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Capitalistic Dynasties in the Land of Equal Opportunity?**

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Intergenerational top income mobility in Sweden: Capitalistic dynasties in the land of equal opportunity?*

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Abstract

This paper presents new evidence on intergenerational income and earnings mobility, focusing on the top of the distribution. Using a large dataset of matched father-son pairs in Sweden we are able to obtain results for fractions as small as 0.1 percent of the population. Overall, we find that intergenerational transmission is stronger in the top, much more so for income than for earnings. In the extreme top (top 0.1 percent) income transmission is remarkably strong with an IG elasticity above 0.9. When exploring potential transmission mechanisms, we find that son IQ, non-cognitive skills, education, as well as different measures of wealth are all positively related to father income when looking at the whole population. Interestingly, however, this pattern changes in the very top of the distribution. Within the top percentile, increases in fathers' income is, if anything, negatively associated with sons' IQ, non-cognitive skills and education and only wealth remains significantly positive. Our results suggest that Sweden, known for having relatively high intergenerational mobility in general, is a society where intergenerational transmission remains strong in the very top of the distribution and that wealth is the most likely channel.

Keywords: Intergenerational income mobility, top incomes, earnings inequality, income inequality, welfare state, non-linear regression, quantile regression

JEL: D31, J62

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1. Introduction

This paper studies intergenerational income mobility focusing on the top of the distribution. More precisely, we study the income association of matched father-son pairs, based on a representative sample of all men born in Sweden in 1960–1967. Our sample consists of more than 100,000 pairs (35 percent of that population), which means that we are able to get good precision estimates for fractions as small as 0.1 percent of the income distribution.

There are two main motivations for this study. The first is based on the growing literature on top income shares over the long run.¹ Besides giving us new comparable long-run series of inequality, this literature has also shown the importance of studying the top in more detail in order to understand aspects of overall inequality.² In particular, it has been shown that the recent surge in inequality in many countries has been driven mainly by large income increases in the top percent (or even smaller fractions). However, so far this literature has not explicitly studied intergenerational mobility. Understanding mobility is crucial for evaluating inequality in general, and the same obviously applies for the recent increase in top income shares. Indeed, when asked about the fairness of high income concentration, most people respond that it crucially depends on *how* those in the top got there. If success depends on “hard work” or “willingness to take risk”, people seem to tolerate inequality—even high degrees of it. If, on the other hand, the rich have reached their position because of inheritance, a certain family environment, or “connections and knowing the right people”, this is generally viewed as unfair.³ Atkinson and Piketty (2007) point out that the change in top income composition in Anglo-Saxon countries, where top wage earners have replaced capital income earners, indicate that today’s income top is not primarily based on inherited wealth. This is supported by the

¹ Starting with Piketty (2001), Atkinson (2004), and Piketty and Saez (2003), a number of studies have followed using a common methodology to create homogenous series of top income shares over the long run for a number of mainly industrialized countries. Roine and Waldenström (2008) and Gustafsson and Jansson (2008) study the Swedish case. Atkinson and Piketty (2007) survey much of this work, its methodology and main findings.

² For example, the top income literature has shown that the top decile is typically a very heterogeneous group both in terms of income composition (though the composition has also changes over time for some groups) and in terms of the volatility of their income share. For most countries it also seems that most of the movement in the share of the top decile group is, in fact, driven by the top percent (something which runs the risk of not being captured if data is based on smaller, often top-coded samples).

³ The quotes are formulations from a Gallup pole used in Fong (2001), but there are many other examples of similar formulations in, for example, the World Values Survey, the General Social Survey, the International Social Survey, the International Social Justice Project, etc. Some studies have focused on the differences in perceptions of *why* people are rich or poor, and, in particular on the differences between the US and Europe with respect to such beliefs (e.g., Alesina, Glaeser and Sacerdote, 2001, and Alesina and Glaeser, 2004). However, the opinion that *if* a person is rich as a consequence of working hard this is fair (and vice versa if the person has not made any effort) seems to be shared across countries. For example, Jencks and Tach (2006) report that a majority of people in Germany, Japan, U.K. and the U.S. agreed with the statement that “[inequality] is fair but only if there are equal opportunities” (based on data collected by the International Social Justice Project (ISJP) in 1991).

findings in Kopczuk and Saez (2004), who show that the recent increase in income concentration in the U.S has not been accompanied by any major increase in wealth concentration, and by Edlund and Kopczuk (2008), who proxy wealth mobility in the U.S. by the share of women in the top of the distribution, and find that this share has decreased substantially over the past decades, also indicating a decreasing role for inheritance among the rich.⁴ While these findings are indicative of changes in mobility, this study explicitly addresses questions about intergenerational associations of top incomes as well as their potential transmission mechanisms.

The second motivation is based on previous research on intergenerational mobility, and in particular on the studies that have been concerned with nonlinearities. Most of these studies have primarily been interested in differences in mobility patterns across the whole range of the bivariate income distribution.⁵ In contrast, we focus on the top of the distribution and in particular on fractions in the very top that in most of this literature are unusually small. We are aware of only two previous studies that share our level of detail in this respect. First, Corak and Heisz (1999) do a thorough exploration of nonlinearities in intergenerational mobility for both earnings and income using a very large sample of Canadian men. Even if their sample size is large enough for them to be able to study small fractions of the distribution, their primary focus is on nonlinearities over the whole distribution rather than groups within the top. Consequently they choose not to study details of the top in the same way as we do. Second, Finnie and Ervine (2006), who also study Canadian data, are explicitly concerned with top groups. Their study is, however, different in that they look at the “origins” of individuals located in today’s top groups by means of a transition matrix. More precisely, they trace the decile in the distribution of family market incomes in the early 1980s, from which individuals in various top groups have originated. We use several models and techniques that are more standard in the intergenerational mobility literature (also including transition matrix-

⁴ Kopczuk, Saez and Song (2010) study *within lifetime income mobility* in the U.S. and find that the probability of remaining in the top percent of the distribution from one period to the next has changed very little over the past decades.

⁵ For example, Eide and Showalter (1999), Grawe and Mulligan (2002), Couch and Lillard (2004), Grawe (2004), Hertz (2005), Jäntti et al. (2006), and Bratsberg et al. (2007) are all (at least partly) concerned with non-linear patterns in the overall distribution. Typically, these studies are concerned with differences across quartiles or deciles rather than percentiles or even fractions of percentiles. This is largely driven by the underlying questions (such as the impact on the intergenerational elasticity from credit constraint on educational investments), but also by the fact that studying small fractions of the distribution requires a very large sample.

es). Finally, we also study potential transmission channels, which is something neither of these studies examine.⁶

Using the same income concepts as in previous work on top incomes, we find that: 1) The intergenerational transmission is generally stronger higher up in the distribution, and especially in the top percentile. In the top 0.1 percentile transmission is remarkably strong, with intergenerational elasticities above 0.9 in our main specifications. 2) Earnings transmission is generally lower than that for total income, suggesting that capital is an important source for the increase; 3) When explicitly studying potential channels of transmission we find that sons' IQ, non-cognitive skills, education as well as wealth, all seem to be positively related to father income in the distribution in general. However, in the top percentile this is only true for measures of wealth, which also indicates that the plausible channel of strong transmission in the top is capital. Cognitive skills, non-cognitive skills and education are, if anything, negatively related to father income within the very top of the distribution.

In the next section of the paper we present our data. Section 3 contains our main results on intergenerational income associations in the top. In section 4, we explore possible transmission channels (such as IQ, non-cognitive skills, education and various measures of wealth). Section 5 contains sensitivity analysis and we also present some alternative measures of intergenerational mobility. Section 6 concludes and discusses topics for future research.

2. Data

We use Swedish data compiled from administrative registers run by Statistics Sweden. First, we use the multi-generational register to connect biological fathers and their sons. We then use income registers to add income and earnings data, based on compulsory reports from employers to tax authorities or from personal tax returns.

The starting point for constructing our population is a random sample of 35 percent of all men born in Sweden between 1960 and 1967. These are the sons in our study and we observe their incomes during 1996–2005, i.e., when they are in their 30s and early 40s. This is a period in life when even annual incomes are shown to be unbiased proxies for lifetime income with

⁶ Corak and Heisz (1999)—like many subsequent studies of nonlinearities—discuss their results in terms of possible borrowing constraints on parental investments in human capital of children, but they do not explicitly study data for this or any other mechanism.

only classical measurement errors (Böhlmark and Lindquist, 2006). Yet, we average their annual incomes over the entire ten-year period in order to eliminate a large part of the transitory fluctuations.

When measuring fathers' incomes, we also want a good proxy for long-run income. There are, however, also arguments for measuring income at the time when their children grew up since this captures important determinants of the intergenerational transmission of incomes. In fact, several previous studies in the intergenerational literature have chosen to measure fathers' incomes in this way.⁷ When measuring fathers' incomes in Sweden, the choice of years is restricted by the fact that consistent income data are available only from 1974 onwards.⁸ For this reason, we measure parental income as the average of income during the years 1974–1979, i.e., when their sons were between seven and nineteen years old and thus mostly living with their parents.

We use two concepts of income. The first is *total income*, which is income from all sources (labor, business, capital and realized capital gains) before taxes and transfers.⁹ This is the same measure as the top income studies have used when studying the evolution of top income shares.¹⁰ Our estimates of the intergenerational mobility in the top, hence, correspond directly to their estimates of the static inequality in the income top. Our second measure is *earnings*, which includes income from work for employees and self-employed.¹¹

Several specific problems arise when measuring incomes and earnings in the absolute top of the distribution. We feel broadly confident with the Swedish register data used in this study—for example there is no such thing as top coding in the income and earnings registers. Yet there are two important sources of measurement error that potentially influence our results.¹²

⁷ See Corak (2006), Björklund and Jäntti (2009), and Black and Devereux (2010) for recent surveys.

⁸ Although we observe incomes since 1968, there was a legal change in 1973–1974 that made a set of social insurance benefits taxable and from then on also included in the income data. As a consequence, to get fully comparable measures of income and earnings we choose 1974 as our starting date.

⁹ Total income (*sammanräknad nettoinkomst* for fathers and *summa förvärvs- och kapitalinkomst* for sons) also includes taxable social insurance benefits such as unemployment insurance, pensions, sickness pay and parental leave benefits.

¹⁰ See Roine and Waldenström (2008).

¹¹ Earnings (*arbetsinkomst*) is an income concept created by Statistics Sweden by combining wages and salaries and business income. It also includes earnings-related short-term sickness benefits and parental-leave benefits but not unemployment and (early) retirement benefits.

¹² Statistics Sweden's income and earnings data rely on personal tax assessments through 1977 for wages, salaries, and transfers, and through 1987 for interests and dividends. Thereafter reports come from employers (and authorities for transfers) and banks respectively. Thus, our sons' data come from employers and banks and most

First, our *earnings* measure never includes capital incomes even though items such as bonuses and realized stock options can be a relatively important form of compensation to top earners. To the extent that such capital-based reimbursements have become more prevalent since the 1970s, which is arguably the case in Sweden, we systematically underestimate top earnings among sons. Since this mismeasurement of the dependent variable ought to be positively correlated with father's earnings, we are at risk of biasing the estimated relationship downwards and *overestimating* earnings mobility across generations.

Second, after Sweden around 1990 liberalized its capital account there has been a drastic increase in cross-border capital movements among the wealthy. In a recent survey of the Swedish household wealth concentration, Roine and Waldenström (2009) show that significant shares of wealth owned by the richest Swedes may be placed in off-shore locations. As a result, capital income among high-income earning sons could be underestimated. Since measurement error is likely to be positively correlated with fathers' earnings, we risk *overestimating* intergenerational income mobility. Altogether, we may not fully capture all incomes and earnings accruing to the top, which could bias our results. Fortunately, the biases all go in the same direction, namely that we tend to overestimate intergenerational mobility and especially so in the very top of the distribution.

We use additional variables in our analysis of potential transmission mechanisms. We use education from Statistics Sweden's education registry. This variable is available in seven levels that we recode to years of schooling. We also use an IQ measure and a measure of cognitive ability obtained from the Swedish military's compulsory enlistment tests that are conducted around age 18 or 19.¹³ The IQ test has four parts (synonyms, inductions, metal folding and technical comprehension), which are reported on a scale from 1 to 9. The results of the tests are transformed to an overall measure of cognitive ability, also ranging from 1 to 9. The variable follows a Stanine scale that approximates a normal distribution. The measure of non-cognitive skills is the outcome of interviews with the conscripts by certified psychologists. The overall objective of these interviews was to assess the conscripts' ability to cope with the

of our fathers' data come from personal reports. Most likely, the latter source introduces some measurement error in fathers' income resulting in an underestimation of intergenerational transmission, and consequently, an overestimation of mobility.

¹³ See Cesarini (2010) and Lindqvist and Vestman (2010) for more information about these tests and evaluations of them for research purposes like the one in this study.

psychological requirements of the military service. The psychologists assign each conscript a score between 1 and 9, and the variable is constructed to follow the Stanine scale with a normal distribution.

We also use wealth variables to examine transmission mechanisms. From the Wealth Register at Statistics Sweden we retrieve market-valued estimates of net worth and financial assets for all individuals in the country. Financial assets (bank accounts, ownership of stocks, bonds and mutual funds) and debts (any kind) come from statements reported by financial firms directly to Statistics Sweden. From the housing and property registers all private housing and real estate (except condominiums) are retrieved. We also use taxable wealth, which is reported by individuals on their tax returns, but only available for the ones with sufficiently high wealth to be taxed (roughly the top fifth).

When determining the sample used in the estimations, we begin by requiring fathers to be residents all the years 1974–1979 and sons in all the years 1996–2005. We then use separate samples for income and earnings and use only the father-son pairs for whom both had positive income observations each observation year, and do correspondingly in the earnings sample.¹⁴ For reasons that we will return to, we are somewhat concerned about the presence of observations with zero income and earnings, and therefore perform some sensitivity analyses to examine whether our basic conclusions are sensitive to the treatment of these observations. A further requirement in our main analysis is that our potential transmission variables—education, IQ, non-cognitive skills and wealth—do not have missing values.

Table 1 reports descriptive statistics for the income and earnings samples of our main analysis as well as descriptive statistics for the variables used in the analysis of potential transmission mechanisms. Our income sample contains 108,277 pairs of fathers and sons and the earnings sample contains 85,848 pairs.¹⁵ Thus we observe more than a thousand father-son pairs in the

¹⁴ Our income and earnings data come in units of 1 SEK for all but two years when they come in 100 SEK. We adjust for this in our analysis by multiplying incomes and earnings in the two latter years by 100. Still, there may be a concern that when taking logs of incomes near the lowest income limit the initial difference in limits could influence the results. Rerunning the main analysis requiring incomes and earnings to be at least 100 SEK instead of just being positive, however, the results (available upon request) do not change.

¹⁵ These numbers can be compared to 151,148 sons who were born in Sweden in 1960–1967 and resided in Sweden all years 1996–2005, that is, the population we want to make inferences about. Table A1 explains how the sample changes depending on the requirements we have. In section 5, we examine whether our results are sensitive to these decisions and find that they are not.

top income percentile and over one hundred in the top 0.1 percentile group.¹⁶ The mean and median in both the income and earnings samples are about the same for fathers as well as for sons. In the top of the distribution, however, incomes are substantially higher, especially for the sons. This indicates the importance of analyzing earnings and incomes separately, especially when studying the top of the distribution. Coefficients of variation are in line with the previously documented trends for top income shares in Sweden, which indicate sharp increases for total income but only moderate changes for earnings (see Roine and Waldenström, 2008, for details). Also we note that the age of fathers is somewhat higher in the income sample, which is plausible given that few fathers have positive earnings after their retirement at the age of 65.¹⁷

[Table 1]

3. Econometric models and main results

Our point of departure is the prototypical model in intergenerational income mobility research

$$y_{si} = \alpha + \beta y_{fi} + \varepsilon_i \quad (1)$$

where y_{si} is the natural log of income of a son in family i and y_{fi} the corresponding measure for his father. We want to estimate the intergenerational relationship between long-run incomes following the standard approach in the literature, and therefore use multi-year average incomes throughout. We also control for father's and son's age (linearly and quadratically) in all our regressions.

The regression coefficient β is the intergenerational elasticity, i.e., it measures the percentage differential in sons' expected income with respect to a marginal percentage differential in the incomes of fathers. In case the variance of long-run incomes in both generations is the same, the elasticity is also the intergenerational correlation in log incomes. In our study, the distinction between the elasticity and the correlation is not relevant since we focus on the intergenerational transmission in the very top of the distributions.

¹⁶ As a comparison, note that Solon (1992) in his seminal study for the United States had a total of some 250 pairs of fathers and sons who lived together in the same PSID household in 1968.

¹⁷ We checked whether the fact that fathers in the income sample are relatively older influence the results, but found that they did not by running the analysis using only fathers aged 65 or less in both populations (results are available upon request).

We extend equation (1) in two ways to address two different questions.¹⁸ First, we run separate LS-regressions across different father fractiles. More specifically, we run equation (1) separately for those father-son pairs where the fathers' income is in the P0–P90, P90–P95, P95–99, P99–P99.9, and P99.9–100 respectively. The interpretation of the coefficient β for each of these regressions is, hence, the percentage differential in sons' expected income with respect to a marginal percentage differential in the incomes of fathers *given that the father had an income in the respective fractile group*.¹⁹

Our second approach is to use quantile regressions to analyze how sensitive the Q th percentile in the sons' income distribution is to the fathers' incomes (see Koenker and Hallock, 2001). When Q is a top income quantile, say the 99th percentile, our estimated parameter tells us how sensitive the top in sons' income distribution is to differentials in fathers incomes. Thus we specify the following equation for each conditional quantile Q :

$$y_{si} = \alpha^Q + \beta^Q y_{fi} + \varepsilon_i^Q \quad (2)$$

Our main results from the LS-regressions across father income fractiles are reported in Table 2. The conventional least squares regression model (1) yields estimates of the intergenerational elasticity of 0.260 for income and 0.168 for earnings when using all observations over the whole distribution.²⁰ These numbers are in line with previous results for Sweden. When looking at the results across the fathers' income fractiles these indicate slightly higher numbers in the top decile compared to the rest of the distribution, but in particular the elasticities are much higher in the top percentile and extreme in the very top. Literally our result for the top 0.1 group suggests that a 10 percent income differential among high-income fathers is trans-

¹⁸ Grawe (2004) uses a model that combines two approaches close to ours, namely spline and quantile regression. However, this combination is not feasible for us as our focus on the very top of the distribution gives small samples.

¹⁹ In a previous version of this paper we used a spline function with knots (chosen by us) at which the slope is allowed to change (see Greene, 1997, pp. 388f). We prefer the separate LS-regressions because the spline approach forces the regression line through the knots making it more dependent on exactly how the division into groups is chosen. As is clear from our results reported in Björklund, Roine and Waldenström (2008), the spline approach is qualitatively the same as the LS approach used here.

²⁰ While this difference between income and earnings might appear as striking, it should be noticed that they also differ in terms of trends in dispersion. Specifically, using information on the ratio of the standard deviation of fathers' and sons' long-run incomes fell by 12.5 percent (0.42/0.48) and the corresponding ratio increased by 14 percent (0.56/0.49) for earnings. In other words, the intergenerational correlations (defined as the estimated intergenerational elasticities multiplied by the ratio of the standard deviations) are 0.23 and 0.19 in the two cases.

mitted into a 9.6 percent differential among sons. This should be contrasted against the average transmission in the whole population which is only 2.6 percent.²¹

[Table 2]

Turning to earnings, we find qualitatively similar patterns but with a much weaker increase in persistence toward the very top. The coefficient at the top is only half as large as it is for income. This difference among income and earnings suggests that it is the capital income component that is strongly inherited at the very top of the distribution.

In the quantile regressions, reported in Table 3, we examine how sensitive sons' incomes and earnings at different levels are to their fathers' incomes and earnings. Although these regressions measure a different aspect of the intergenerational income association, the results reveal basically the same non-linear patterns as we saw in the LS-regression analysis. In the case of incomes, there is a somewhat smoother increase in the degree of persistence across generation over the level of sons' incomes. The median regression, Q50, has an intergenerational elasticity of 0.274, which is close to the OLS-estimate in table 2. At the 90th quantile, we observe coefficients of 0.375 and for Q99-coefficient it is 0.455, which implies that a 10 percent income differential among fathers is related to a 4.6 percent higher income for sons' at the 99th quantile of the distribution. Going even further up the income distribution, we find a coefficient of 0.642 at Q99.9, which is markedly higher than elsewhere in the distribution. The results for earnings, however, are much more stable over the sons' distribution; it is around 0.16 up to Q99 and rises to 0.242 at Q99.9.

[Table 3]

Altogether, while our results corroborate previous findings on average Swedish income mobility they also highlight new evidence on notable nonlinearities in this relationship across the distribution of income and earnings. Specifically, we find that while the income associations are relatively weak in the population at large this changes markedly in the top of the distribution. In the absolute top of the distribution we find very strong associations and among fathers

²¹ It is worth pointing out that this is a measure of the expected transmission *given* that the father is in this top group, rather than a measure of how difficult it is to get to this group. See Hertz (2005) for more on the interpretation of different measures of mobility.

in the top 0.1 percentile group income increases are almost completely transmitted to their sons. These non-linear transmission patterns also prevail in the earnings distribution, but to a much lesser extent. Overall there seems to be a considerable degree of equality of opportunity for wage earners in the Swedish economy, with low-wage earning fathers transmitting very little of their earnings status to their sons. Even in the absolute top, earnings mobility is only slightly higher than mobility at the income median. Possibly this high level of mobility in the earnings top could in part be due to the omission of capital incomes accruing to high-wage earning sons, which, as discussed above, leads to an overestimation of earnings mobility.

It is illuminating to illustrate the mobility pattern with a transition matrix as well. By so doing, we can also show the prevalence of large steps in the income distribution from one generation to the next. Table 4 gives a transition matrix for income with the same group limits as in our regressions. The table reveals that 7.3 percent of the sons of fathers in the P99.9-100 fractile show up in the same fractile for sons. This number is 73 times higher than 0.1, which would indicate independence between fathers' and sons' incomes. Nonetheless, as many as 11.9 percent (in contrast to 25 percent with independence) in the group with the richest fathers show up in the P0–25 group of sons. Large upward steps from the bottom half of the distribution to the very top does not exist in our data, but a non-negligible fraction (0.3 percent in contrast to 0.9 percent) move to P99–99.9 fractile of sons.

[Table 4]

4. Transmission channels

Establishing the high degree of income transmission from father to son in the top of the distribution obviously raises questions about its sources. Why is it that the intergenerational association is so strong in the top? What is it that sons of income rich fathers inherit that translates into such a strong income relation? Even though the differences between the results for earnings and total income are indicative of the importance of capital questions remain and there is no general method that one can use to answer such questions.²² The basic problem is that just about every plausible factor can work directly as well as indirectly through a number of different channels. Assets, education, intelligence, and social skills can all have effects on each

²² Goldberger (1989) points to the general difficulty of disentangling various processes behind intergenerational transmissions. See Solon (1999) for a discussion of this.

other as well as directly on income and they can be transmitted from one generation to the next through various processes.

A seemingly straightforward approach would have been to estimate a recursive system of equations in which parental income is allowed to have an indirect impact on income-enhancing variables (such as IQ) in one equation, and a direct effect (net of IQ) in another equation. With estimates from such equations the total “effect” could be disentangled into direct and indirect ones. However, from econometrics text books it is well known that such a system of equations requires strong identifying assumptions; indeed the error terms in the equations must be uncorrelated. Here we limit ourselves to looking for suggestive evidence about variables that can, and cannot, account for the dramatic discontinuity in income transmission in the very top of the fathers’ income distribution. We simply change the left-hand variable in our basic model, i.e., son’s income, to be other son outcomes that capture possible channels of transmission such as IQ, non-cognitive skills, education and wealth. If the association between these outcomes and father income remain positive, this indicates a potential channel of transmission. If, on the other hand, there is no association, or if it turns out to be negative, it seems difficult to construct a model where this particular factor plays a role in explaining the positive income association across generations.

We use six different measures of four basic plausible transmission mechanisms: IQ, non-cognitive skills, education, and three different measures of wealth, namely net worth, financial assets, and taxable wealth. For the IQ, non-cognitive skills and education measures we also run separate regressions using dummy variables for the highest level of achievement since we are looking for variables that can explain income and earnings at the very top.

Table 5 reports descriptive statistics by fathers’ income and earnings fractiles. These statistics themselves are suggestive about which mechanisms are important in the top and which are not. In the income sample, IQ, non-cognitive skills and education somewhat in the top of the distribution until the top fractile where the variables actually fall a bit. All indicators of wealth, however, rise markedly in the top and also from P99–99.9 to P99.9–100. In the earnings sample, the three skill measures are either stable or declining in the very top whereas the wealth indicators increase markedly. The level of wealth in the top of the fathers’ earnings distribution is, however, clearly lower than in the top of the income distribution.

[Table 5]

In Table 6 and 7 we turn to the piecewise linear income and earnings regressions, which are estimated within the fractiles of fathers' income and earnings. In addition to estimates for the raw mediating variables, we report estimates for dummy variables for the highest level of IQ, non-cognitive skills and education, as well as the log of the wealth variables. The results from the descriptive tables hold up even when we look at transmission within the top income fractiles. Whereas all skill variables are positive at least up through P95–99, they are always insignificant (often even with a negative point estimate) at the very top. Thus, we find it most unlikely that skill is an important mediating variable for the strong income and earnings transmission at the very top. The pattern in the top is different for the wealth variables. For income, the coefficients are always positive and clearly significantly different from zero except when taxable wealth is measured in absolute terms when the t-ratio is only 1.28. We summarize the results for income in Figure 1. For earnings, the coefficients are also positive but not always significantly so and the logged variables (which express elasticities) are lower than for income. We summarize the results for earnings in Figure 2.

[Table 6 and 7; Figure 1 and 2]

5. Sensitivity analyses

We now turn to sensitivity analyses. First, we ask whether the interesting difference in results for income and earnings is driven by the fact that the estimations in Table 2 and 3 were done on two different samples. In row 1a and 1b of Table 8 (piecewise linear) and Table 9 (quantile regressions), we report estimates for the same models as in Table 2 and 3, but requiring that fathers had both positive incomes and positive earnings each year 1974–1979 (giving us the same sample when estimating earnings and incomes, respectively). The results are similar to those in our main specification, suggesting that the differences in results between income and earnings are not due to the differences in the samples that we used in our main analysis.

[Table 8 and 9]

The motivation for the other sensitivity analyses is that we are concerned about the interpretation of observations with zero annual income (or earnings).²³ On one hand, both income and earnings might correctly be zero. In particular, our register information might correctly report zero earnings income for a person who has studied the whole year, been unemployed the whole year or left the labor force (for retirement or something else) for the whole year. In some of these cases, in particular unemployment, retirement and long-term sickness, we could expect the person to collect some taxable social transfers but not necessarily for those who study. On the other hand, there is also a possibility that income or earnings in our data is recorded zero by mistake. One example is if the tax declaration process is not completed and possibly even subject to a judicial process.

Our strategy is to make two extreme assumptions about the possible nature of the zero income observations and investigate whether our main results would change substantially. Looking first at the case where we treat the zero income/earnings observations as being incorrect and use average of log income for the remaining years, the main results are not changed, see rows 2a and 2b in Table 8 and 9 and the main results in Table 2 and 3.

Finally, treating the zero income/earnings observations as being correct we calculate the log of average income for all years treating zeros as just zeros. As can be seen in rows 3a and 3b in Table 8 and 9, this does not seem to change the main results either. This approach, however, also involves the change of functional form since we now use the log of average income for all years instead of the average of the log of annual income observations. In order to investigate whether this change is important, we go back to the assumption in rows 2a and 2b and treat zero observations as incorrect but use the log of the average of income instead of the average of the log. The results in rows 4a and 4b in the tables show that our main results are robust with respect to this assumption as well.

6. Concluding discussion and suggestions for future research

Analogously to the top income literature, a first general conclusion that can be drawn from our results is that it is crucial to study small fractions in the top of the distribution to get a clear picture of income mobility. Discussing “the top” as consisting of the top 20, or top 10, or even the top 5 percent, runs the risk of missing important aspects. Indeed, our most striking

²³ Table A1 offers details of the structure of attrition due to different sample criteria.

results do not show until within the top percentile. Furthermore, as is also suggested by the top income literature, it is important to separate different sources of income, in particular to separate between earnings and income including capital income.

While our results are clear in showing higher generational persistence in total income than in earnings, as well as in showing sharp increases in persistence for the very top groups, some questions still remain in terms of interpretation. First, and most importantly, we cannot distinguish the “qualitative source” of capital incomes. The concepts of capital income and realized capital gains may both contain income from stock options or the sale of a company built by the individual who reports the income, as well as income flowing from inherited capital. The former is connected to an individual’s work effort while the latter is based on inheritance of wealth. Typically we would like to distinguish these when making interpretations. Importantly though, the fact that top capital incomes may be related to work effort, does not alter the fact that those who receive such compensation also had fathers with similar positions in the income distribution. Second, the fact that we focus on persons residing in Sweden over the period means that our estimates do not include those who have chosen to move abroad. To the extent that such moves have, for example, been more common among individuals who have made their own fortunes, these “mobile” top income earners are not captured in our sample. Again, this does not take away the result that among those who reside in Sweden persistence in the top is very high.

Our results suggest several interesting avenues for further research. To begin with, we have followed much of the previous research and confined the analysis to men. Obviously, it would be interesting to incorporate mothers and daughters too. It would also be fascinating to consider the role of parents-in-law and thus assortative mating in a study of intergenerational inheritance of top incomes and earnings. Chadwick and Solon (2002) have shown that this can be done in a straightforward way by using family income of parents and offspring.

Finally, our results can at present be given two different comparative interpretations. Either the combination of high overall earnings mobility and extremely high income persistence in the top is a unique feature of the extensive welfare state, perhaps even a consequence of the particular “Nordic model”, or, alternatively, income persistence in the top is just as high, or even higher, in societies like the U.S. where overall mobility is lower than in Sweden. Determining which is right requires studies of top income mobility for other countries.

References

- Alesina, Alberto, Edward Glaeser, and Bruce Sacerdote. 2001. "Why Doesn't the United States Have a European-Style Welfare State?" *Brookings Papers on Economic Activity*, 2: 1–69.
- Alesina, Alberto and Edward Glaeser. 2004. *Fighting Poverty in the U.S. and Europe: A World of Difference*. Oxford University Press.
- Atkinson, Anthony B. 2004. "Top Incomes in the UK over the Twentieth Century." *Journal of the Royal Statistical Society, Series A*, 168(2): 325–343.
- Atkinson, Anthony B. and Thomas Piketty (eds.). 2007. *Top Incomes over the Twentieth Century – A Contrast between European and English-Speaking Countries*, Oxford University Press.
- Björklund, Anders, Jesper Roine and Daniel Waldenström. 2008. "Intergenerational Top Income Mobility in Sweden: A Combination of Equal Opportunity and Capitalistic Dynasties." IZA DP no. 3801.
- Björklund, Anders and Markus Jäntti. 2009. "Intergenerational Income Mobility and the Role of Family Background", in B. Nolan, W. Salverda and T. Smeeding (eds.), *Oxford Handbook of Economic Inequality*, Oxford University Press, Oxford.
- Black Sandra E. and Paul J. Devereux. 2010. "Recent Developments in Intergenerational Mobility." NBER WP 15889.
- Bratsberg, Bernt, Knut Røed, Oddbjørn Raaum, Robin Naylor, Markus Jäntti, Tor Eriksson, and Eva Österbacka. 2007. "Nonlinearities in Intergenerational Earnings Mobility: Consequences for Cross-Country Comparisons," *Economic Journal*, vol. 117(519), C72–C92.
- Böhlmark, Anders and Matthew Lindquist. 2006. "Life-Cycle Variations in the Association between Current and Lifetime Income: Replication and Extension for Sweden." *Journal of Labor Economics*, 24(4): 879–900.
- Cesarini, David. 2010. "Family influences on Productive Skills, Human Capital and Lifecycle Income." Manuscript.
- Chadwick, Laura and Gary Solon. 2002. "Intergenerational Income Mobility Among Daughters." *American Economic Review*, 92(1): 335–344.
- Corak, Miles. 2006. "Do Poor Children Become Poor Adults? Lessons from a Cross-Country Comparison of Generational Earnings Mobility." *Research on Economic Inequality*, 13(1): 143–188.
- Corak, Miles and Andrew Heisz. 1999. "The Intergenerational Earnings and Income Mobility of Canadian Men: Evidence from Longitudinal Income Tax Data." *Journal of Human Resources*, 34(3): 504–533.
- Couch, Kenneth A., and Dean R. Lillard. 2004. "Non-linear patterns in Germany and the United States", in Miles Corak (ed) *Generational Income Mobility in North America and Europe*, Cambridge University Press.
- Edlund, Lena and Wojciech Kopczuk. 2009. "Women, Wealth and Mobility", *American Economic Review* 99(1), 146–178.
- Eide, Eric R. and Mark H. Showalter. 1999. "Factors Affecting the Transmission of Earnings across Generations: A Quantile Regression Approach", *Journal of Human Resources* 34(2), 253–267.

- Finnie, Ross and Ian Irvine. 2006. "Mobility and Gender at the Top Tail of the Earnings Distribution", *Economic and Social Review* 37(2), 149-173.
- Fong, Christina. 2001. "Social Preferences, Self-Interest, and the Demand for Redistribution." *Journal of Public Economics*, 82(2): 225–246.
- Goldberger, Arthur S. 1989. "Economic and Mechanical Models of Intergenerational Transmission." *American Economic Review* 79(3): 505–513.
- Grawe Nathan D. and Casey B. Mulligan. 2002. "Economic Interpretations of Intergenerational Correlations." *Journal of Economic Perspectives*, 16(3): 45–58.
- Grawe, Nathan. 2004. "Reconsidering the Use of Nonlinearities in Intergenerational Earnings Mobility as a Test for Credit Constraints". *Journal of Human Resources* 39/3: 813–827.
- Greene, William H. 1997. *Econometric Analysis*, 3rd Edition, Prentice Hall, Upper Saddle River, NJ.
- Gustafsson, Björn and Birgitta Jansson. 2008. "Top incomes in Sweden over three-quarters of a century: a micro data approach." *Cambridge Journal of Economics* 32(6): 963–976.
- Hertz, Tom. 2005. "Rags, Riches, and Race: The Intergenerational Economic Mobility of Black and White Families in the United States." In S. Bowles, H. Gintis and M. Osborne Growes (eds.). *Unequal Chances*, Princeton University Press.
- Jencks, Christopher and Laura Tach. 2006. "Would Equal Opportunity Mean More Mobility?" In S.L. Morgan, D.B. Grusky, G.S. Fields (eds.), *Mobility and Inequality*, Stanford University Press.
- Jäntti, Markus, Bernt Bratsberg, Knut Roed, Odbjoern Raaum, Robin Naylor, Eva Österbacka, Anders Björklund and Tor Eriksson. 2006. "American Exceptionalism in a New Light: A Comparison of Intergenerational Earnings Mobility in the Nordic Countries." IZA DP no. 1938.
- Koenker, Roger and Kevin F. Hallock. 2001. "Quantile Regression." *Journal of Economic Perspectives*, 15(4): 143–156.
- Kopczuk, Wojciech and Emmanuel Saez. 2004. "Top Wealth Shares in the United States, 1916–2000: Evidence from Estate Tax Returns." *National Tax Journal*, 57(2): 445–487.
- Kopczuk, Wojciech, Emmanuel Saez and Jae Song. 2010. "Earnings Inequality and Mobility in the United States: Evidence from Social Security Data since 1937." *Quarterly Journal of Economics*, 125(1): 91–128.
- Lindquist, Erik and Roine Westman. 2010. "The Labor Market Returns to Cognitive and Noncognitive Ability: Evidence from the Swedish Enlistment." *American Economic Journal: Applied Economics*, forthcoming.
- Piketty, Thomas. 2001. *Les hauts revenus en France au 20ème siècle*. Grasset, Paris.
- Piketty, Thomas. 2003. "Income Inequality in France, 1900–1998." *Journal of Political Economy*, 111(5): 1004–1042.
- Piketty, Thomas and Emmanuel Saez. 2003. "Income Inequality in the United States, 1913–1998." *Quarterly Journal of Economics*, 118(1): 1–39.
- Roine, Jesper and Daniel Waldenström. 2008. "The Evolution of Top Incomes in an Egalitarian Society: Sweden, 1903–2004." *Journal of Public Economics*, 9(1–2): 366–387.

- Roine, Jesper and Daniel Waldenström. 2009. "Wealth Concentration over the Path of Development: Sweden, 1873–2006." *Scandinavian Journal of Economics*, 111(1): 151–187.
- Saez, Emmanuel, and Michael Veall. 2005. "The Evolution of High Incomes in Northern America: Lessons from Canadian Evidence." *American Economic Review*, 95(3): 831–849.
- Solon, Gary. 1992. "Intergenerational Income Mobility in the United States.", *American Economic Review*, 82(3): 393–408.
- Solon, Gary. 1999. "Intergenerational Mobility in the Labor Market," in O. Ashenfelter and D. Card (eds.) *Handbook of Labor Economics* vol. 3A. Elsevier, Amsterdam, North Holland.

Table 1: Descriptive statistics for main income and earnings samples.

Variable	Type	Mean	S.D.	Min	P10	P50	P90	P95	P99	P99.9	Max
<i>Fathers:</i>											
Age in 1979	Inc.	45.1	7.2	27	36	44	55	58	64	73	86
	Earn.	44.7	6.8	28	36	44	54	57	62	69	81
Income in 1979	Inc.	252	140		137	227	382	470	751	1,313	12,263
	Earn.	258	127		157	232	386	472	740	1,213	4,573
Average income 1974–1979	Inc.	254	137	3	151	226	379	467	756	1,280	13,950
	Earn.	256	122	1	160	229	382	466	740	1,157	4,467
Average log income 1974–1979	Inc.	12.34	0.42	7.74	11.89	12.32	12.84	13.04	13.52	14.02	16.39
	Earn.	12.32	0.56	6.88	11.94	12.33	12.85	13.04	13.50	13.95	15.24
<i>Sons:</i>											
Age in 2005	Inc.	40.9	2.0	38	38	41	44	44	45	45	45
	Earn.	40.9	2.0	38	38	41	44	44	45	45	45
Income in 2005	Inc.	357	431		180	299	546	689	1,292	4,592	45,223
	Earn.	351	224		187	309	548	675	1,093	2,834	10,802
Average income 1996–2005	Inc.	304	283		173	265	452	553	920	3,099	43,346
	Earn.	302	165	3	177	272	453	540	806	1,981	13,051
Average log income 1996–2005	Inc.	12.46	0.48	3.13	11.98	12.47	12.98	13.17	13.58	14.48	17.50
	Earn.	12.46	0.49	5.94	11.91	12.49	12.99	13.17	13.54	14.32	16.10
Cognitive skills	Inc.	5.2	1.9	1	3	5	8	8	9	9	9
	Earn.	5.3	1.9	1	3	5	8	8	9	9	9
Non-cognitive skills	Inc.	5.2	1.6	1	3	5	7	8	9	9	9
	Earn.	5.3	1.6	1	3	5	7	8	9	9	9
Education years	Inc.	12.0	2.1	7	9	11	15	16	18	20	20
	Earn.	12.1	2.1	7	9	11	15	16	20	20	20
Net worth	Inc.	378	2,596	–24,371	–136	120	1,023	1,643	3,938	12,500	734,300
	Earn.	360	1,163	–24,371	–130	133	993	1,552	3,600	12,000	78,190
Financial assets	Inc.	145	2,361	0	0	27	314	558	1,482	6,433	746,400
	Earn.	137	618	0	0	30	315	553	1,479	5,917	64,115
Taxable wealth	Inc.	46	546	–1,991	0	0	0	91	1,202	5,178	85,112
	Earn.	44	509	–1,908	0	0	0	91	1,202	4,826	85,112

Note: The income (earnings) sample consists of father-son pairs with positive income (earnings) all years. Incomes and earnings are in thousand 2005 SEK. Observations are 108,277 (incomes) and 85,848 (earnings). Fathers are observed during 1974–1979 and sons in 1996–2005 (except for Net worth and Financial assets which are averages based on the period 1999–2005). See text for further details.

Table 2: Main Results. Piecewise linear regressions across fathers' fractiles

	OLS (P0–100)	P0–90	P90–95	P95–99	P99–99.9	P99.9–100
<i>Incomes:</i>						
Father income	0.260 (0.003)	0.220 (0.004)	0.278 (0.129)	0.244 (0.068)	0.606 (0.181)	0.959 (0.230)
$\Pr(\hat{\beta} = \hat{\beta}^{OLS})$		[0.000]	[0.892]	[0.819]	[0.046]	[0.003]
N	108,277	97,449	5,414	4,331	974	109
<i>Earnings:</i>						
Father earnings	0.168 (0.003)	0.125 (0.003)	0.335 (0.148)	0.187 (0.072)	0.558 (0.218)	0.507 (0.290)
$\Pr(\hat{\beta} = \hat{\beta}^{OLS})$		[0.000]	[0.272]	[0.788]	[0.051]	[0.042]
N	85,848	77,263	4,292	3,434	773	86

Note: Results based on estimating equation (1). Robust standard errors in parenthesis. P-values from χ^2 -test of equality with the OLS coefficient in brackets. Constant term suppressed.

Table 3: Quantile regressions across sons' conditional fractiles

	Median (Q50)	Q90	Q95	Q99	Q99.9
Father income	0.232 (0.003)	0.328 (0.005)	0.334 (0.007)	0.380 (0.014)	0.536 (0.035)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.000]	[0.000]	[0.000]	[0.000]
Father earnings	0.160 (0.004)	0.168 (0.003)	0.157 (0.005)	0.158 (0.007)	0.242 (0.019)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.026]	[0.591]	[0.823]	[0.000]

Note: Bootstrapped standard errors (using 100 reps) in parenthesis. P-values from χ^2 -test of coefficient equality with the median (Q50) regression coefficient in brackets. Sample sizes are 108,277 for incomes and 85,848 for earnings.

Table 4: Transition matrices

a) Incomes

	Son's income fractile								
	P0-25	P25-50	P50-75	P75-90	P90-95	P95-99	P99-99.9	P99.9-100	
Father's income fractile:									
P0-25	33.2	29.3	22.9	10.1	2.6	1.5	0.3	0.0	100.0
P25-50	26.0	29.8	27.2	11.9	3.0	1.8	0.3	0.0	100.0
P50-75	22.4	25.0	28.3	16.0	4.5	3.2	0.6	0.0	100.0
P75-90	19.6	18.6	24.2	21.1	8.2	6.9	1.3	0.2	100.0
P90-95	16.8	13.2	20.5	24.5	11.5	10.4	2.8	0.4	100.0
P95-99	16.4	11.3	15.8	23.4	13.3	14.9	4.5	0.4	100.0
P99-99.9	16.3	7.4	11.3	19.8	15.3	21.7	6.4	1.8	100.0
P99.9-100	11.9	3.7	8.3	11.9	10.1	27.5	19.3	7.3	100.0

b) Earnings

	Son's earnings fractile								
	P0-25	P25-50	P50-75	P75-90	P90-95	P95-99	P99-99.9	P99.9-100	
Father's earnings fractile:									
P0-25	32.5	29.7	23.0	10.1	2.7	1.7	0.3	0.0	100.0
P25-50	26.5	29.8	26.9	11.7	2.9	1.8	0.3	0.0	100.0
P50-75	22.8	24.6	28.0	15.8	4.7	3.3	0.6	0.1	100.0
P75-90	19.3	18.3	24.4	21.4	8.4	6.8	1.4	0.2	100.0
P90-95	17.2	14.0	21.7	23.0	10.4	10.3	2.9	0.4	100.0
P95-99	15.7	11.4	16.3	25.6	12.7	13.9	4.0	0.4	100.0
P99-99.9	15.8	7.1	13.6	21.7	14.5	19.1	7.0	1.2	100.0
P99.9-100	10.5	4.7	12.8	17.4	12.8	30.2	9.3	2.3	100.0

Table 5: Transmission mechanisms: Descriptive statistics

a) Incomes

Son variables		Sons with fathers in the following income fractile:				
		P0–90	P90–95	P95–99	P99–99.9	P99.9–100
Income	Mean	289	394	452	581	1,498
	(S.d.)	(206)	(334)	(466)	(812)	(4,453)
IQ	Mean	5.1	6.3	6.5	6.7	6.3
	(S.d.)	(1.9)	(1.7)	(1.7)	(1.6)	(1.7)
Non-cog. skills	Mean	5.1	5.8	6.0	6.2	6.1
	(S.d.)	(1.6)	(1.6)	(1.6)	(1.6)	(1.7)
Net worth	Mean	311	647	944	2,575	6,387
	(S.d.)	(912)	(1,798)	(2,803)	(24,417)	(16,208)
Financial assets	Mean	113	254	363	1,537	2,853
	(S.d.)	(474)	(887)	(1,243)	(24,454)	(7,624)
Taxable wealth	Mean	28	111	210	554	2,488
	(S.d.)	(325)	(775)	(1,006)	(2,321)	(9,099)
Education years	Mean	11.8	13.4	13.8	14.4	13.8
	(S.d.)	(2.0)	(2.3)	(2.4)	(2.4)	(2.4)
N		97,519	5,416	4,300	941	101

b) Earnings

Son variables		Sons with fathers in the following earnings fractile:				
		P0–90	P90–95	P95–99	P99–99.9	P99.9–100
Earnings	Mean	290	383	423	477	583
	(S.d.)	(138)	(229)	(353)	(338)	(430)
IQ	Mean	5.2	6.4	6.6	6.8	6.5
	(S.d.)	(1.8)	(1.7)	(1.7)	(1.6)	(1.7)
Non-cog. skills	Mean	5.2	5.9	6.0	6.3	6.3
	(S.d.)	(1.5)	(1.6)	(1.6)	(1.5)	(1.6)
Net worth	Mean	307	677	877	1,363	3,627
	(S.d.)	(928)	(2,019)	(1,949)	(3,805)	(8,175)
Financial assets	Mean	114	275	350	566	1,999
	(S.d.)	(452)	(1,244)	(1,174)	(1,882)	(5,483)
Taxable wealth	Mean	27	123	212	364	2,277
	(S.d.)	(252)	(863)	(1,112)	(1,512)	(10,025)
Education years	Mean	11.9	13.5	13.9	14.6	14.0
	(S.d.)	(2.0)	(2.3)	(2.3)	(2.3)	(2.2)
N		77,327	4,306	3,393	745	77

Table 6: Mechanisms of transmission: top incomes

Father income fractiles	Dependent variables (different son outcomes):						
	Income	IQ	High IQ	Non-cog. skills	High non-cog. skills	Education years	High Education
P0–90	0.220 (0.004)	0.938 (0.019)	0.097 (0.003)	0.648 (0.016)	0.052 (0.002)	1.205 (0.021)	0.136 (0.003)
P90–95	0.278 (0.129)	1.161 (0.399)	0.249 (0.102)	0.977 (0.363)	0.165 (0.077)	1.726 (0.527)	0.471 (0.109)
P95–99	0.244 (0.068)	0.751 (0.183)	0.143 (0.052)	0.646 (0.180)	0.150 (0.044)	1.723 (0.270)	0.339 (0.055)
P99–99.9	0.606 (0.181)	0.017 (0.422)	-0.064 (0.125)	1.131 (0.377)	0.042 (0.107)	-0.752 (0.615)	0.071 (0.135)
P99.9–100	0.959 (0.230)	0.027 (0.357)	-0.116 (0.095)	-0.900 (0.419)	-0.115 (0.081)	-0.377 (0.512)	-0.013 (0.124)
N (total)	108,277	108,277	108,277	108,277	108,277	108,277	108,277

	Net worth	Log Net worth	Log Pos. Net worth	Financial assets	Log Financial Assets	Tax wealth	Log Tax wealth	Log Pos. Tax wealth
P0–90	44,576 (10,003)	0.227 (0.021)	1.125 (0.057)	64,359 (5,323)	1.166 (0.040)	30,372 (3,020)	0.324 (0.033)	0.312 (0.031)
P90–95	1,717,360 (551,264)	1.602 (0.366)	4.143 (1.249)	581,102 (228,001)	2.240 (0.746)	579,264 (254,568)	3.895 (1.072)	3.693 (1.020)
P95–99	1,133,324 (348,117)	0.872 (0.174)	1.111 (0.619)	489,117 (128,797)	1.289 (0.346)	607,793 (136,805)	3.795 (0.629)	3.451 (0.594)
P99–99.9	6,412,201 (2,170,916)	1.826 (0.432)	3.340 (1.327)	2,803,406 (1,414,553)	2.499 (0.697)	2,287,123 (850,186)	7.847 (1.763)	7.395 (1.713)
P99.9–100	20,303,567 (7,458,157)	1.684 (0.336)	3.198 (1.379)	12,197,353 (4,286,513)	3.158 (0.544)	5,646,754 (4,397,791)	5.767 (2.166)	5.753 (2.112)
N (total)	108,277	73,732	108,277	108,277	108,277	108,277	102,515	108,277

Note: The dependent variable is specified in column headings and independent variable is father income. Separate regressions are run for different father income fractiles, with N showing the aggregate number of observations. Constant terms are suppressed. Robust standard errors are in parenthesis. High IQ, non-cognitive skills and education are dummy variables equal to one when sons are in roughly the top five percentiles in the respective distributions. Wealth variables are in Swedish currency or logged ditto. “Positive” wealth means that all observations with negative or zero wealth are replaced by one (which in log form becomes zero). For further details of variables and methods, see Table 1 and the text.

Table 7: Mechanisms of transmission: top earnings

Father earnings fractiles	Dependent variables (different son outcomes):						
	Earnings	IQ	High IQ	Non-cog. skills	High non-cog. skills	Education years	High Education
P0–90	0.125 (0.003)	0.367 (0.015)	0.040 (0.003)	0.212 (0.012)	0.021 (0.002)	0.553 (0.017)	0.066 (0.003)
P90–95	0.335 (0.148)	0.954 (0.455)	0.280 (0.122)	0.748 (0.419)	0.158 (0.094)	1.058 (0.612)	0.298 (0.130)
P95–99	0.187 (0.072)	0.763 (0.213)	0.163 (0.061)	0.599 (0.210)	0.166 (0.053)	1.600 (0.311)	0.330 (0.065)
P99–99.9	0.558 (0.218)	−0.146 (0.541)	−0.049 (0.164)	0.987 (0.476)	0.061 (0.135)	−0.528 (0.798)	0.029 (0.170)
P99.9–100	0.507 (0.290)	−0.187 (0.651)	−0.191 (0.222)	−1.141 (1.152)	−0.032 (0.220)	−1.630 (1.025)	−0.267 (0.238)
N (total)	85,848	85,848	85,848	85,848	85,848	85,848	85,848

	Net worth	Log Net worth	Log Pos. Net worth	Financial assets	Log Financial Assets	Tax wealth	Log Tax wealth	Log Pos. Tax wealth
P0–90	−133,761 (12,394)	−0.094 (0.013)	0.088 (0.042)	6,872 (3,293)	0.201 (0.027)	2,811 (2,204)	−0.087 (0.031)	−0.073 (0.029)
P90–95	1,518,510 (467,287)	1.426 (0.411)	4.005 (1.456)	721,186 (295,688)	2.372 (0.845)	549,901 (208,487)	3.841 (1.257)	3.704 (1.202)
P95–99	898,129 (229,907)	0.751 (0.187)	0.996 (0.707)	314,850 (122,999)	1.194 (0.387)	487,796 (121,232)	3.383 (0.724)	3.107 (0.683)
P99–99.9	2,158,355 (1,200,581)	0.641 (0.509)	3.723 (1.640)	519,832 (461,338)	2.577 (0.825)	398,132 (356,693)	5.862 (2.120)	5.555 (2.032)
P99.9–100	12,619,482 (8,927,638)	1.620 (0.781)	1.752 (3.101)	8,077,958 (6,358,300)	3.103 (1.143)	15,946,230 (13,186,815)	7.471 (3.636)	6.215 (3.396)
N (total)	85,848	59,816	85,848	85,848	85,848	85,848	81,415	85,848

Note: The dependent variable is specified in column headings and independent variable is father earnings. Separate regressions are run for different father earnings fractiles, with N showing the aggregate number of observations. Constant terms are suppressed. Robust standard errors are in parenthesis. High IQ, non-cognitive skills and education are dummy variables equal to one when sons are in roughly the top five percentiles in the respective distributions. Wealth variables are in Swedish currency or logged ditto. “Positive” wealth means that all observations with negative or zero wealth are replaced by one (which in log form becomes zero). For further details of variables and methods, see Table 1 and the text.

Table 8: Robustness analysis: Piecewise linear regressions (incomes and earnings)

	OLS (P0–100)	P0–90	P90–95	P95–99	P99–99.9	P99.9–100
<i>Alt. sample 1: Positive income and earnings all years, use average of logs</i>						
1a. Father income	0.293 (0.004)	0.249 (0.005)	0.341 (0.128)	0.262 (0.066)	0.582 (0.182)	0.878 (0.219)
Pr($\hat{\beta} = \hat{\beta}^{OLS}$)		[0.000]	[0.710]	[0.649]	[0.073]	[0.015]
N	85,753	77,177	4,288	3,430	772	86
1b. Father earnings	0.168 (0.003)	0.125 (0.003)	0.334 (0.148)	0.189 (0.072)	0.526 (0.217)	0.507 (0.290)
Pr($\hat{\beta} = \hat{\beta}^{OLS}$)		[0.000]	[0.274]	[0.761]	[0.071]	[0.042]
N	85,753	77,177	4,288	3,430	772	86
<i>Alt. sample 2: Treat zeros as incorrect, use average of logs</i>						
2a. Father income	0.248 (0.004)	0.220 (0.005)	0.168 (0.151)	0.154 (0.084)	0.474 (0.235)	0.848 (0.228)
Pr($\hat{\beta} = \hat{\beta}^{OLS}$)		[0.000]	[0.598]	[0.275]	[0.410]	[0.004]
N	117,837	106,050	5,894	4,713	1,062	118
2b. Father earnings	0.132 (0.003)	0.099 (0.003)	0.280 (0.164)	0.167 (0.085)	0.696 (0.241)	0.831 (0.267)
Pr($\hat{\beta} = \hat{\beta}^{OLS}$)		[0.000]	[0.360]	[0.676]	[0.007]	[0.000]
N	116,366	104,720	5,821	4,658	1,049	118
<i>Alt. sample 3: Treat zeros as correct, use average of logs</i>						
3a. Father income	0.264 (0.004)	0.216 (0.004)	0.262 (0.139)	0.186 (0.077)	0.641 (0.217)	0.598 (0.226)
Pr($\hat{\beta} = \hat{\beta}^{OLS}$)		[0.000]	[0.991]	[0.340]	[0.072]	[0.145]
N	117,837	106,050	5,894	4,713	1,062	118
3b. Father earnings	0.142 (0.003)	0.108 (0.003)	0.368 (0.166)	0.126 (0.084)	0.620 (0.251)	1.047 (0.303)
Pr($\hat{\beta} = \hat{\beta}^{OLS}$)		[0.000]	[0.169]	[0.842]	[0.024]	[0.000]
N	116,324	104,680	5,820	4,657	1,049	118
<i>Alt. sample 4: Treat zeros as correct, use log of averages</i>						
4a. Father income	0.282 (0.003)	0.237 (0.004)	0.319 (0.131)	0.188 (0.073)	0.661 (0.203)	0.550 (0.209)
Pr($\hat{\beta} = \hat{\beta}^{OLS}$)		[0.000]	[0.778]	[0.222]	[0.060]	[0.205]
N	117,837	106,050	5,894	4,713	1,062	118
4b. Father earnings	0.184 (0.003)	0.142 (0.003)	0.462 (0.141)	0.186 (0.074)	0.510 (0.215)	0.823 (0.262)
Pr($\hat{\beta} = \hat{\beta}^{OLS}$)		[0.000]	[0.048]	[0.986]	[0.104]	[0.000]
N	116,324	104,679	5,822	4,656	1,049	118

Note: Robust standard errors in parenthesis. In brackets are p-values from a χ^2 -test of coefficient equality with the OLS coefficient.

Table 9: Robustness analysis: Quantile regressions (incomes and earnings)

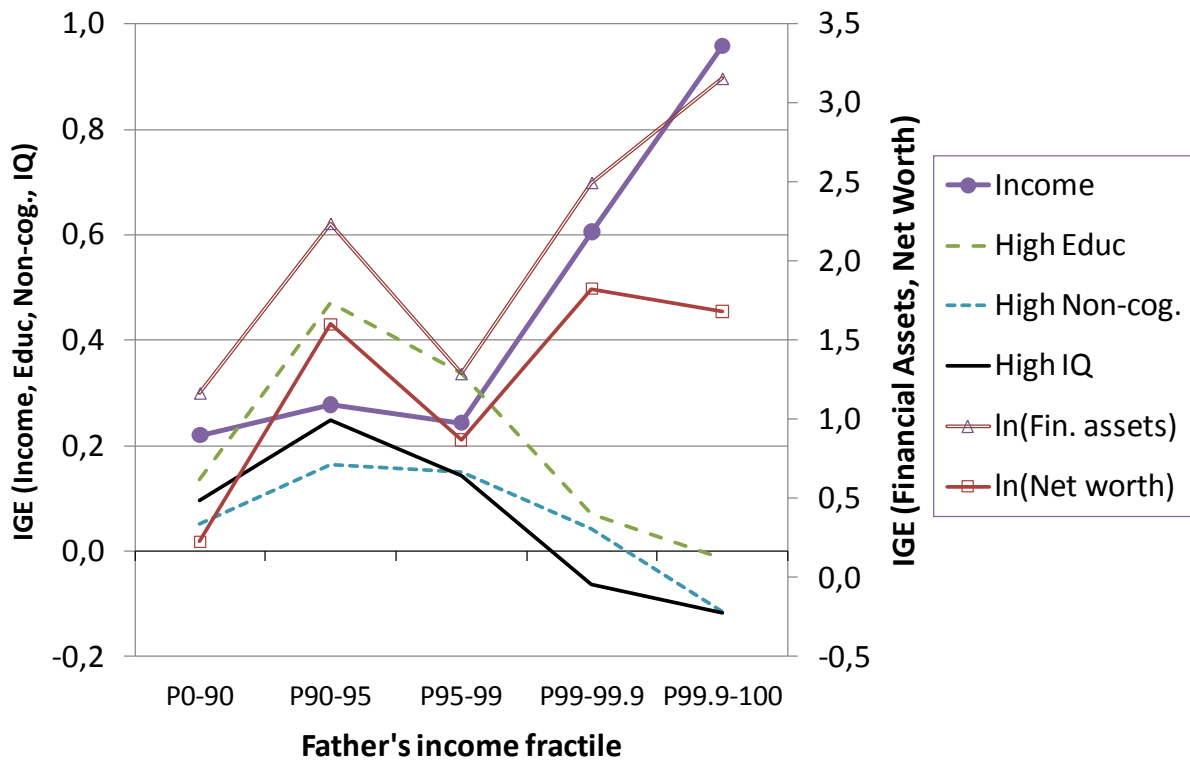
	Q50	Q90	Q95	Q99	Q99.9
<i>Alt. sample 1: Positive income and earnings all years, use average of logs</i>					
1a. Father income	0.274 (0.005)	0.375 (0.007)	0.384 (0.009)	0.455 (0.021)	0.642 (0.041)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.000]	[0.000]	[0.000]	[0.000]
1b. Father earnings	0.159 (0.004)	0.168 (0.003)	0.157 (0.005)	0.158 (0.007)	0.242 (0.014)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.026]	[0.591]	[0.823]	[0.000]
<i>Alt. sample 2: Treat zeros as incorrect, use average of logs</i>					
2a. Father income	0.214 (0.004)	0.275 (0.005)	0.259 (0.007)	0.263 (0.01)	0.312 (0.022)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.000]	[0.000]	[0.000]	[0.000]
2b. Father earnings	0.106 (0.003)	0.117 (0.002)	0.116 (0.002)	0.119 (0.006)	0.165 (0.017)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.001]	[0.004]	[0.049]	[0.001]
<i>Alt. sample 3: Treat zeros as correct, use average of logs</i>					
3a. Father income	0.223 (0.004)	0.285 (0.005)	0.275 (0.008)	0.269 (0.012)	0.324 (0.028)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.000]	[0.000]	[0.000]	[0.000]
3b. Father earnings	0.109 (0.002)	0.126 (0.003)	0.122 (0.004)	0.130 (0.006)	0.175 (0.017)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.000]	[0.003]	[0.000]	[0.000]
<i>Alt. sample 4: Treat zeros as correct, use log of averages</i>					
4a. Father income	0.242 (0.004)	0.332 (0.004)	0.339 (0.007)	0.369 (0.022)	0.429 (0.032)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.000]	[0.000]	[0.000]	[0.000]
4b. Father earnings	0.157 (0.004)	0.175 (0.004)	0.163 (0.005)	0.178 (0.006)	0.248 (0.021)
$\Pr(\hat{\beta} = \hat{\beta}^{Q50})$		[0.000]	[0.246]	[0.002]	[0.000]

Note: Bootstrapped standard errors (using 100 reps) in parenthesis. P-values from χ^2 -test of coefficient equality with the median (Q50) regression coefficient in brackets. Sample sizes are 85,753 (1a and 1b), 117,837 (2a, 3a and 4a), 116,365 (2b), 116,323 (3b and 4b).

Table A1: Structure of attrition.

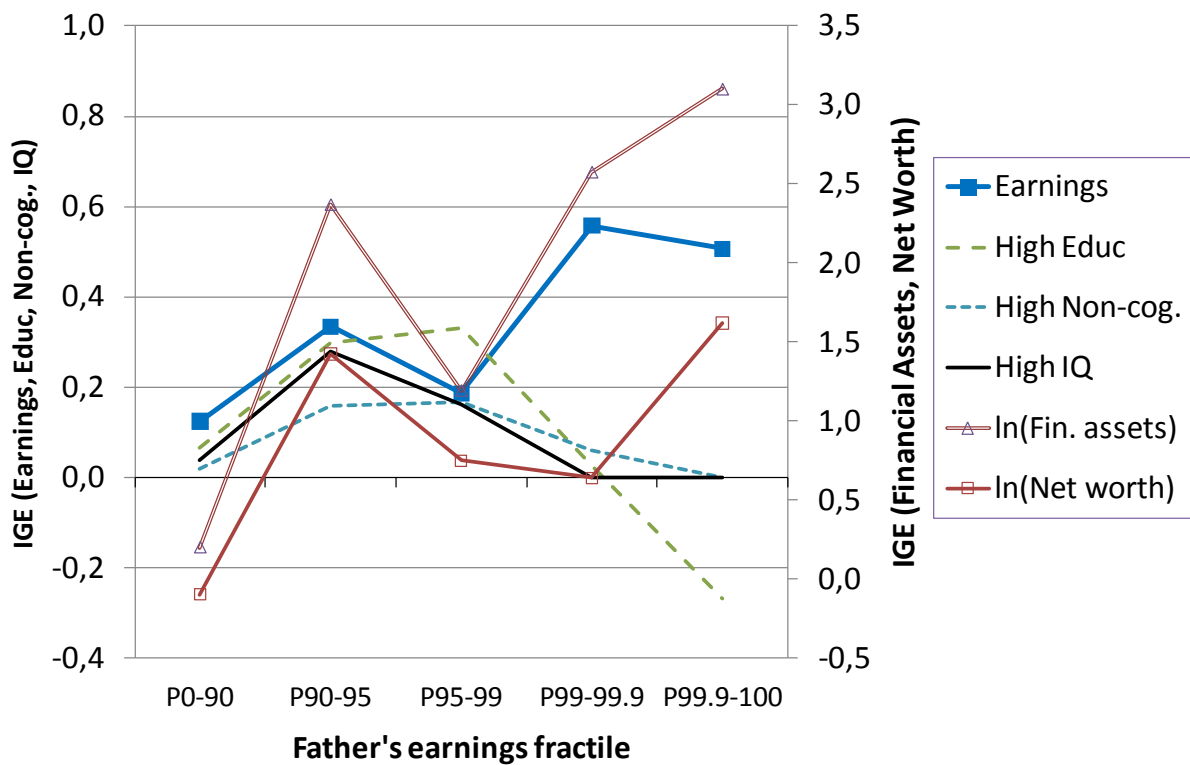
	Number of observations	
	Income	Earnings
1. All sons, born in Sweden in 1960–1967 and part of the multigenerational register, registered as living in Sweden all years 1996–2005.	151,148	151,148
2. All sons in 1 and with at least one positive income (earnings) observation.	150,902	148,612
3. All sons in 1 and with 10 positive income (earnings) observations.	142,716	126,045
4. All sons in 3 with a known biological father.	140,710	124,379
5. All sons in 4 with a biological father who was registered in Sweden all years 1974–1979.	134,673	119,300
6. All sons in 5 with a biological father who has at least one positive income (earnings) observation.	134,599	118,638
7. All sons in 6 with a biological father who has positive income (earnings) observations all years 1974–1979.	130,047	101,635
8. All sons in 7 for whom we also observe IQ, non-cognitive skills and education.	108,277	85,848

Figure 1: Mechanisms of income transmission



Note: The figure shows estimated intergenerational income elasticities ($\hat{\beta}$) of equation (1), reported in Table 6.

Figure 2: Mechanisms of earnings transmission



Note: The figure shows estimated intergenerational income elasticities ($\hat{\beta}$) of equation (1), reported in Table 7.