stage is given as:

$$\begin{aligned}\hat{H}_i^P = \beta_0^P + \beta_1^P R_i^P + \beta_2^P R_i^P \times S_i^{G,P} + \beta_c^P + \beta_m^P + \beta_3^P S_i^{G,P} + \beta_4^P \boldsymbol{X}_i^P + \beta_5^P \boldsymbol{X}_i^K + \xi_i^P \\ + \gamma_1^{-P} R_i^{-P} + \gamma_2^{-P} R_i^{-P} \times S_i^{G,-P} + \gamma_c^{-P} + \gamma_m^{-P} + \gamma_3^{-P} S_i^{G,-P} + \gamma_4^{-P} \boldsymbol{X}_i^{-P}\end{aligned} \tag{5}$$

where the only difference between equations (4) and (5) is that the latter includes not only parental reform participation, but also its interaction with grandparents' education, $S_i^{G,P}$. In constructing our modified instrument we are taking advantage of the fact that reform participation is a valid instrument. Then under assumption that ϵ_i in equation (1) is mean-independent of the included covariates, any function of the reform dummy and the covariates is also a valid instrument due to the consistency of IV estimation (Løken et al. 2012). The inclusion of grandparents' education in the first stage, in turn, implies that it is also incorporated in the second stage – defined in equation (1) above – as part of the permanent characteristics of the parents.

A crucial assumption of our identification strategy is that, conditional on birth cohort and municipality fixed effects, exposure to the reform is random. This condition would be violated if individuals responded to the reform by moving to or from reformed municipalities in a certain way. To address this issue we separately estimate the impact of the reform on individuals who did not change municipality of residence as well as the full sample of individuals – that also includes individuals who moved to and from reformed municipalities. Given that the effect of the reform in these two samples is not statistically different from each other as can be seen in Table A.2 in Appendix A, we thus demonstrate that there was no selective mobility. This is also consistent with the results obtained by

[28] The Wald F statistic for the first stage is less than 1.
[29] This could increase the small sample bias of the IV estimator (Staiger and Stock 1997).
[30] The Wald F statistic for the first stage is 18.82.

Meghir and Palme (2005). The latter had access to data on individuals' municipality of birth as well as municipality in the sixth grade using survey data from the 1948 and 1953 cohorts of the Individual Statistics project and reached the same conclusion. Thus, we believe that exposure of individuals to the educational reform was approximately random.

Another underlying assumption is that there was no selection of municipalities, based on characteristics, that implemented the reform in a given year. As mentioned in Section 2, municipalities that were interested in participating in the reform had to report on different characteristics – such as population growth, tax revenues, local demand for education, and availability of teachers and school premises – to the National Board of Education. The main objective of the Board, when selecting municipalities for participation, was to obtain a certain amount of variation across municipality types in order to facilitate the ongoing assessment of the reform. Although the latter already suggests that there was no selection of municipalities based on characteristics, Table A.1 in Appendix A verifies that it indeed was the case. Particularly, the Table shows that doubling the population of an average municipality, i.e., increasing it by 1,000 people, leads to the reform being implemented only 0.03 years earlier. Similarly, significant increases in the municipality income per capita as well as in its area also result in very small changes in when the reform was enforced. Additionally, Tables A.3 and A.4 in Appendix A show that our results are robust to the inclusion of linear trends in municipality characteristics. Moreover, Table 1 in Section 3 shows that our sample of pre-reform and post-reform individuals is mostly balanced with the only caveat being that both parents and children in the pre-reform system are a bit older. The age difference is unavoidable given the nature of the reform, in which individuals born earlier attended school in the old system, and the slow roll out of the reform affected a younger generation of individuals. Hence, we believe that there was no trend in which municipalities with certain characteristics got to implement the new system earlier than other municipalities. Since municipalities were still uncertain if their application would be approved even after applying, we also believe that municipalities did not take any preemptive action before they were assigned to the reformed system.

Given the plausibility of these two assumptions, we next turn to evaluating the impact of parental human capital on children's human capital using the IV approach defined in

equations (1) and (5).

4.2 *IV and OLS Estimates*

In this subsection we present our estimates of the causal effect of parental human capital on children's human capital using the empirical model outlined in the previous subsection.

Table 5: IV and OLS Estimates of the Effect of Parental Human Capital on Children's Human Capital

	IV	OLS
Mother's Human Capital (1,000 SEK)	243.947**	40.508***
	(99.927)	(2.279)
Father's Human Capital (1,000 SEK)	136.144**	63.638***
	(53.478)	(1.437)
Observations	213,723	213,723
Adjusted R^2	0.698	0.723

Notes. The table above demonstrates the effect of parental human capital on that of their children. An individual's human capital is proxied by the average gross income when he was between 30 and 40 years old. The results are displayed for children of individuals subject to the educational reform. All income measures are presented in year 2000 prices and parental income is calculated in 1,000 SEK. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, children's gender, the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table 5 above shows our IV and OLS estimates with the first-stage results presented in Table B.1 in Appendix B. The IV results given in Column 1 demonstrate a strong positive relationship between human capital of parents and children. Particularly, our results suggest that a 1,000 SEK increase in the mother's and father's human capital – proxied by their average gross income between the ages of 30 and 40 – increases children's human capital on average by almost 244 and 136 SEK, respectively. Thus, we find that both the mother's and father's human capital have a substantial impact on that of children with the effect of maternal human capital being the larger of the two.[31] Overall, we estimate that a 1,000 SEK increase in parental human capital leads to an increase in children's human capital by 190 SEK.[32]

Our OLS findings in Column 2, on the other hand, predict that the impact of parental human capital is smaller in magnitude with a 1,000 SEK increase in parental human capital being associated with only 52 SEK increase in children's human capital. There

[31] Table B.4 in Appendix B shows results when we proxy for an individual's human capital using years of schooling.

[32] 190 SEK value was calculated by taking the average of 244 and 136.

are two potential reasons why our IV results differ from the OLS ones. The first one is that the OLS estimates describe the difference in average levels of human capital for children whose parents had different levels of human capital, i.e., OLS gives you difference in averages, not necessarily average differences (i.e., causal effect). The IV estimates, however, capture a weighted average of the marginal effects across the parental human capital distribution with more weight being assigned to parents that are most affected by the reform participation. Accounting for potential heterogeneous effects of parental human capital on that of children, we therefore re-estimate our IV and OLS findings above for the sample of parents who benefited less from the educational reform.[33] Limiting the sample to high human capital parents – defined as parents whose parents, i.e., grandparents of the children in our sample, have more than compulsory level of education – we find that there is indeed some heterogeneity in the effects. Particularly, panel A of Table 6 below demonstrates that the causal impact of parental human capital is lower at around 77 SEK for high human capital parents.[34] Differences in the results between Tables 5 and 6 therefore caution us about generalizability of our results to other settings. On the other hand, both tables show that there is a significant causal effect of parental human capital on children.

Table 6: Heterogeneity in the IV and OLS Estimates of the Effect of Parental Human Capital on Children's Human Capital

	IV	OLS
Panel A. Estimates for high human capital parents		
Mother's Human Capital (1,000 SEK)	75.226**	41.527***
	(36.310)	(2.462)
Father's Human Capital (1,000 SEK)	79.165***	65.799***
	(22.185)	(1.563)
Panel B. Estimates for daughters		
Mother's Human Capital (1,000 SEK)	270.180***	48.331***
	(75.972)	(2.456)
Father's Human Capital (1,000 SEK)	153.581***	45.082***
	(50.111)	(1.780)

Notes. The table above presents the effect of parental human capital on that of children. Panel A limits the sample to parents whose parents have more than compulsory level of schooling. Panel B, on the other hand, focuses on daughters. An individual's human capital is proxied by the average gross income when he was between 30 and 40 years old. The results are displayed for children of individuals subject to the educational reform. All income measures are presented in year 2000 prices. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, children's gender (in panel A), the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

[33] Table A.3 in Appendix A shows heterogeneous effects of the reform on the parent generation.

[34] Table B.5 in Appendix B contains full estimates.

Given heterogeneity in the estimates resulting from where parental human capital is in the distribution, next we look at whether the importance of parental human capital also differs based on children's gender. Panel B of Table 6 above presents the findings for daughters whose parents were affected by the educational reform.[35] The table shows that parental human capital matters more for daughters with the impact being in the magnitude of 213 SEK compared to 190 SEK for all children. This, in turn, also has implications for gender gap in children's human capital and provides evidence that educating parents might be instrumental in decreasing the gender gap in children, favoring boys.

The second reason for potential differences in the IV and OLS estimates comes from the classical measurement error. Measurement error might arise even in our setting that uses high-quality administrative data given that parental income was collected every 5 years. Consider, for example, the case when parents were hit with a shock the year the income data was gathered. Then our human capital variable will not be capturing the "true" human capital of parents and, as a result, our OLS estimates will be subject to downward bias. Table B.8 in Appendix B demonstrates that there is indeed some measurement error in the findings. Specifically, the Table highlights that the effect of parental human capital is a bit lower at 173 when we instrument for parental human capital using a longer time span between the ages of 30 and *50*. The comparison of the estimates, however, shows that the classical measurement error is a smaller concern in our setting as was expected given the quality of the data.

Overall, in this section we provided evidence on the substantial causal link between parents' and children's human capital. Specifically, instrumenting for parental human capital using their reform participation, we showed that a 1,000 SEK increase in parental human capital leads to an almost 190 SEK increase in children's human capital.

5 Quantifying the Importance of Parental Income

In this section we aim to quantify how an exogenous increase in parental income – that keeps all other characteristics of parents the same – affects children's human capital using

[35] Table B.7 in Appendix B contains full estimates.

the tax reform of 1991.

5.1 *The Empirical Model and Its Identification*

This subsection presents our empirical model of how children's human capital depends on parental income and discusses how we identify it. Let $\boldsymbol{X}_i^K$ and $\boldsymbol{X}_i^P$ reflect observable permanent characteristics of a child (whether the child was born in Sweden, the child's gender, and the child's birth year) and his parents (whether each parent was born in Sweden, each parent's birth year, the number of children, and the municipality of residence in 1990), respectively. Let η_i^K include unobservable characteristics of a child as well as an error term. Additionally, let I_i^P represent family net income, defined as the sum of maternal and paternal net income when children are between 0 and 18 years old. Net income can be thought of as the gross income excluding any taxes, alimony payments, and repayments of student loans. We combine parental incomes into one measure in our analysis instead of having them separately as a 1,000 SEK increase in family income does not affect children differently based on whether it comes from an increase in maternal or paternal income.[36] Particularly, Table C.4 in Appendix C shows that we can not reject that the impact on child outcomes of the mother's income is the same as the father's.[37] Given these variables, human capital of a child in family i – proxied by his average gross income between the ages of 30 and 40 – can be defined as follows:

$$H_i^K = \alpha_1 I_i^P + \alpha_2 \boldsymbol{X}_i^K + \alpha_3 \boldsymbol{X}_i^P + \eta_i^K \tag{6}$$

Accounting for the omitted variable bias, to get consistent estimates of family income, we first assume that unobserved characteristics of a child are independent of family *net* income once we control for *gross* income of parents, Y_i^P, as well as a child's birth cohort, α_c^K:

$$E(\eta_i^K | I_i^P, Y_i^P, \alpha_c^K) = Y_i^P + \alpha_c^K$$

[36] It should be noted that this assumption did not hold when we were considering parental human capital in Section 4.

[37] The results for children's cognitive IQ scores is the only exception to this rule. The latter, however, might be coming from the fact that the IQ scores are available only for boys.

Given this assumption, equation (6) becomes:

$$H_i^K = \beta_1 I_i^P + \beta_2 Y_i^P + \beta_3 \boldsymbol{X}_i^K + \beta_4 \boldsymbol{X}_i^P + \epsilon_i^K \tag{7}$$

where $E(\epsilon_i^K I_i^P) = 0$ and birth cohort fixed effects for children and parents are captured in $\boldsymbol{X}_i^K$ and $\boldsymbol{X}_i^P$, respectively. Second, to identify the causal effect of family net income on children's outcomes, we take advantage of the tax reform that took place in Sweden in 1991 and exogenously altered net income of parents while holding their gross income and other characteristics constant.[38] Since the relationship between net and gross incomes changed exogenously over time in response to the reform, we modify equation (7) to allow for net income of parents to be a time-dependent function, i.e., $I_{i,t}^P$:

$$H_i^K = \beta_1 I_{i,t}^P + \beta_2 Y_i^P + \beta_3 \boldsymbol{X}_i^K + \beta_4 \boldsymbol{X}_i^P + \epsilon_i^K \tag{8}$$

This exogenous change in the dependency between net and gross incomes is the main mechanism that allows for identification of the causal effect of family net income. To illustrate the idea behind our identification strategy, we present a simple example. Consider two high-income families that are identical[39] in all aspects except that the child in family 1 was born in 1990 and is one year younger than the respective child in family 2. Given that the tax reform substantially decreased the marginal income tax rate of these high-income families and consequently significantly increased their net income, these two families make up our treatment group. Analogously, let our control group consist of two identical low-income families 3 and 4. For ease of exposition, we assume that there was no change in the net income of low-income families due to the tax reform. Additionally, we assume that these low-income families are identical except that the child in family 3 was born one year later in 1990. Human capital of children in these 4 families is then given as:

$$H_i^{K,G} = \beta_1 I_{i,t}^{P,G} + \beta_2 Y_i^{P,G} + \beta_3 \boldsymbol{X}_i^{K,G} + \beta_4 \boldsymbol{X}_i^{P,G} + \epsilon_i^{K,G}$$

[38] Later in this subsection we show that this assumption holds.

[39] Identical in this case means that parents in both families earn the same gross income at each point in their lives and have similar observable characteristics.

where $i \in \{1, 2, 3, 4\}$ and G denotes whether the family is in a treatment or control group with $G = T, C$. Using the difference-in-differences approach we then have:

$$\left(H_1^{K,T} - H_2^{K,T}\right) - \left(H_3^{K,C} - H_4^{K,C}\right) = \beta_1\left(I_{1,t}^{P,T} - I_{2,t}^{P,T}\right) - \beta_1\left(I_{3,t}^{P,C} - I_{4,t}^{P,C}\right)$$

which is the same as:

$$\left(H_1^{K,T} - H_2^{K,T}\right) - \left(H_3^{K,C} - H_4^{K,C}\right) = \frac{\beta_1}{19}\left(I_{1,1,1990}^{P,T} - I_{2,1,1991}^{P,T}\right)$$

where $I_{2,1,1991}^{P,T}$ denotes net income of family 2 when the child was 1 year old that was calculated using the tax scheme specified in the tax reform of 1991. As shown in the equation above, the identification comes from the fact that the high-income family 1 that has a child born in 1990 received more net income starting from when their child was 1 year old whereas the high-income family 2 did so only when their child turned 2.[40] Thus, the only difference in the human capital of children can be explained by the fact that the child from family 1 got exposed to the reform one year earlier. Appendix C contains a more detailed explanation of how the identification works.

In our identification strategy above we are implicitly assuming that parental gross income remained the same, i.e., parents did not strategically respond to the tax reform in terms of hours worked. Unfortunately, we can not address this issue using data from Statistics Sweden as it does not contain the number of hours worked for 1990 and 1991. Thus, we use data from the OECD that includes average hours worked for every employed individual in Sweden between 1970 and 2017. Figure C.1 in Appendix C shows that the number of hours worked decreased by less than 1% for the sample of employed individuals between 1990 and 1991 from 1,575 to 1,562.[41] Additionally, Figures C.2 and C.3 in Appendix C show that parents in our sample did not respond to the reform by taking more parental leave time or sick leave, respectively. Thus, we believe that the assumption of the absence of strategic response from parents in terms of hours worked is plausible.

It is, however, possible that parents reacted to the tax reform in other ways through

[40] Since we are assuming that the net income of low-income families is not affected by the reform, we have $I_{3,1,1990}^{P,C} - I_{4,1,1991}^{P,C} = 0$.

[41] Similarly, Blomquist et al. (2001) evaluate tax reforms carried out in Sweden between 1980 and 1991 and show that the net increase in average desired hours of work was only 2%.

increased work effort, saving, risk-taking or through reduced levels of stress (Feldstein 2008). Moreover, a decrease in the tax rates could have also impacted provision of public goods such as quality of children's education. To address these concerns, in Table C.2 in Appendix C we re-estimate equation (8) focusing on families that are identical in terms of observables with the only difference being that the children are born one *month* apart instead of a year as was done above. In this case, even an increase by 10% in the number of hours worked by parents due to increased work effort would only amount to a difference of 13 hours per month for parents. We are then estimating whether this difference of 13 hours had an impact on children's human capital 30 years later. Similarity of the estimates in Table C.5 in the next subsection and in Table C.2 in Appendix C demonstrates that other behavioral responses by parents as well as changes in the provision of public goods by the government are less likely to be driving our results.

At last, since the reform was implemented at the beginning of a very sharp recession in Sweden, we need to ensure that we are indeed capturing the effect of the tax reform and not of the economic recession. Hence, we turn to the report by the *Welfare Commission*[42] that provided a comprehensive assessment of welfare developments in Sweden in the 1990s (Palme et al. 2003). In their summary research, the Commission pointed out that the main changes in welfare trends were in employment levels and mental health of individuals. Moreover, the report showed that groups that were most vulnerable during this time were immigrants, single mothers, and elderly.[43] We thus check whether our estimates are sensitive to these changes in work conditions of the parent generation. Given significant changes in the employment rates in Sweden in the early 1990s, we start off by limiting our sample to those parents that were employed throughout the entire period between 1990 and 1995. Similarity of the findings in Table C.1 in Appendix C that contains results for employed parents and Table C.5 in the next subsection that includes all parents in the sample demonstrate that our results are less likely to be driven by changes in the level of employment. Since we have shown above that increased levels of parental stress do not alter our results, next we verify whether exclusion of immigrant

[42]The *Welfare Commission* is a commission of academic researchers that were brought together by the Swedish Government with the aim of providing a comprehensive assessment of welfare developments in Sweden in the 1990s (Palme et al. 2003).

[43]Appendix C provides a more detailed explanation of changes highlighted in the report.

parents impacts our estimates.[44] Table C.3 in Appendix C shows that our findings do not respond to the exclusion of this group of parents. Overall, we believe that our estimates are capturing the effect of the tax reform and not of other macroeconomic shocks that took place in Sweden at that time.

Given this identification strategy, in the next subsection we describe our empirical method to estimate the effect of changes in parental income on children's outcomes.

5.2 *Difference-in-Differences and OLS Estimates*

In this subsection we present our estimates of the causal effect of family net income on children's human capital using the empirical model outlined in the previous subsection.

Table 7 below shows our difference-in-differences and OLS estimates. The difference-in-differences estimates are obtained using the identification strategy outlined above and thus additionally control for family gross income as well as family gross income percentile dummies. The difference-in-differences results given in Column 1 demonstrate a strong positive relationship between family net income and children's human capital. Particularly, our results suggest that a 1,000 SEK increase in family net income on average increases children's human capital – proxied by the average gross income between the ages of 30 and 40 – by almost 56 SEK. To ensure consistency of our estimates with the ones found in the literature, Table C.5 in Appendix C also estimates how changes in family net income affect other outcomes of children. Particularly, the table highlights that a 1,000 SEK increase in parental human capital boosts children's grades after ninth grade and cognitive IQ scores of boys at age 18 by 0.002 and 0.001 of a standard deviation, respectively. At first glance the effect of parental income on children's grades and cognitive IQ scores may seem rather small. However, they are consistent with the estimates obtained in Løken et al. (2012) for the effect of parental income on children's IQ scores in Norway.[45]

[44] We do not verify exclusion of single mothers or elderly on our results since they are not part of the main sample.

[45] Additionally, Table C.7 in Appendix C shows that a 10% increase in family net income is associated with a significant increase in the magnitude of 8.7% and 6.3% for children's grades and cognitive IQ scores, respectively.

Table 7: Diff-in-Diff and OLS Estimates of the Effect of Family Net Income on Children's Human Capital

	Diff-in-Diff	OLS
Family Net Income (1,000 SEK)	55.792***	71.178***
	(3.810)	(1.448)
Observations	235,998	235,998
Adjusted R^2	0.723	0.723

Notes. The table above presents the effect of family net income when children were 0-18 years old on children's human capital, defined as the average gross income between the ages of 30 and 40. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, children's gender, the level of educational attainment of a grandparent as well as municipality fixed effects. Column 1 additionally controls for family gross income when children were 0-18 years old and fixed effects for family gross income percentile in 1990. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices and family income is calculated in 1,000 SEK. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Our OLS findings in Column 2, on the other hand, predict that the impact of family net income is larger in magnitude with a 1,000 SEK increase in family net income being associated with a 71 SEK increase in children's human capital.[46] Comparison of the difference-in-differences and OLS findings indicates a significant endogeneity bias that is present in the OLS estimates.

Analogous to Section 4.2 and accounting for potential heterogeneous effects of family net income on children's human capital, we additionally re-estimate our diff-in-diff and OLS findings above for high human capital parents – defined as parents whose parents, i.e., grandparents of the children in our sample, have more than compulsory level of education. Panel A of Table 8 below demonstrates that the causal impact of family net income for high human capital parents is almost identical to the ones for the full sample.[47] This, in turn, suggests that the results are less likely to be driven by a subgroup of parents. The latter is not surprising considering that we explicitly control for gross income of individuals in our diff-in-diff approach.

As another check of heterogeneity of estimates, next we look at whether the importance of family net income differs based on children's gender. Panel B of Table 8 below presents the findings for daughters whose parents were affected by the educational reform. Unlike the estimates for parental human capital in Section 4.2, the table demonstrates

[46]Table C.6 in Appendix C shows that the same increase in family net income leads to a 0.003 and 0.002 of a standard deviation increase in grades after ninth grade and cognitive IQ scores of boys at age 18, respectively.

[47]Table C.8 in Appendix C contains full estimates.

that family net income matters less for daughters with the impact being in the magnitude of 41 SEK compared to 56 SEK for all children. This, in turn, also has implications for gender gap in children's human capital and suggests that an exogenous increase in parental income might have a small effect in decreasing the gender gap in children, favoring boys.

Table 8: Heterogeneity in the Diff-in-Diff and OLS Estimates of the Effect of Family Net Income on Children's Human Capital

	Diff-in-Diff	OLS
Panel A. Estimates for high human capital parents		
Family Net Income	54.986***	69.425***
	(4.885)	(1.563)
Panel B. Estimates for daughters		
Family Net Income	41.064***	60.897***
	(3.770)	(1.533)

Notes. The table above presents the effect of family net income when children were 0-18 years old on children's human capital. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, children's gender (in panel A), the level of educational attainment of a grandparent as well as municipality fixed effects. Column 1 additionally controls for family gross income when children were 0-18 years old and fixed effects for family gross income percentile in 1990. Panel A limits the sample to parents whose parents have more than compulsory level of schooling. Panel B, on the other hand, focuses on daughters. An individual's human capital is proxied by the average gross income when he was between 30 and 40 years old. The results are displayed for children of individuals subject to the educational reform. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

In general, our results using the tax reform of 1991 suggest that a 1,000 SEK increase in family net income leads to almost 56 SEK increase in children's human capital. Since the impact of parental human capital on that of their children in Section 4 was estimated using the average *gross* income of both parents and children, we convert net income of parents to gross income. As a result, we find that a 1,000 SEK increase in family *gross* income increases children's human capital by 73 SEK.[48] Since the causal effect of parental human capital on children's human capital was estimated to be 190 SEK, we conclude that 73 SEK of the 190 SEK – that is, around 40% of the overall effect of parental human capital on children – is due to the parental income with the rest coming from parental education channel.

To check robustness of our results to the methods used, we re-estimate our findings by *explicitly* measuring the effect of parental education channel in a following two-step

[48]This estimate is obtained by accounting for the fact that parental net income is 0.76% of parental gross income in our data.

approach outlined in Section 4.1. Specifically, in the first step we identify the impact of family net income on children's human capital as was done in Table 7 above. In the second step we take advantage of the educational reform and instrument for the education channel using parental reform participation as well as its interaction with grandparents' education as was done in equation (5). Then, accounting for estimates of family net income and instrumenting for parental education channel, we use equation (3) to explicitly identify the impact of the education channel. Table 9 below presents our results and demonstrates that the effect of parental education channel is estimated at 114 SEK, i.e., it accounts for 60% of the overall effect of parental human capital. The latter, in turn, highlights that the results are robust to the estimation methods we employ. The Table also shows that maternal education has a larger effect on children's human capital compared to that of the father.

In general, our findings from Tables 7 and 9 establish that *both* parental income and education are important determinants of children's human capital.

Table 9: IV and OLS Estimates of the Effect of Parental Education Channel on Children's Human Capital

	IV	OLS
Mother's Education Channel	155.358**	47.396***
	(64.154)	(1.700)
Father's Education Channel	73.400**	45.305***
	(28.344)	(1.134)
Observations	197,981	197,981
Adjusted R^2	0.057	0.728

Notes. The table above presents the effect of parental education channel on children's human capital, defined as the average gross income between the ages of 30 and 40. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, children's gender, the level of educational attainment of a grandparent as well as municipality fixed effects. All income measures are presented in year 2000 prices and family income is calculated in 1,000 SEK. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Accounting for non-linearities in the estimates, we show that around 90% of the overall effect is due to parental income channel when we focus on high human capital parents. The latter can be explained by the fact that when we look at children of individuals with similar levels of education, income of the parents should be the main factor that distinguishes them. Additionally, we estimate whether the relative importance of parental income channel differs based on the gender of a child. As a result we find that there is

some heterogeneity in the results with a bit over 70%[49] of the overall effect of parental human capital on daughters coming from the parental education channel.

Overall, in this paper we show that an increase in parental education benefits children not only through larger income, but also through other changes in who parents are.

6 Robustness Analysis

This section discusses a number of robustness checks, supporting the validity of our main results.

Fertility.–Our intergenerational analysis relies on the fact that fertility rates were not affected by the educational reform. Tables A.5 and A.6 in Appendix A show that the educational reform participation did not significantly affect neither decision of parents to have children nor the number of children they chose to have.

Assortative Mating.–Figure A.2 in Appendix A highlights that although there was a slight decline in the correlation between the mother's and father's education over time, the educational reform did not have an impact on assortativeness of marriages by human capital of individuals.

Sample Selection.–In our analysis, we limited the sample of children to those born after 1972. To make sure that the sample selection is not driving our results, we ran our intergenerational analysis including all children born after 1970 in Table B.6 in Appendix B. Although, the results for children born after 1970 are higher than the ones we estimated for the younger generation, they are in the ballpark of our findings.

Children from Intact Families.–Our main analysis looks at the effect of biological parents' human capital and income on children's outcomes. Since it is possible that the findings are capturing the impact of step parents on children, in Tables B.9 and C.10 in Appendices we restrict the sample to intact families. Doing so, does not change our main results with estimates for intact families depicting a slightly higher effect of maternal human capital on children. Overall, analogous to the main results, we find that around 65% of the overall effect of parents on children comes from the parental education channel.

[49] A 1,000 SEK increase in parental net income leads to a 41 SEK increase in daughters' gross income. This implies that a 1,000 SEK increase in parental *gross* income results in a 54 SEK increase in daughters' gross income and that 136 SEK out of 190 SEK is due to parental education channel.

Log Specification.–Above we have measured both parents' and children's human capital in levels. For comparison, Table C.7 in Appendix C presents our findings of the effect of an exogenous increase in family net income on children's outcomes when income is measured in logs instead of levels. In line with Dahl and Lochner (2012) and Bastian and Michelmore (2018), we find that this does not change our main results. Specifically, we find that a 10% increase in parental net income during an individual's childhood increases his average permanent gross income by 0.9%, standardized grades after ninth grade by 8.7% of a standard deviation, and the cognitive IQ scores by 6.3% of a standard deviation.

Linear Trends in Municipality Characteristics.–In our analysis we condition on parental municipality of residence. However, we do not include linear trends for municipality characteristics. Given the possibility that characteristics of reformed municipalities are correlated with the reform implementation year, we also add linear trends for municipality characteristics in our estimation. This, however, does not alter our results of the impact of the reform participation on individual's human capital as can be seen from Tables A.3 and A.4 in Appendix A that present our results with and without municipality linear trends, respectively.

7 Concluding Remarks

There are two main mechanisms in the canonical family model of the transmission of human capital across generations – parental income and parental education. In this work we provided novel empirical evidence to disentangle the significance of these two factors in determining children's human capital by taking advantage of two reforms that affected the group of parents in our study.

The first one is an educational reform in the 1960s in Sweden that increased compulsory schooling from seven/eight years to nine years, abolished placement based on academic achievement after grade six, and imposed a nationally unified curriculum, thus influencing every individual who went to school in the new system. Taking advantage of the exogenous change in human capital of the parents and the variation in the implementation of the reform across municipalities, we estimated that a 1,000 SEK increase in an individual's human capital leads to a 190 SEK increase in his children's human capital.

This increase in children's human capital, further, is a result of both changes in parental education *and* parental income channels since more educated parents are wealthier and because they are a different type of parents due to changes in their education.

To separately identify the importance of the parental education channel from that of parental income in affecting children's human capital, we also considered a tax reform that took place in Sweden in 1991 and exogenously altered parental income without affecting any of parents' other characteristics. Using the tax reform we estimated that the parental education channel accounts for 117 SEK of the 190 SEK – that is, slightly above 60% of the overall effect – of the impact of parental human capital on that of the children. Thus, we provided evidence that *both* parental education and parental income are important determinants of children's human capital.

Overall, the paper improves understanding of the mechanisms that drive intergenerational human capital mobility and shows that both parental education and income are important in explaining intergenerational transmission of inequality compared to changes in parental income alone. This result is very important if one is considering a policy with the aim of increasing equality of opportunity.

Appendix A

Disentangling the Importance of Income and Quality Channels

The focus on parental income and quality as main mechanisms though which intergenerational transmission of human capital takes place comes from the fact that any general human capital production function for children can be reduced to a function of only these two factors. To show this, let's start with a general human capital production function for children where a child's human capital H^K, is a function of his endowment H_0^K, his parent's human capital H^P, and investment of his parents X^K:

$$H^K = l(H_0^K, X^K, H^P, \cdot)$$

where $(\cdot)$ throughout this subsection will contain shocks to a child and/or his parents for ease of notation. Since investments by parents are themselves a function of a child's endowment H_0^K, his parent's human capital H^P, and income of parents I^P whereas children's initial endowments H_0^K can be viewed as a function of parental human capital H^P we have:

$$X^K = m(H_0^K, H^P, I^P, \cdot)$$
$$H_0^K = n(H^P, \cdot)$$

Thus, children's human capital can be reduced to a function of parental human capital, parental income as well as shocks:

$$H^K = f(H^P, I^P, \cdot)$$

Hence, a parent's effect on a child can be considered to be transmitting only through parental income and parental education. Supposing a linear relationship for expositional purposes yields:

$$H^K = \alpha_0 + \alpha_1 H^P + \alpha_2 I^P + \xi^K$$

Since parental income is a function of human capital as shown below:

$$I^P = \beta_0 + \beta_1 H^P + \eta^P$$

we further have

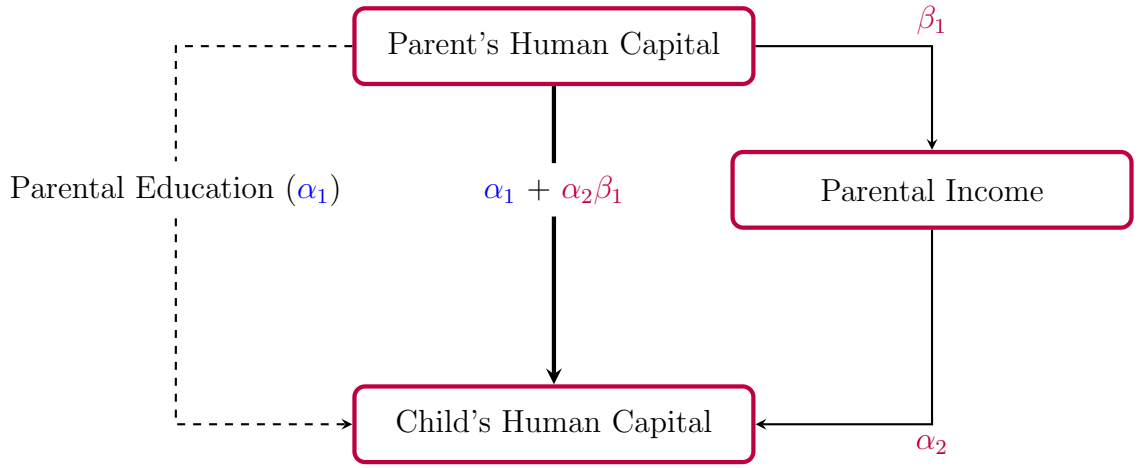
$$H^K = \gamma_0 + \gamma_1 H^P + \epsilon^K \tag{9}$$

where parents influence children through parental education and income channels:

$$\gamma_1 = \underbrace{\alpha_1}_{\text{parental education}} + \underbrace{\alpha_2\beta_1}_{\text{parental income}} \tag{10}$$

The way parents affect their children's human capital given in equations (9) and (10) is presented in Figure A.1.

Figure A.1: The Impact of Parental Human Capital on Children's Human Capital



Using this framework, we want to separately identify the impact of parental education versus parental income on children's human capital.

Table A.1: Dependence of the Educational Reform Implementation Year on Municipality Characteristics

Municipality Population (in 1,000)	-0.027***
	(0.002)
Area (in 1,000 Sq Km)	-0.001***
	(0.000)
Municipality Income Per Capita (in 1,000 SEK)	0.000***
	(0.000)
Share of Farming Area	-0.105***
	(0.029)
Share of Pop Supporting Right Party	0.040
	(0.066)
Share of Pop Supporting the Farmers' Party	0.124*
	(0.064)
Observations	10,432
Adjusted R^2	0.035

Notes. The table above shows how the educational reform implementation year depends on municipality characteristics. We limit the municipalities to those that did not merge between 1960 and 1966. Independent variables are all given in their 1960 value. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table A.2: The Impact of the Reform on Human Capital of Parents (1,000 SEK)

	Entire Sample	Stayers
Reform (Dummy)	0.733**	0.904**
	(0.339)	(0.371)
Observations	854,610	709,793
Adjusted R^2	0.257	0.253
P-value	0.267	

Notes. The table above presents the effect of the reform on human capital of individuals – proxied by the average gross income between the ages of 30 and 40. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed for individuals as well as municipality fixed effects. Column 1 displays the result for all individuals in our main sample whereas column 2 does so for those who also did not change their municipality of residence until at least the end of the sixth grade. The results are displayed for individuals born between 1943 and 1960, i.e., born 6 years before and 5 years after the reform for each municipality (excluding the preceding cohort). All income measures are presented in year 2000 prices. Standard errors are in parenthesis and are clustered at the 1960 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

P-values above tests whether the effect of the reform participation on individuals in the main sample is the same as the on individuals who did not change their municipality of residence.

Table A.3: The Impact of the Reform on Human Capital of Parents (1,000 SEK)

	All	All	Men	Women
Reform (Dummy)	0.733**	1.149***	0.856	1.402***
	(0.316)	(0.326)	(0.534)	(0.387)
Reform × Grandparent Education		-0.338***	0.064	-0.738***
		(0.086)	(0.145)	(0.122)
Parent is Male	72.330***	72.331***		
	(0.724)	(0.724)		
Grandparent Education	5.471***	5.683***	6.664***	4.610***
	(0.065)	(0.079)	(0.123)	(0.105)
Observations	854,610	854,610	441,200	413,410
Adjusted R^2	0.257	0.257	0.061	0.074

Notes. The table above presents the effect of the reform on human capital of individuals – proxied by the average gross income between the ages of 30 and 40. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed for individuals as well as municipality fixed effects. Columns 2-4 display the impact of the reform for individuals by parental educational attainment level, with the baseline category being parents who have the previous compulsory schooling requirement of 7 years. The results are displayed for individuals born between 1943 and 1960, i.e., born 6 years before and 5 years after the reform for each municipality (excluding the preceding cohort). All income measures are presented in year 2000 prices. Standard errors are in parenthesis and are clustered at the 1960 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table A.4: The Impact of the Reform on Human Capital of Parents (1,000 SEK)

	All	All	Men	Women
Reform (Dummy)	0.746**	1.180***	0.843	1.530***
	(0.325)	(0.337)	(0.586)	(0.421)
Reform × Grandparent Education		-0.336***	0.120	-0.794***
		(0.094)	(0.156)	(0.139)
Parent is Male	72.809***	72.810***		
	(0.763)	(0.763)		
Grandparent Education	4.036***	4.247***	4.610***	3.837***
	(0.065)	(0.083)	(0.115)	(0.115)
Voter Turnout	6.844	6.626	1.134	13.585*
	(6.173)	(6.259)	(9.940)	(7.774)
Share of Pop Supporting Left Parties	10.032	9.343	17.343	0.302
	(7.510)	(7.693)	(11.270)	(9.108)
Share of Pop Supporting Right Parties	13.997*	13.870*	30.070***	-3.954
	(7.392)	(7.435)	(11.035)	(9.423)
Area (in 1,000 Sq Km)	-0.004	-0.005	0.013	-0.026
	(0.022)	(0.022)	(0.041)	(0.025)
Municipality Population (in 1,000)	0.020	0.032	-0.017	0.077
	(0.037)	(0.036)	(0.027)	(0.063)
Share of Farming Area	-0.940***	-0.960***	-1.846***	-0.127
	(0.259)	(0.268)	(0.576)	(0.254)
Share of Agricultural Estates	-1.340	-1.075	-0.305	-1.881
	(1.766)	(1.761)	(2.687)	(2.450)
Municipality Income Per Capita (1,000 SEK)	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Real Estate Value Per Capita (1,000 SEK)	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	761,357	761,357	392,757	368,600
Adjusted R^2	0.264	0.264	0.073	0.077

Notes. The table above presents the effect of the reform on human capital of individuals – proxied by the average gross income between the ages of 30 and 40 – while controlling for linear trends in municipality characteristics. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed for individuals as well as municipality fixed effects. Columns 2-4 display the impact of the reform for individuals by parental educational attainment level, with the baseline category being parents who have the previous compulsory schooling requirement of 7 years. The results are displayed for individuals born between 1943 and 1960, i.e., born 6 years before and 5 years after the reform for each municipality (excluding the preceding cohort). All income measures are presented in year 2000 prices. Standard errors are in parenthesis and are clustered at the 1960 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

The difference between Tables A.3 and A.4 above is that the latter also controls for linear trends in municipality characteristics. However, given that we do not have data for municipality characteristics for all the years for which we have data on individuals, this is not our preferred specification.

Table A.5: The Impact of the Reform on the Decision of Parents to Have Children

	All	All	Men	Women
Reform (Dummy)	0.002	0.001	0.002	-0.000
	(0.002)	(0.002)	(0.003)	(0.003)
Reform × Grandparent Education		0.001	-0.001	0.002***
		(0.000)	(0.001)	(0.001)
Parent is Male	-0.072***	-0.072***		
	(0.002)	(0.002)		
Grandparent Education	-0.003***	-0.004***	0.002***	-0.010***
	(0.000)	(0.000)	(0.001)	(0.001)
Observations	888,044	888,044	454,985	433,059
Adjusted R^2	0.012	0.012	0.003	0.006

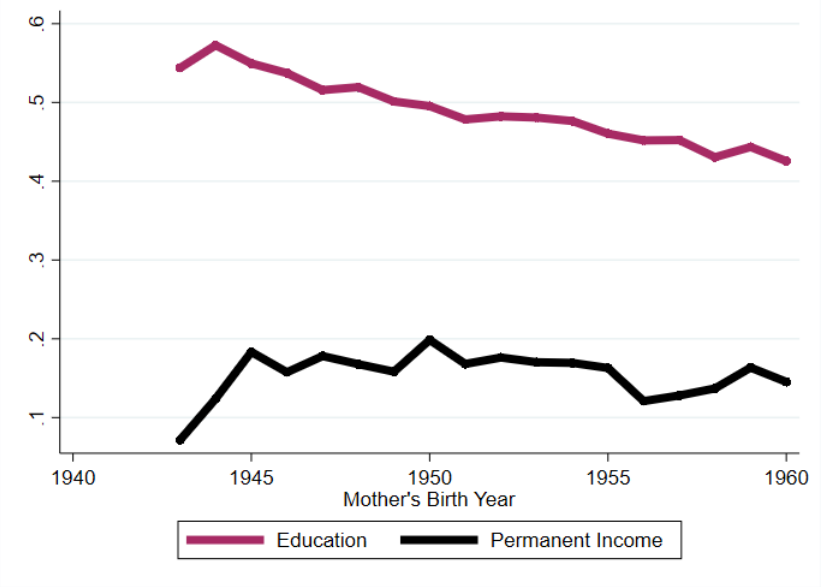
Notes. The table above presents the effect of the reform on individuals' decision to have children. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed for individuals as well as municipality fixed effects. Columns 2-4 display the impact of the reform for individuals by parental educational attainment level, with the baseline category being parents who have the previous compulsory schooling requirement of 7 years. The results are displayed for individuals born between 1943 and 1960, i.e., born 6 years before and 5 years after the reform for each municipality (excluding the preceding cohort). Standard errors are in parenthesis and are clustered at the 1960 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table A.6: The Impact of the Reform on the the Number of Children Parents Decide to Have

	All	All	Men	Women
Reform (Dummy)	0.006	0.007	0.010	0.003
	(0.006)	(0.006)	(0.009)	(0.009)
Reform × Grandparent Education		-0.000	-0.005***	0.005**
		(0.002)	(0.002)	(0.002)
Parent is Male	-0.132***	-0.132***		
	(0.006)	(0.006)		
Grandparent Education	-0.001	-0.001	0.015***	-0.018***
	(0.001)	(0.001)	(0.002)	(0.002)
Observations	888,044	888,044	454,985	433,059
Adjusted R^2	0.006	0.006	0.003	0.006

Notes. The table above presents the effect of the reform on the number of children an individual chooses to have. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed for individuals as well as municipality fixed effects. Columns 2-4 display the impact of the reform for individuals by parental educational attainment level, with the baseline category being parents who have the previous compulsory schooling requirement of 7 years. The results are displayed for individuals born between 1943 and 1960, i.e., born 6 years before and 5 years after the reform for each municipality (excluding the preceding cohort). Standard errors are in parenthesis and are clustered at the 1960 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Figure A.2: Assortative Mating Over Time by Education and Permanent Income



Notes: The Figure above shows changes in the assortative mating by education and income changes over time for individuals in our sample.

Appendix B

Table B.1: The First-Stage of Parental Human Capital on Children's Human Capital

	Mothers	Fathers
Mother's Reform Participation	0.483	3.222***
	(0.75)	(2.88)
Father's Reform Participation	2.206***	1.211
	(3.43)	(1.15)
Mother's Reform Part. × Grandparent Education	0.036	-1.610***
	(0.23)	(-7.44)
Father's Reform Part. × Grandparent Education	-1.205***	0.790***
	(-7.39)	(3.31)
Grandparent Education	5.566***	8.794***
	(22.61)	(27.24)
Child is Male	0.195	-0.109
	(0.81)	(-0.35)
Observations	215,159	215,858

Notes. The table above presents the first-stage of parental human capital on that of their children. Column 1 display results for mother's human capital whereas column 2 reflect the results for fathers. Parental human capital is proxied by the average gross income of individuals between ages of 30 and 50. All income measures are presented in year 2000 prices. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effect for parents and children, level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table B.2: IV and OLS Estimates of the Effect of Paternal Human Capital on Children's Human Capital

	IV	OLS
Father's Human Capital (1,000 SEK)	799.098**	66.165***
	(309.005)	(1.164)
Observations	405,862	405,862
Adjusted R^2	0.263	0.729

Notes. The table above presents the effect of a father's human capital on that of their children. An individual's human capital is proxied by the average gross income when he was between 30 and 40 years old. The results are displayed for children of individuals subject to the educational reform. All income measures are presented in year 2000 prices and parental income is calculated in 1,000 SEK. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, children's gender, the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table B.3: IV and OLS Estimates of the Effect of Maternal Human Capital on Children's Human Capital

	IV	OLS
Mother's Human Capital (1,000 SEK)	460.945***	52.938***
	(107.270)	(1.739)
Observations	432,570	432,570
Adjusted R^2	0.622	0.703

Notes. The table above presents the effect of a mother's human capital on that of their children. An individual's human capital is proxied by the average gross income when he was between 30 and 40 years old. The results are displayed for children of individuals subject to the educational reform. All income measures are presented in year 2000 prices and parental income is calculated in 1,000 SEK. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, children's gender, the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table B.4: IV and OLS Estimates of the Effect of Parental Education on Children's Education

	IV	OLS
Mother's Education	0.026	0.204***
	(0.031)	(0.002)
Father's Education	0.026	0.158***
	(0.022)	(0.002)
Child is Male	-0.669***	-0.674***
	(0.012)	(0.012)
Grandparent Education	0.224***	0.059***
	(0.021)	(0.003)
Observations	277,306	277,306
Adjusted R^2	0.132	0.201

Notes. The table above presents the effect of parental education on children's education. The results are displayed for children of individuals subject to the educational reform. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table B.5: IV and OLS Estimates of the Effect of Parental Human Capital on Children for High Human Capital Parents

	IV	OLS
Mother's Human Capital (1,000 SEK)	75.226**	41.527***
	(36.310)	(2.462)
Father's Human Capital (1,000 SEK)	79.165***	65.799***
	(22.185)	(1.563)
Observations	122,794	162,709
Adjusted R^2	0.718	0.711

Notes. The table above presents the effect of parental human capital on that of their children for parents whose parents have more than compulsory level of schooling. An individual's human capital is proxied by the average gross income when he was between 30 and 40 years old. The results are displayed for children of individuals subject to the educational reform. All income measures are presented in year 2000 prices. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, children's gender, the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table B.6: IV and OLS Estimates of the Effect of Parental Human Capital on Children's Human Capital

	IV	OLS
Mother's Human Capital (1,000 SEK)	568.233***	49.932***
	(171.157)	(2.443)
Father's Human Capital (1,000 SEK)	291.383***	79.540***
	(91.680)	(1.784)
Child is Male	28,075.497***	28,232.903***
	(393.422)	(362.668)
Observations	246,118	246,118
Adjusted R^2	0.602	0.722

Notes. The table above presents the effect of parental human capital on that of their children. An individual's human capital is proxied by the average gross income when he was between 30 and 40 years old. The results are displayed for children of individuals subject to the educational reform. All income measures are presented in year 2000 prices. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

The difference between Table B.6 above and Table 5 in the main text is that the former limits the sample of children to those who were born after 1969 whereas the latter places a further restriction by focusing on children who were born after 1972.

Table B.7: IV and OLS Estimates of the Effect of Parental Human Capital on Daughters' Human Capital

	IV	OLS
Mother's Human Capital (1,000 SEK)	270.180***	48.331***
	(75.972)	(2.456)
Father's Human Capital (1,000 SEK)	153.581***	45.082***
	(50.111)	(1.780)
Observations	103,784	103,784
Adjusted R^2	0.674	0.723

Notes. The table above presents the effect of parental human capital on that of their daughters. An individual's human capital is proxied by the average gross income when he was between 30 and 40 years old. The results are displayed for children of individuals subject to the educational reform. All income measures are presented in year 2000 prices and parental income is calculated in 1,000 SEK. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table B.8: IV and OLS Estimates of the Effect of Parental Human Capital on Children's Human Capital

	IV	OLS
Mother's Human Capital (1,000 SEK)	220.850**	50.667***
	(102.872)	(2.141)
Father's Human Capital (1,000 SEK)	125.758**	56.895***
	(49.504)	(1.275)
Observations	215923	215923
Adjusted R^2	0.004	0.724

Notes. The table above demonstrates the effect of parental human capital on that of their children. Parental human capital is proxied by the average gross income when he was between 30 and 50 years old as opposed to 40 in the main text. The results are displayed for children of individuals subject to the educational reform. All income measures are presented in year 2000 prices and parental income is calculated in 1,000 SEK. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, children's gender, the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

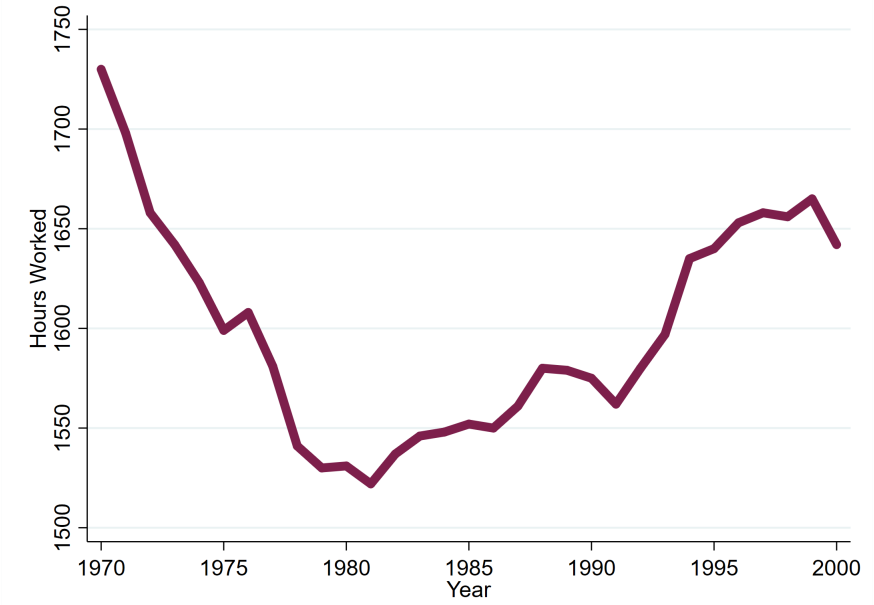
Table B.9: IV and OLS Estimates of the Effect of Parental Human Capital on Children's Human Capital for Intact Families

	IV	OLS
Mother's Human Capital (1,000 SEK)	310.657**	40.261***
	(147.301)	(2.579)
Father's Human Capital (1,000 SEK)	121.127	55.497***
	(77.972)	(1.749)
Observations	141,083	141,083
Adjusted R^2	0.702	0.739

Notes. The table above presents the effect of parental human capital on that of their children for children from intact families. An individual's human capital is proxied by the average gross income when he was between 30 and 40 years old. The results are displayed for children of individuals subject to the educational reform. All income measures are presented in year 2000 prices and parental income is calculated in 1,000 SEK. The table also controls for an indicator for being born in a Nordic country and birth cohort fixed effects for both parents and children, the level of educational attainment of a grandparent as well as municipality fixed effects. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

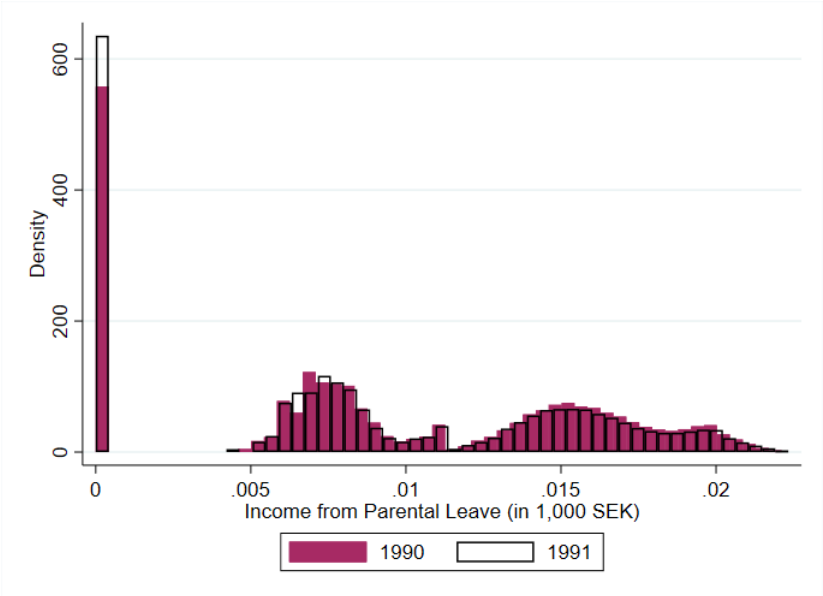
Appendix C

Figure C.1: Average Hours Worked for Employed Individuals in Sweden



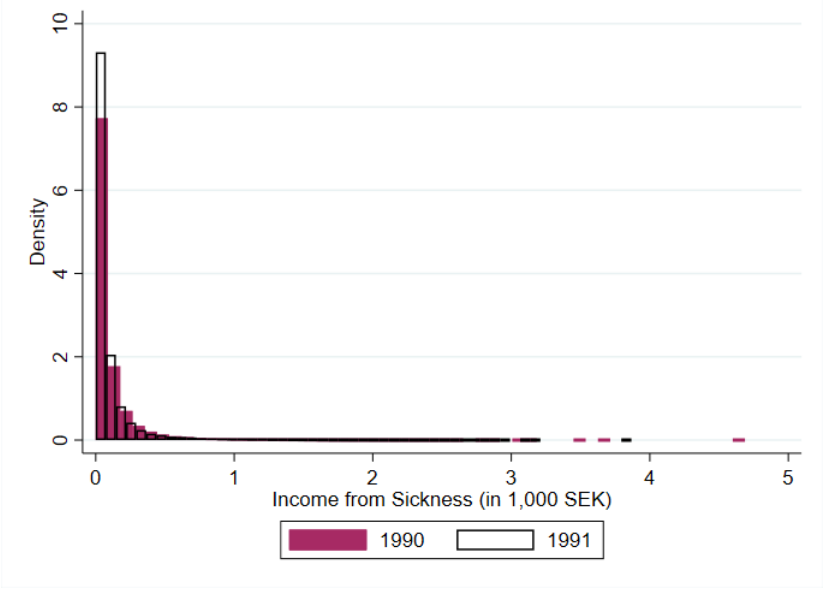
Notes: Source: OECD data for hours worked for Sweden taken from *https://data.oecd.org/emp/hours-worked.htm.*

Figure C.2: Distribution of Income from Parental Leave in 1990 and 1991



Notes: The Figure above show the distribution of income from parental leave in 1990 and 1991.

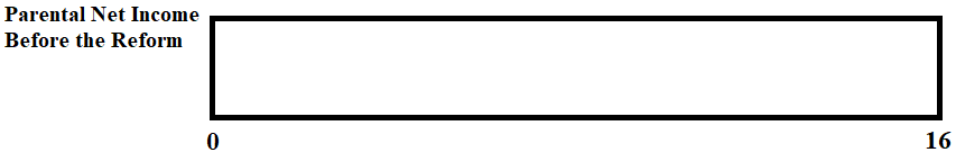
Figure C.3: Distribution of Income from Sickness in 1990 and 1991



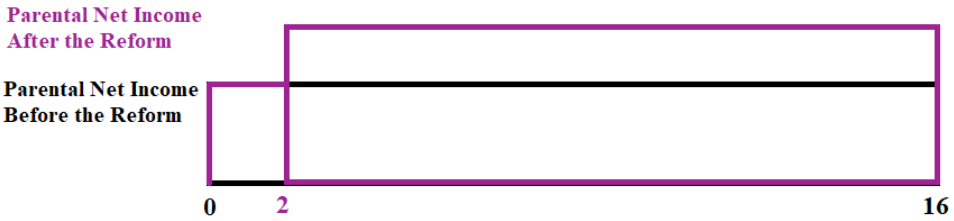
Notes: The Figure above show the distribution of income from sickness in 1990 and 1991.

Identification of the Causal Effect of Parental Income on Children's Income Using the Tax Reform of 1991

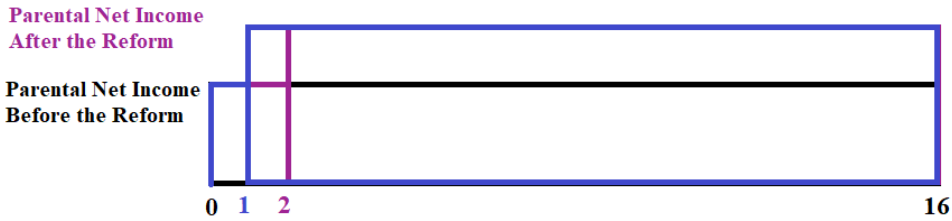
Let the following graph represent parental income during an individual's childhood, i.e., when he was between 0 and 16 years old.



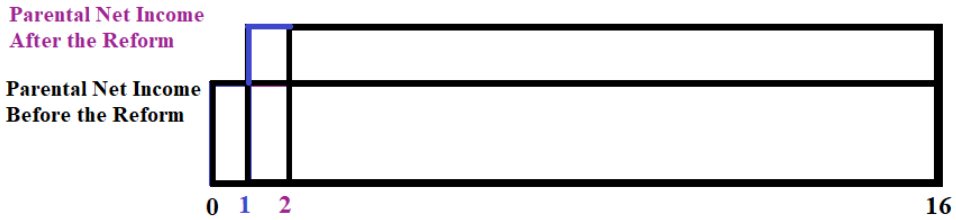
Now assume that child 1's parents experienced an exogenous increase in net income when he was 2 years old – that is depicted by a bump up from a black to pink line below:



Consider another child 2 who was 1 years old in 1991. For him, the change in parental net income is given by a change from a black to blue line:



Then the only difference between children 1 and 2, assuming all other parent/child characteristics of the two families are the same except for the parent-child pair in family 1 being born one year earlier, is that child 2's family had one more years of extra net income when he was young:



Economic Changes in Sweden in the 1990s

Given significant changes to the tax system, what makes evaluating this reform difficult and prevents this reform from being a goldmine for economists interested in various behavioral changes to different incentives is that the reform was implemented at the beginning of a very sharp recession. We argue that although the severe economic crisis that hit Sweden in 1991 (that is, the same year that the tax changes were implemented) complicates a comparison across years, this should not affect the change we measure in a substantial way.

Our identification strategy does not depend on the tax reform itself, but mainly depends on the exogeneity of the shock that altered parental income. Hence, neither our estimates nor our identification strategy will not be affected by other exogenous changes to parental net and gross incomes due to the economic recession. However, our identification will be compromised if there were changes in parental behavior that are not reflected in changes in parental income. Although we can not rule out all possible changes in parental behavior due to either the tax reform or the economic recession, we rule out some of the main changes that were highlighted by the *Welfare Commission*.

The *Welfare Commission* is a commission of academic researchers that were brought together by the Swedish Government with the aim of providing a comprehensive assess-

ment of welfare developments in Sweden in the 1990s. In their summary research, the Commission pointed out that many of the changes in welfare trends observed for the 1990s were linked in one way or another to working life. The most fundamental issue during this time was that employment rates fell greatly in a very short time and Sweden moved from full employment to mass unemployment. Given such big changes in the employment rate, we limit our sample to those parents that were employed to see if it affects our results significantly. Table C.1 below presents our estimates of the importance of parental net income when we limit the sample of parents to those that were employed between 1990 and 1995. Our findings are in the magnitude of 64 SEK and are only slightly higher than our estimate of 56 SEK obtained in the main text. Thus, we do not think that high unemployment rate as a result of the economic crisis would drastically change our results.

Table C.1: Diff-in-Diff Estimates of the Effect of Family Net Income on Children's Outcomes for Employed Parents

	Human Capital	Grade	Cognitive IQ
Family Net Income	63.987***	0.002***	0.001***
	(4.707)	(0.000)	(0.000)
Observations	157,943	201,369	72,997
Adjusted R^2	0.710	0.157	0.086

Notes. The table above presents the effect of family net income when children were 0-18 years old on children's long term outcomes. The outcomes of interest in columns 1,2, and 3 are children's average gross income between the ages of 30 and 40, standardized grades after ninth grade, and standardized cognitive IQ scores at age 18, respectively. The table also controls for parental gross income when children were 0-18 years old and fixed effects for parental gross income percentile in 1990. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades and cognitive test scores are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Another reason that can affect children's long-term outcomes is mental health of the parents. As the Commission pointed out, the incidence of stressful work increased greatly in the 1990s. To address this concern, we change our identification strategy outlined in Section 5 to not only compare children who were born one year apart but were born only one month apart. The latter should alleviate the issue since one more month of parental stress might affect a negligent effect on children's long-term outcomes. Table C.2 below presents the results. The Table highlights that the incidence of stressful work is unlikely to affect our results given the similarity between Table C.2 below and C.5 in the main text.

Table C.2: Diff-in-Diff Estimates of the Effect of Family Net Income on Children's Outcomes

	Human Capital	Grade	Cognitive IQ
Family Net Income	55.813***	0.002***	0.001***
	(3.810)	(0.000)	(0.000)
Observations	235,998	303,190	108,557
Adjusted R^2	0.723	0.173	0.090

Notes. The table above presents the effect of family net income when children were 0-18 years old on children's long term outcomes. The outcomes of interest in columns 1,2, and 3 are children's average gross income between the ages of 30 and 40, standardized grades after ninth grade, and standardized cognitive IQ scores at age 18, respectively. The table also controls for parental gross income when children were 0-18 years old, fixed effects for parental gross income percentile in 1990, and children's birth month fixed effects. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades and cognitive test scores are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Additionally, the Commission highlighted that immigrants, single mothers, and elderly were the most vulnerable groups during the economic crisis. Hence, in Table C.3 below we demonstrate our results for non-immigrant parents. Similarity in the findings between Table C.3 below and C.5 in the main text highlights that the results are robust to the exclusion of immigrant parents.

Table C.3: Diff-in-Diff Estimates of the Effect of Family Net Income on Children's Human Capital for Non-Immigrant Parents

	Human Capital	Grade	Cognitive IQ
Family Net Income	55.308***	0.002***	0.001***
	(3.740)	(0.000)	(0.000)
Observations	230,582	296,492	106,153
Adjusted R^2	0.724	0.168	0.090

Notes. The table above presents the effect of family net income when children were 0-18 years old on children's outcomes for non-immigrant parents. The outcomes of interest in columns 1,2, and 3 are children's average gross income between the ages of 30 and 40, standardized grades after ninth grade, and standardized cognitive IQ scores at age 18, respectively. The table also controls for parental gross income when children were 0-18 years old and fixed effects for parental gross income percentile in 1990. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades and cognitive test scores are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Overall, we believe that our findings are robust to other macroeconomic shocks that took place in Sweden at that time.

Table C.4: Diff-in-Diff Estimates of the Effect of the Mother's and Father's Net Income on Children's Outcomes

	Human Capital	Grade	Cognitive IQ
Mother's Net Income (1,000 SEK)	52.338***	0.002***	0.002***
	(7.114)	(0.000)	(0.000)
Father's Net Income (1,000 SEK)	60.934***	0.002***	0.001***
	(4.107)	(0.000)	(0.000)
Observations	234,892	302,014	108,069
Adjusted R^2	0.724	0.169	0.092
P-value	0.2543	0.6330	0.0000

Notes. The table above presents the effect of the mother's and father's net income when children were 0-18 years old on children's long term outcomes. The outcomes of interest in columns 1,2, and 3 are children's average gross income between the ages of 30 and 40, standardized grades after ninth grade, and standardized cognitive IQ scores at age 18, respectively. The table also controls for parental gross income when children were 0-18 years old and fixed effects for parental gross income percentile in 1990. P-values above show whether the effect of the mother's permanent income on children's outcomes is the same as the father's. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades and cognitive test scores are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table C.5: Diff-in-Diff Estimates of the Effect of Family Net Income on Children's Outcomes

	Human Capital	Grade	Cognitive IQ
Family Net Income (1,000 SEK)	55.792***	0.002***	0.001***
	(3.810)	(0.000)	(0.000)
Observations	235,998	303,190	108,557
Adjusted R^2	0.723	0.169	0.090

Notes. The table above presents the effect of family net income when children were 0-18 years old on children's long term outcomes. The outcomes of interest in columns 1,2, and 3 are children's average gross income between the ages of 30 and 40, standardized grades after ninth grade, and standardized cognitive IQ scores at age 18, respectively. The table also controls for family gross income when children were 0-18 years old and fixed effects for family gross income percentile in 1990. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades and cognitive test scores are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table C.6: OLS Estimates of the Effect of Family Net Income on Children's Outcomes

	Human Capital	Grade	Cognitive IQ
Family Net Income (1,000 SEK)	71.178***	0.003***	0.002***
	(1.448)	(0.000)	(0.000)
Observations	235,998	303,190	108,557
Adjusted R^2	0.723	0.166	0.086

Notes. The table above presents the effect of family net income when children were 0-18 years old on children's long term outcomes. The outcomes of interest in columns 1,2, and 3 are children's average gross income between the ages of 30 and 40, standardized grades after ninth grade, and standardized cognitive IQ scores at age 18, respectively. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades and cognitive test scores are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table C.7: Diff-in-Diff Estimates of the Effect of Logarithm of Family Net Income on Children's Outcomes

	Human Capital	Grade	Cognitive IQ
Family Net Income	0.09***	0.87***	0.63***
	(0.03)	(0.03)	(0.04)
Observations	235,998	303,190	108,557
Adjusted R^2	0.966	0.169	0.089

Notes. The table above presents the effect of family net income when children were 0-18 years old on children's average permanent gross income between the ages of 30 and 40, standardized grades after ninth grade, and boys' standardized cognitive IQ scores at age 18. The table also controls for parental gross income when children were 0-18 years old and fixed effects for parental gross income percentile in 1990. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades and cognitive test scores are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table C.8: Diff-in-Diff Estimates of the Effect of Family Net Income on Children's Outcomes for High Human Capital Parents

	Human Capital	Grade	Cognitive IQ
Family Net Income	54.986***	0.002***	0.001***
	(4.885)	(0.000)	(0.000)
Observations	151,309	197,156	70,132
Adjusted R^2	0.718	0.165	0.087

Notes. The table above presents the effect of parental net income when children were 0-18 years old on children's long term outcomes. The outcomes of interest in columns 1,2, and 3 are children's average gross income between the ages of 30 and 40, standardized grades after ninth grade, and standardized cognitive IQ scores at age 18, respectively. The table also controls for parental gross income when children were 0-18 years old and fixed effects for parental gross income percentile in 1990. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades and cognitive test scores are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table C.9: Diff-in-Diff Estimates of the Effect of Family Net Income on Daughters' Outcomes

	Human Capital	Grade
Family Net Income	41.064***	0.002***
	(3.770)	(0.000)
Observations	114,574	147,627
Adjusted R^2	0.720	0.124

Notes. The table above presents the effect of family net income when children were 0-18 years old on daughters' long term outcomes. The outcomes of interest in columns 1 and 2 are children's average gross income between the ages of 30 and 40 and standardized grades after ninth grade, respectively. The table also controls for parental gross income when children were 0-18 years old and fixed effects for parental gross income percentile in 1990. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

Table C.10: Diff-in-Diff Estimates of the Effect of Family Net Income on Children's Outcomes for Intact Families

	Human Capital	Grade	Cognitive IQ
Family Net Income	56.602***	0.002***	0.001***
	(3.901)	(0.000)	(0.000)
Observations	161,717	210,589	75,866
Adjusted R^2	0.737	0.160	0.083

Notes. The table above presents the effect of family net income when children were 0-18 years old on children's long term outcomes for children from intact families. The outcomes of interest in columns 1, 2, and 3 are children's average gross income between the ages of 30 and 40, standardized grades after ninth grade, and standardized cognitive IQ scores of boys, respectively. The table also controls for parental gross income when children were 0-18 years old and fixed effects for parental gross income percentile in 1990. Net income measure is the gross income net of any taxes that also accounts for alimony payments and repayments of student loans. All income measures are presented in year 2000 prices. Grades are normalized by birth cohort to have a mean of zero and a standard deviation of one. Standard errors are in parenthesis and are clustered at the 1990 municipality level. *, **, and *** mean statistically different from zero at 10, 5, and 1% levels of significance.

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