

Education and income mobility in the United States, Great Britain, and Sweden

# The Role of Education for Intergenerational Income Mobility: A comparison of the United States, Great Britain, and Sweden

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Previous studies have found that intergenerational income persistence is relatively high in the United States and Britain, especially as compared to Nordic countries. We compare the association between family income and sons' earnings in the United States (National Longitudinal Study of Youth 1979), Britain (British Cohort Study 1970), and Sweden (Population Register Data, 1965 cohort), and find that both income elasticities and rank-order correlations are highest in the United States, followed by Britain, with Sweden being clearly more equal. We ask whether differences in educational inequality and in return to qualifications can explain these cross-country differences. Surprisingly, we find that this is not the case, even though returns to education are higher in the United States. Instead, the low income mobility in the United States and Britain is almost entirely due to the part of the parent-son association that is not mediated by educational attainment. In the United States and especially Britain, parental income is far more important for earnings at a given level of education than in Sweden, a result that holds also when controlling for cognitive ability. This goes against widespread ideas of the United States as a country where the role of ascription is limited and meritocratic stratification prevails.

## Introduction

Previous studies suggest that intergenerational inequality as measured by parent-to-child income associations is comparatively high in the United States and Great Britain in relation to other Western countries, especially the Nordic (e.g., Blanden 2013; Bratsberg et al. 2007; Corak 2012). In research on intergenerational mobility, education is often held forward as a key driver of intergenerational income persistence and is therefore a potential explanation of such country differences. As Corak (2006, p. 170) puts it: "The rewards to higher-skilled/higher-educated individuals in the labor market, and the opportunities

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for children to obtain the required skills and credentials are two important factors influencing the degree of generational mobility and the differences across countries.” In this perspective, the US and British positions may come about because family income is more strongly related to educational attainment there, in combination with greater economic returns to such attainment. In support of such view, income inequality, assumed to be important for children’s opportunities, is high in these countries (OECD 2011b). Previous comparative studies have also shown family income to exert a relatively strong influence on child cognitive development (Bradbury et al. 2015) and subsequent school attainment (OECD 2011a) in the United States; the latter could be driven by the high costs for US college education, which is free in most European countries (cf. Jerrim, Chmielewski, and Parker 2015). In addition, both the United States and Britain are characterized by high returns to college education (OECD 2013; Jerrim and Macmillan 2015).

We study the relationship between parental income, child education, and subsequent earnings, asking to what extent intergenerational income persistence can be accounted for by education, and whether such mediation is particularly large in the United States and Britain, thus explaining the low income mobility there. We contrast these countries with perhaps the “most different” case, namely Sweden, a highly equal society, purportedly because of a relatively weak importance of the family of origin on educational attainment (Erikson and Jonsson 1996) in combination with relatively low income returns to education (OECD 2013).

We begin our empirical analysis by providing improved and more comparable estimates of intergenerational income associations (in terms of both elasticities and rank-order correlations), using the 1979 National Longitudinal Survey of Youth (NLSY) for the United States, the British 1970 Cohort Study (BCS), and Swedish registry data. This is a contribution to the field in two ways: (1) we address the double methodological problems plaguing intergenerational income mobility studies, namely income volatility on the parental side and life-course bias on the child’s side; and (2) we are able to use Swedish data of whole childhood family incomes to illustrate the likely magnitudes of residual biases in intergenerational associations for the United States and Britain.

On the basis of these intergenerational associations, our main contribution is to address the role of education for intergenerational persistence. We do this first by analyzing the association between family income and children’s educational attainment across countries, and second by estimating the association between educational credentials and income at around age 40. Third, we divide the total associations into one path that goes via education and one that does not—in previous literature known as stratification via “achievement” and “ascription,” respectively (Blau and Duncan 1967). We consider the possibility that the United States in particular may on the one hand be unequal because of strong associations involving education, but on the other exhibit a type of stratification regime where intergenerational advantages are passed on predominantly via achievement rather than ascription, which would be indicated by a weak partial association between parental income and own income, controlling for education.

In our approach to measuring children's achievement (or attainment), we take three steps. First, we control for a four-category educational variable that is, we believe, as comparable as possible given the generically different educational systems we analyze. Second, we construct more fine-grained measures of educational qualifications that are nationally specific but comparable in the sense that they represent functional equivalents in our three countries. Finally, in order to pick up potentially unobserved educational differences, we also control for cognitive ability, using measures that are not identical across countries but again, we believe, comparable in capturing a very similar underlying construct.

## The Mediating Role of Education for Intergenerational Persistence

Education is often seen as the main driver of the association between parental socioeconomic position, however measured, and child's—indeed, this is maintained in such diverse social science traditions as [Blau and Duncan's \(1967\)](#) status attainment model, [Bourdieu's \(1973\)](#) cultural capital approach, a variety of social class mobility models (e.g., [Ishida, Müller, and Ridge 1995](#)), as well as in the more recent literature on income mobility ([Becker and Tomes 1986](#)). This follows the logic that education (E) is the key determinant of labor market destinations (D), measured in terms of occupation or income, and that educational attainment is empirically related to the socioeconomic origin (O), typically measured as the occupation or income of parents when the child is a teenager. These two associations (ED and OE) rest on solid empirical ground and are present in all studied modern societies and using a variety of measures ([Card 1999](#); [Jerrim and Macmillan 2015](#) for ED and OE; [OECD 2013](#) for ED; [Shavit, Arum, and Gamoran 2007](#) for OE; [Shavit and Müller 1998](#); [Treiman and Yip 1989](#)).

While much research into social inequalities of opportunity has focused on the OE and OD associations, respectively ([Breen and Jonsson 2005](#)), emphasis has also been given to the part of the total association between origin and destination (OD) that is mediated by educational qualifications (OE\*ED), but more importantly perhaps the part that is *not* so mediated; that is, the origin-destination association that remains after controlling for educational attainment (OD.E). The latter is assumed to depend on “ascriptive” characteristics of the childhood family that give unfair advantage to children of affluent or high-status families in the competition for job and income opportunities; such characteristics would include a family name, social connections, wealth, cultural capital, or sheer nepotism. [Blau and Duncan \(1967\)](#) famously assumed that such inequality would dissipate over time, in a process where the US stratification system developed from one based on ascription to one based on achievement; that is, one in which the impact of the family origin is almost entirely mediated by education. Although not equal as long as the chances of attaining higher education are unequally distributed, many people would certainly regard stratification based on educational credentials—as in [Bell's \(1973\)](#) “just meritocracy”—as legitimate.

## The Form and Strength of Intergenerational Persistence

The question of whether intergenerational mobility (or persistence) is more related to achievement than ascription is a question about the *form* of stratification. But often the critical question for inequality instead concerns the *strength* of the intergenerational associations. In sociology, the dominant traditions have been to study intergenerational processes via social class mobility and through socio-economic or occupational prestige correlations across generations. Such studies suggest that the United States and Britain, despite being economically unequal societies, show mobility rates on par with many other Western countries (e.g., [Beller and Hout 2006](#); [Erikson and Goldthorpe 1985, 1992](#); [Treiman and Yip 1989](#)). Valuable as these studies are, they suffer from two problems. First, there is a lack of comparability across countries in occupational codes, crucial for the construction of social class and gradational measures. Second, treating the social structure as comprised by a few (normally 3–10) big classes hides a lot of variance in (“hierarchical”) living conditions and limits the opportunity of analyzing intergenerational inequality to the full—the same problem, although to a less extent, goes for analyses of occupational mobility.<sup>1</sup>

An indication that conventional social mobility studies tend to underestimate the degree of intergenerational inequality is that studies of parent-to-child income associations consistently show Britain and (particularly) the United States to be far more unequal than other comparable Western countries, especially the Nordic ([Blanden 2013](#); [Bratsberg et al. 2007](#); [Corak 2012](#); [Jäntti et al. 2006](#)). It is possible that this pattern comes about because of both relatively strong OE and ED associations involving economic resources: Recent studies have suggested that early child inequality may be particularly rampant in the United States ([Bradbury et al. 2015](#); [Ermisch, Jäntti, and Smeeding 2012](#)), and inequality of educational achievement at around age 15 is also above average ([OECD 2011a](#), figure 2.4). In addition, the cost for college education is relatively high in the United States, as are the returns to educational qualifications ([OECD 2013](#), tables A6.1, A7.3a–3b).

It is particularly in the United States, then, that we assume that education is a strong mediator of the intergenerational income association. Unlike the United States, Britain is not seen as a very achievement-oriented society—it is more conventionally portrayed rather as a “class society,” especially in a transatlantic perspective, and thus possibly closer to the ascriptive form of stratification. In our empirical analysis, we ask to what extent educational credentials are behind the intergenerational income associations—if this is the case, it would point to educational policy as the potentially most important remedy for inequality of opportunity. We contrast the high-inequality countries of the United States and Britain with Sweden, a country clearly toward the equal end of the distribution of income ([OECD 2011b](#)) and with low intergenerational persistence (e.g., [Blanden 2013](#)). Is the position Sweden takes due to weak OE and ED associations, or could it be that, as a generally equal society, also its ascriptive features are weak?

## Estimating Income Mobility

Studies of fathers and sons dominate the research on intergenerational mobility, which is becoming increasingly untenable with growing female labor participation. Ignoring mothers is particularly problematic given that father's income or occupation gives only partial information about the economic (and related) resources that a child can draw upon, something that can give a biased image of the extent and patterns of persistence (Beller 2009; Nordli Hansen 2010). In contrast to much of the previous work on intergenerational mobility, we therefore include not only fathers' but also mothers' incomes to calculate total family income. On the child side, we have, however, reluctantly chosen to study sons only, for two reasons. First, the analyses of daughters require modeling the complex cross-country differences in the patterns of female labor market participation, which warrants a careful and thorough treatment and therefore an article of its own. Second, we do not have data on cognitive ability for Swedish women, as this information was gathered through the military conscription tests.

Our first estimate of income mobility is the regression coefficient  $\beta$  from equation (1),

$$\ln Y_i^{\text{Child}} = \alpha_1 + \beta \ln Y_i^{\text{Parent}} + \varepsilon_{i1}, \quad (1)$$

where  $i$  indexes individuals (children), the dependent variable is the log of earnings ( $Y_i^{\text{Child}}$ ) of an individual in adulthood and the explanatory variable is the log of income of the parents during childhood ( $Y_i^{\text{Parent}}$ ),  $\varepsilon_1$  is an idiosyncratic error term, and  $\alpha_1$  and  $\beta$  are parameters to be estimated. Our parameter of interest,  $\beta$ , is the intergenerational elasticity, interpreted as the proportion of the income differences between two sets of parents that we on average will find in (and assessed at the geometric mean of) children's earnings.

The elasticity measures the relationship between two generations' incomes often decades apart, and is sensitive to changes in these distributions; the elasticity becomes higher, *ceteris paribus*, if the variance increases from parents to children, and vice versa. It is therefore useful to calculate the rank-order correlation (Spearman's rho) to analyze whether there is also an inter-nation difference in positional mobility. This measure removes differences in income dispersion across generations and countries by focusing solely on the role of changing positions within the income distributions (see Chetty et al. 2014; Gregg, Macmillan, and Vittori 2016), and is often preferred to the Pearson correlation (which adjusts the elasticity by dividing the standard deviation in log family income with the standard deviation of son's log earnings, but is more sensitive to distributional properties such as extreme values).<sup>2</sup> Measuring both the elasticity and the rank correlation therefore allows us to assess the economic consequences of the intergenerational income process (elasticities) for our samples, as well as the positional mobility in the underlying distribution (the rank correlation).

We calculate the rank correlation, using percentile groups, as

$$\text{rank } Y_i^{\text{Child}} = \alpha_2 + \beta^r \text{rank } Y_i^{\text{Parent}} + \varepsilon_{i2}, \quad (2)$$

which is the same as equation (1) apart from using the percentile rank transformations of the parental income and child's earnings variables. Here,  $\varepsilon_{i2}$  is the idiosyncratic error term and  $\alpha_2$  and  $\beta^r$  are the parameters to be estimated, where  $\beta^r$  now gives the rank correlation between incomes across generations.

A concern in income mobility studies is measurement error. First, a point-in-time measure includes temporary income fluctuations ("transitory shocks"), biasing mobility estimates downward, which is why averaging across a number of periods of income is to be preferred (Solon 1992). To address this, we concentrate on analyses based on two points of family income—for Sweden, we can even estimate full childhood family incomes, which we use for adjusting US and British income mobility estimates. Second, the age at which earnings are measured affects estimates: Age-earnings profiles are steeper for individuals with more human capital, making measures of earnings at younger ages downwardly biased. Haider and Solon (2006) and Böhlmark and Lindquist (2006) show how the estimated lifetime income is affected by using single-year earnings as proxies, and suggest that earnings measures around age 40 are good approximations in both the United States and Sweden. We have therefore chosen to show results using child's earnings at around that age (for results for younger and older ages, see Gregg et al. 2013).

## Estimating the Role of Education

To estimate the role of education for intergenerational persistence, we follow the common practice in the intergenerational literature (e.g., Blanden, Gregg, and Macmillan 2007; Bowles, Gintis, and Osborn Groves 2005) and use the intuitive decomposition approach traditionally used in path analysis. The first stage involves analyzing the relation between the education of an individual and the parental income, as shown in equation (3):

$$ed_i^{\text{Child}} = \alpha_3 + \lambda \ln Y_i^{\text{Parent}} + \varepsilon_{i3}, \quad (3)$$

where  $i$  indexes individuals (children),  $ed_i^{\text{Child}}$  is the child's measured education and  $Y_i^{\text{Parent}}$  is parental income in childhood,  $\varepsilon_{i3}$  is an idiosyncratic error term, and  $\lambda$  and  $\alpha_3$  are parameters to be estimated.  $\lambda$  is therefore the estimated association between parental income and child's education level.

The second stage involves analyzing the labor market value of education in terms of later earnings, conditional on parental income, as shown in equation (4):

$$\ln Y_i^{\text{Child}} = \alpha + \gamma ed_i^{\text{Child}} + \delta \ln Y_i^{\text{Parent}} + u_i, \quad (4)$$

where the log of child earnings in adulthood ( $Y_i^{\text{Child}}$ ) are regressed on the education level of the child ( $ed_i^{\text{Child}}$ ) and the log of parental childhood income ( $Y_i^{\text{Parent}}$ ),  $u$  is an error term and  $\alpha$ ,  $\gamma$ , and  $\delta$  are parameters to be estimated, with  $\gamma$

capturing the returns to given education levels and  $\delta$  measuring the direct association between parental income in childhood and the child's labor market earnings, conditional on their educational attainment. By combining equations (3) and (4), the elasticity in equation (1),  $\beta$ , can be decomposed into two parts. First, the "direct income component,"  $\delta$ , and second, the "through education component," which is the product of the relationship between education and family income ( $\lambda$ ) and the returns to education in the labor market ( $\gamma$ ), meaning that the elasticity can be written as

$$\beta = \gamma\lambda + \delta. \quad (5)$$

The logic is the same for the decomposition of rank correlations. In essence, the decomposition consists in comparing the effect terms for parental income before ( $\beta$ ) and after ( $\delta$ ) adding child education to the regression, with the difference between these two being the part accounted for by education ( $\gamma\lambda$ ). One should keep in mind that it is a descriptive and not a causal decomposition, as observed associations may also pick up effects of unmeasured factors. However, this is a problem for our cross-country comparisons only insofar as there are differences across countries in the impact of unobserved variables.

## Data and Measures

Because of the measurement problems mentioned above, very few datasets are suitable for studies of intergenerational income mobility. In fact, we have found only one dataset in the United States (NLSY; cf. [Levine and Mazumder 2002](#)) and one in England (BCS; cf. [Blanden, Gregg, and Macmillan 2007](#)) that (1) provide information on income/earnings at two or more occasions directly from both parents and children; (2) measure child earnings around age 40; and (3) cover approximately the same birth cohorts.<sup>3</sup> The Swedish register data (e.g., [Mood, Jonsson, and Bihagen 2012](#)) are more flexible, and we adjust them to match the structure of the other datasets.

The NLSY is a nationally representative survey of around 13,000 individuals born in the United States between January 1, 1957, and December 21, 1964, that is, aged 14–22 in 1979. They were followed yearly up until 1994 and biannually since. The original sample consists of three subsamples; we use the cross-section sample of 2,974 boys designed to be nationally representative of all non-institutionalized civilians living in the United States in 1979 in these age groups, using custom-designed sampling weights to control for the complex nature of the survey. The BCS sampled all those born in Britain in a particular week in April 1970, in total 8,906 baby boys, and obtained data on sample members and their families at birth and at various ages, of which we use 10 and 16 for origin information and 42 for generating son's income.

The Swedish data come from population-wide registers, primarily tax records, educational registers, censuses, and the enlistment register (for cognitive ability). Information from different registers is matched (also longitudinally) using a unique personal identifier, and information for parents and children is matched



using a multigenerational link.<sup>4</sup> We here use the full male cohort born 1965, around 50,000 parent-son pairs, with matched information on parental incomes during childhood and own earnings when adult.

### ***Income and Earnings Measures***

The NLSY provides a continuous measure of the resident parents' total family income, counting income from all sources, before any taxes or deductions both in 1978 and 1979, when cohort members were on average age 16 and 17. Cohort members must have family income in both periods to be included in our final sample. We use sons' earnings as measured in 2000 when the average age of the cohort members was 39. Cohort dummies are included throughout the analysis in the United States to account for the fact that respondents were born across an eight-year period.

The British BCS contains income of the parents present in the household before taxes and deductions in banded form at age 10 and 16. We generate continuous income variables by fitting a Singh–Maddala (1976) distribution to the banded data using maximum likelihood estimation, which is particularly helpful in allocating an expected value for those in the open top category. These measures have been extensively used and their robustness and comparability carefully tested (see Blanden, Gregg, and Macmillan 2013, appendix A, for full details, including the specific survey questions asked). Cohort members must have reported incomes at 10 and 16 to be included in our final sample. We use earnings information for sons in the British data at age 42, using work history data to take into account spells out of work in the last year.

For Sweden, income data for parents are available from 1968 onward, and earnings data are available for children from 1990 to 2007. For the 1965 cohort, we have parental incomes (here defined as incomes of parent and any stepparent in the household of residence) for sons' ages 3–18 and sons' earnings for ages 25–42. Because we can construct average family income from two different periods for the NLSY (age 16 and 17) and BCS (age 10 and 16), we use income measured at child ages 10, 16, and 17 in the Swedish data to match either of these. We also use the Swedish data to explore the likely extent of attenuation bias from observing parental income across the entire childhood compared to two points in time in the US and British survey data. In our calculation of elasticities, we find that measures of family income at age 16 and 17 capture 71 percent of the persistence from total childhood income estimates, and at 10 and 16, around 81 percent of the total persistence from observing total childhood income. This difference across measures from the US and British data is to be expected, given that there is likely to be more transitory error in the US data with incomes measured only one year apart, compared to six years in the British data. If uncorrected, this would lead to an artificially low persistence in British data, so we therefore rescale the three country estimates to be comparable (see below).

A requirement to be included in the Swedish data is that at least one parent lives in Sweden at ages 10, 16, or 17, and has any registered income, and hence immigrant children who arrived after around age 10 are excluded from the analysis.



Out of all men born in 1965 with at least one parent living in Sweden, 9 percent lack information on parental income, and two-thirds of this group has immigrant parents. We also exclude zero incomes (0.5 percent), as families with children in Sweden cannot have true zero disposable incomes. Child earnings are measured at age 41. All income and earnings data are annual, measured per calendar year, and top-coded at four standard deviations from the mean in order to down-weight the impact of a small group with extremely high values (inevitable in population data).

In all countries, we exclude individuals with missing data on earnings, and self-employed earnings (the latter of which are usually poor indicators of true economic status). A final refinement to improve comparability is to adjust the lower tail of the son's earnings distribution, as the British data, unlike the US and Swedish, exclude those who do not work at the time of the survey. Also, to bring the samples in the United States and Sweden more in line with the British data, we trim the tail of the annual earnings in the United States and Sweden below the 2nd percentile of earnings.<sup>5</sup>

Table 1 shows the descriptive statistics for family income and sons' earnings across countries and age groups, as well as sons' highest educational attainment. All income measures are logged and deflated using national consumer price indices. In all countries, family income pertains to the coupled or single-parent household where the child lived at the time of measurement. Our average measures use the natural logarithm of the average incomes (rather than the average of the logged incomes).

The greatest problem with studying intergenerational income associations is that it requires income data for parents (reported by parents when their children live at home) as well as earnings for children as adults (reported by children). The few data sources that manage this are panel surveys that typically come with high non-response rates, much due to attrition. In the US data, there is family income at age 16 for 2,150 out of 2,974 boys, which is reduced to 1,562 when demanding a second data point on family income (at age 17) and, mostly because of panel attrition up to the age of measuring earnings at age 39 (but also because we removed 7 percent self-employed), we are left with 985 cases for our analytical sample. The British panel attrition reduces the 8,906 originally sampled boys to 3,554 at age 16 (recall that this is a very long panel), which is further reduced to 2,757 when adding a second data point for family income, and 1,332 for the final sample (removing self-employed and those who did not respond at age 42 or had missing data on earnings).

With the missingness in the US and British (but not Swedish) data, we run the risk that our analytical samples misrepresent the original samples. We checked this by comparing means and associations between the original sample and our analytical sample. In the US data, respondents' educational distribution and mean earnings, as well as family income at either age of the child, are comparable. In the British data, the panel attrition is somewhat greater for children of lower education and lower cognitive ability. However, correlations between our main variables are reassuringly similar, and our decomposition analysis returns very similar estimates when we use one rather than two observations of family income (while the elasticities show the advantage of using two).

**Table 1. Summary Statistics of Family Income, Earnings, and Education in the United States, Britain, and Sweden for Our Sample of Parent-Son Pairs**

Country	US	Britain	Sweden
Birth cohort	1957–65	1970	1965
Average ln monthly income (st. dev.)			
Family income age 16	10.78 (0.67)	9.85 (0.60)	12.58 (0.47)
Average family income 16, 17	10.84 (0.59)		12.59 (0.45)
Average family income 10, 16	9.88 (0.44)		12.57 (0.41)
Earnings at 39/42	10.59 (0.69)	10.40 (0.59)	12.48 (0.54)
Highest educational level of son in US/ Britain/Sweden	Percent		
Dropout/<O-level/comprehensive	7.2	19.2	14.9
HS graduate/O-level/short upper secondary	33.3	33.9	40.8
Associate's/A-levels/long upper secondary, short post-secondary	27.2	11.7	31.5
Bachelor's/university qualification/university qualification	26.6	26.2	12.8
Missing education data	5.8	9.0	0.1
Total	100	100	100
N	985	1,332	49,482

**Notes:**

1. **Sources:** Authors' calculations based on NLSY79 (United States), BCS70 (Britain), and Swedish population registers, 1965 cohort. Sample weights are used in the United States for the representative cross-sectional sample.
2. Across all three sources, the sample consists of those with valid observation of parental income at two periods in childhood (16/17 United States, 10/16 Britain/Sweden) and earnings at age 39/42.
3. For Sweden, education is the highest education recorded 1990–2007. In the United States and Britain, education is the highest education recorded in 1988 and 1996, respectively.
4. Excluded from the sample are observations with self-employed sons or zero parental incomes, sons in the bottom 2 percent of earnings (United States and Sweden), and sons in the top 2 percent of earnings (United States).
5. Incomes and earnings above 4 standard deviations are top-coded in Sweden.

**Measures of Educational Attainment and Cognitive Ability**

Sons' education is measured around age 26–28 in the United States and Britain, and in Sweden it is derived from the population educational register of 2007 (or earlier if the individual is missing in 2007). We first construct a four-category highest educational attainment measure aiming at maximum comparability, as depicted in the lower part of table 1 (shown as ISCED categories in appendix

table A1). The bottom category consists of those, normally low achievers, who left school early without a qualification (although in Sweden they formally have the lowest type of exam). The next level consists of those who graduated and thus can call on some qualifications—in Sweden this amounts to shorter vocational tracks at the secondary level. While we believe that the British level is equivalent to the US here, we should note that Britons at this level are 16 years of age rather than 18/19 in the United States and Sweden. The highest level singles out those with a university exam, such as a bachelor's degree, and the category in between then consists of all other types of upper secondary and shorter postsecondary educational qualifications, general or vocational. Dummies are included in regressions where education information is missing (6 percent in US data and 9 percent in Britain, less than 0.1 percent in Sweden).

Second, we construct a much more detailed classification (appendix table A2). This is nationally specific but indirectly comparable because it covers the important distinctions in each nation's educational system, and incorporates functionally equivalent qualifications and degrees. Because the British educational system is more qualification based than either the US or Swedish, we include number of O- and A-levels as a separate category. In all countries alike, we were able to distinguish between university majors with different labor market returns.

Third, we also include a measure of cognitive ability to complement the indicators of formal educational qualifications. The NLSY contains a standardized measure of the Armed Forces Qualification Test (AFQT) taken at age 17. This is a combined score from arithmetic reasoning, word knowledge, paragraph comprehension, and numerical operations. For the British data, we create a combined test score at age 16 including tests for spelling, vocabulary, reading, and math. (When missing, this score was complemented with standardized reading, spelling, language comprehension, math, and ability [words, numbers, matrices] test scores measured at age 10.) For Sweden, we use a standardized measure of the enlistment test, combining logical reasoning, verbal comprehension, spatial ability, and technical understanding, and taken by almost all men in our cohorts at age 18.<sup>6</sup>

## Results

We begin with the country ranking of intergenerational income associations. Table 2 shows income elasticities and rank correlations for our countries, using family income at child's age 16 (left side) as well as estimates averaging family income over two or more observations (right side).

First, associations are stronger the more data points on family income we use. Second, there is a clear ranking of mobility across the countries when using comparable measures of (point-in-time) family income at 16 and earnings at around 40, with Sweden exhibiting far greater mobility, Britain in the middle, and the United States with the lowest mobility. Third, the alternative rank correlation measure, which adjusts for changes in income inequality across generations, reveals the same patterns across countries. This is an important and novel finding, suggesting that the lower mobility in the United States is not, as could be

**Table 2. Intergenerational Elasticities and Rank Correlations at Age 39/42 for Sons in the US, Britain, and Sweden**

Country	US	Britain	Sweden	US	Sweden	Britain	Sweden	Sweden
	<i>Point-in-time family income</i>			<i>Averaging family income over child's ages</i>				
Age family income	16	16	16	16 & 17	16 & 17	10 & 16	10 & 16	3–18
Elasticity	0.372 (0.028)	0.315 (0.023)	0.213 (0.005)	0.427 (0.038)	0.236 (0.005)	0.453 (0.035)	0.268 (0.006)	0.332 (0.007)
Rank	0.354 (0.027)	0.343 (0.023)	0.225 (0.004)	0.350 (0.032)	0.231 (0.004)	0.343 (0.026)	0.240 (0.004)	0.255 (0.005)
<i>N</i>	1,320	1,662	50,428	985	49,951	1,332	49,482	38,540

**Notes:**

- Sources:** Authors' calculations based on NLSY79 (United States), BCS70 (Britain), and Swedish population registers, 1965 cohort. Sample weights are used in the United States for the representative cross-sectional sample.
- Elasticities and rank coefficients from regressions of ln of sons' gross annual earnings/rank of ln earnings on ln of family income/rank of ln income. Standard errors in parentheses.
- Across all three sources, the sample consists of those with valid observation of parental income at two periods in childhood (16/17 United States, 10/16 Britain/Sweden) and earnings at age 39/42.
- For Sweden, education is the highest education recorded 1990–2007. In the United States and Britain, education is the highest education recorded in 1988 and 1996, respectively.
- Excluded from the sample are observations with self-employed sons or zero parental incomes, sons in the bottom 2 percent of earnings (United States and Sweden), and sons in the top 2 percent of earnings (United States).
- Incomes and earnings above 4 standard deviations are top-coded in Sweden.

surmised, because of a particularly rapid growth in income inequality across generations. To test the robustness of our findings, we calculated rank correlations averaging across two observations also on the son's side; this exercise did not change the correlations much (results not shown).

Fourth, when correcting for some of the temporary fluctuations in family income (or reporting errors in the data) by averaging family incomes over two years, the ordering of Britain and the United States is not so clear. The elasticity is now slightly higher in Britain, but this is an unfair comparison because with two data points observed six years apart, there is likely to be less persistence in transitory shocks, giving a better proxy for permanent childhood income. Utilizing the flexibility of the Swedish data, we can explore how much of a difference averaging over these different windows makes. If we use the point-in-time family income elasticity at age 16 (0.213), averaging over age 16 and 17, as is available in the US data, produces an 11 percent increase, to 0.236. In the United States, the coefficient increases by 15 percent, from 0.372 to 0.427. Taking an average of income at age 10 and 16 in the Swedish data, as is available in the British data, produces an increase in the estimated persistence from 0.213 to 0.268 (26 percent increase). The corresponding increase in the British data is from 0.307 to 0.444 (45 percent increase). Overall, this suggests that averaging over adjacent years removes less bias in elasticities than averaging over years further apart, which means that the true British elasticity is probably not higher than the US one. We can also see that the impact of averaging on elasticities is greater in Britain and the United States as compared to Sweden, which is probably due to measurement error being greater in survey data. All in all, elasticities are sensitive to measurement error, while rank correlations are quite well estimated by the point-in-time coefficients (cf. [Chetty et al. 2014](#) for the United States).

### ***Adjusting Elasticities Using Whole Childhood Income Histories***

Because of the sizeable increases in elasticities when family incomes are summed over two observations, it is pertinent to ask what estimates would look like if we had even more observations. Fortunately, we have the unique opportunity to calculate the average family incomes over virtually the whole childhood (age 3–18) in the Swedish data. This leads to a substantial increase in intergenerational persistence, the elasticity going from the point estimate 0.213 at age 16, over the 10/16 average of 0.268, to 0.332 (see the rightmost column in table 2). The rank correlation is again much more resistant to measurement error, increasing from 0.225 (0.240) to 0.255.

Because the US estimates (using ages 16/17) are more downwardly biased than the British estimates (using ages 10/16), we adjust the estimates in order to be able to compare them, and for this purpose we use the scaling suggested by the Swedish data. Naturally, measurement error may not be identical over countries, but for comparative purposes this rescaling is clearly better than comparing the 10/16 to the 16/17 estimates without any adjustment. We thus assume

that the attenuation bias we found for Sweden would be proportionally the same for our other countries, and we rescale all estimates to the Swedish 3–18 estimates. That is, we assume that the elasticity when observing family income at age 16 and 17 captures only around 71 percent, and at 10 and 16 around 81 percent of the elasticity when observing whole childhood family income.<sup>7</sup> This adjustment moves the elasticity for total childhood income in Britain to around 0.55 and for the United States up in the region of 0.60, matching the estimate in Mazumder (2005). This is thus our expected elasticity for the United States and Britain if we had had income data for whole childhoods. If the US and British data contain more measurement error than the Swedish data, these numbers underestimate the true elasticity in these countries.

Because the attenuation bias in the rank correlation is much smaller, the same rescaling makes less of a difference, and the ranking of countries is the same, from low persistence in Sweden ( $r_{\text{rank}} = 0.255$ ) to high persistence in Britain (0.354) and, especially, the United States (0.386).<sup>8</sup> Figure 1 reports the results for the rescaling of both elasticities and rank correlations, and demonstrates that the differences between countries are similar irrespective of measure. Our analysis of the strength of the intergenerational income associations supports the conjecture made previously: The United States has the lowest mobility, Britain is not far off, while Sweden is clearly the most mobile of our countries.

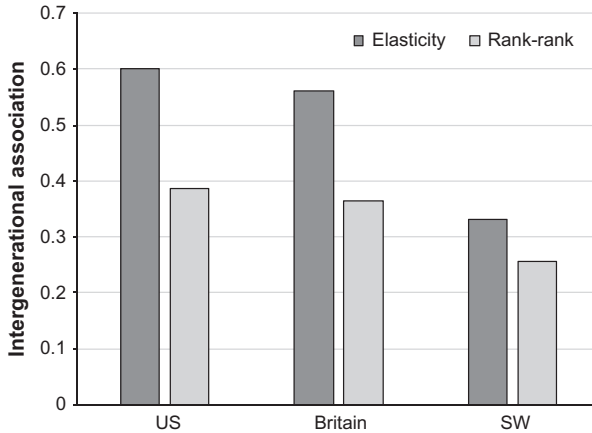
### ***Educational Inequality, and Returns to Education***

Building on the estimations of the *strength* of the intergenerational persistence above, we now turn to the *form* of the stratification system. We do this by unpacking the mobility process into the role that (a) education inequalities (OE) and (b) wage returns to education (ED) play in intergenerational income persistence across our countries. Can the low mobility in the United States and Britain be explained by high levels of inequality of educational attainment, or by great returns to educational credentials? In the following, we only show regression tables for the first (four-category) education variable (for results using extended educational measures and cognitive ability variables, see appendix tables A3 and A4).

We begin by exploring the patterns of returns to education across countries. Table 3 describes the percentage lower earnings associated with achieving a given level of educational attainment compared to the baseline category (university degree/bachelor's). There is a substantial advantage with having a university exam in all countries, and there is a gradient also among the other educational categories. While the income differences across educational categories are much the same in Britain and Sweden, the United States stands out by having a particularly high return to a bachelor's degree.

The results for the earnings returns to education appear to support the view that education is behind the low mobility in the United States, but as we recall from equation (5) this also depends on the relation between family income and educational attainment, shown in table 4. The interpretation is the effect of a

**Figure 1. Estimated intergenerational income elasticities and rank-rank correlations for sons aged 39/42 in the United States, Britain, and Sweden**



**Notes:**

1. **Sources:** Authors' calculations based on NLSY79 (United States), BCS70 (Britain), and Swedish population registers, 1965 cohort. Sample weights are used in the United States for the representative cross-sectional sample.
2. Across all three sources, the sample consists of those with valid observation of parental income at two periods in childhood (16/17 United States, 10/16 Britain/Sweden) and earnings at age 39/42.
3. Excluded from the sample are observations with self-employed sons or zero parental incomes, sons in the bottom 2 percent of earnings (United States and Sweden), and sons in the top 2 percent of earnings (United States).
4. Incomes and earnings above 4 standard deviations are top-coded in Sweden.

doubling of average family income on the probability of being in each one of the education groupings rather than in any of the other three categories. There are striking similarities in the educational inequalities between the United States and Sweden. In contrast, British men experience more inequality, with family income being especially important for avoiding the lowest level of education. However, Sweden shows a relatively strong negative estimate for shorter upper secondary schooling, which is probably a consequence of the accentuated vocational content at this level of education.

### ***Decomposing the Intergenerational Association: The Role of Education***

Can the role of education in the intergenerational process account for the low mobility in the United States and Britain? After having analyzed both the association between family income and education, and the returns to education, we now turn to decomposing the income association.<sup>9</sup> As above, we rescale the associations and its constituent parts to approximate a value that is comparable across countries. That is, we divide all components by the same constant (0.71



**Table 3. Wage Returns to Highest Educational Level for Sons in the United States, Britain, and Sweden**

	US	Britain	Sweden
<b>Highest educational level of sons in US/Britain/Sweden</b>			
Dropout/<O-level/comprehensive	-0.762 (0.082)	-0.563 (0.045)	-0.546 (0.009)
HS graduate/O-level/short upper secondary	-0.557 (0.050)	-0.384 (0.038)	-0.423 (0.007)
Assoc/A-levels/long upper sec., short post sec.	-0.361 (0.052)	-0.288 (0.050)	-0.253 (0.007)
Bachelor's/university qualification/univ qualific	Base	Base	Base
N	985	1,332	49,482

**Notes:**

1. **Sources:** Authors' calculations based on NLSY79 (United States), BCS70 (Britain), and Swedish population registers, 1965 cohort. Sample weights are used in the United States for the representative cross-sectional sample.
2. Coefficients from a regression of ln monthly earnings of sons at 39/42 on highest education level dummies for sons and ln monthly average family income in childhood. Standard errors in parentheses.
3. A missing dummy is included for missing sons' education (not shown in table).
4. Family income averaged over age 10 and 16 in British data; 16 and 17 in US data; 10 and 16 in Swedish data. Using 16 and 17 for Sweden gives  $-0.557, -0.432, -0.259$ .
5. Elasticities and rank coefficients from regressions of ln of sons' gross annual earnings/rank of ln earnings on ln of family income/rank of ln income.
6. Across all three sources, the sample consists of those with valid observation of parental income at two periods in childhood (16/17 United States, 10/16 Britain/Sweden) and earnings at age 39/42.
7. For Sweden, education is the highest education recorded 1990–2007. In the United States and Britain, education is the highest education recorded in 1988 and 1996, respectively.
8. Excluded from the sample are observations with self-employed sons or zero parental incomes, sons in the bottom 2 percent of earnings (United States and Sweden), and sons in the top 2 percent of earnings (United States).
9. Incomes and earnings above 4 standard deviations are top-coded in Sweden.

in the United States, 0.81 in Britain), which of course does not change the proportion accounted for by education.

We follow the three-step strategy described earlier. First, we use only our most comparable four-category educational schema; then we add the full educational classification; finally, we add our indicators of cognitive ability (appendix tables A3 and A4 give the underlying regressions for the two last steps). Figure 2 shows the results, with the three bars to the left representing the elasticities and the three to the right the rank correlations. Our decomposition separates out the part of the income associations (OD) that is mediated by education (in two

**Table 4. Family Income Gradients in Education for Sons in the United States, Britain, and Sweden**

	US	Britain	Sweden
<b>Highest educational level of sons in US/Britain/Sweden</b>			
Dropout/<O-level/comprehensive	-0.092 (0.015)	-0.187 (0.024)	-0.127 (0.004)
HS graduate/O-level/short upper secondary	-0.118 (0.029)	-0.046 (0.030)	-0.207 (0.005)
Assoc/A-levels/long upper sec., short post sec.	0.013 (0.027)	0.044 (0.020)	0.145 (0.005)
Bachelor's/university qualification/univ qualific	0.195 (0.026)	0.256 (0.027)	0.190 (0.004)
Gap: Highest—lowest education level	0.287	0.443	0.317
<i>N</i>	985	1,332	49,482

**Notes:**

- Sources:** Authors' calculations based on NLSY79 (United States), BCS70 (Britain), and Swedish population registers, 1965 cohort. Sample weights are used in the United States for the representative cross-sectional sample.
- Income gradients from separate bivariate regressions of categorical education dummies on family income in childhood. The base category is therefore all other education categories. Coefficients show the effects of doubling family incomes on attaining one educational qualification rather than any other. Standard errors in parentheses.
- Family income averaged over age 10 and 16 in British data; 16 and 17 in US data; 10 and 16 in Swedish data (using 16 and 17 for Sweden gives -0.115, -0.165, 0.127, and 0.153).
- Across all three sources, the sample consists of those with valid observation of parental income at two periods in childhood (16/17 United States, 10/16 Britain/Sweden) and earnings at age 39/42.
- For Sweden, education is the highest education recorded 1990–2007. In the United States and Britain, education is the highest education recorded in 1988 and 1996, respectively.
- Excluded from the sample are observations with self-employed sons or zero parental incomes, sons in the bottom 2 percent of earnings (United States and Sweden), and sons in the top 2 percent of earnings (United States).
- Incomes and earnings above 4 standard deviations are top-coded in Sweden.

forms) and by cognitive ability from the “ascriptive” part that is unmediated by these variables (OD.E). This can be seen as the bottom (black) part of the bars, while the mediators make up the upper part (dark gray for the comparative four-level education, white for the full educational variable, and light gray for cognitive ability).

Surprisingly, the results reveal that the transmission of advantage across generations—measured either as elasticities or rank correlations—which is flowing through education (the non-black fields) is quite similar in all three countries. There is slightly less persistence through education in Sweden, and given the

patterns revealed in tables 3 and 4, we infer that this originates in the lower returns to education rather than in smaller inequalities in education by parental income. But the standout characteristic of Sweden is the unmediated part: The net association between family income and own earnings, controlling for education and cognitive ability, is much stronger in the United States and Britain. Thus, education is not, as is commonly believed, the important trigger of differences in income mobility between our countries. Instead, the big differences arise in the part of the parent-to-son income elasticity *not* going through education: it is inequalities in earnings *within education groups* that are strikingly more patterned by parental income in the United States and Britain compared to Sweden. And although Britain appears to have somewhat more ascription than the United States, the main picture is one that puts both of these countries in the unequal (“class society”) stratification type: that is, where the intergenerational income association is strong and ascription is a prominent feature. To be sure, a tangible income association that is unmediated by education and cognitive ability also remains in Sweden, so there are no doubt general mechanisms in Western labor markets that favor children of high-income families. In fact, 43 percent of the intergenerational income association in Sweden is not mediated by education, which is in itself a reminder that Bell’s meritocratic ideal is far away from the observed patterns—but this figure is overshadowed by the 57 percent in the United States and 65 percent in Britain.

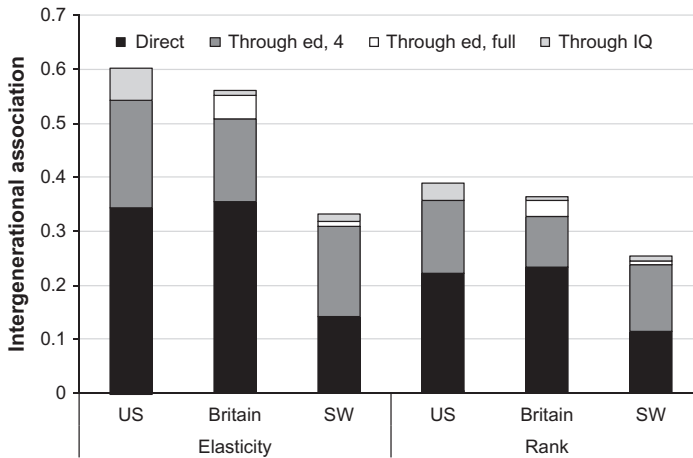
It can be noted from figure 2 that when we go from our four-category education variable to a fuller account of education, the part that is mediated by education increases especially in Britain, while cognitive ability plays a larger role in the United States. It is possible that both of these pick up inequality in educational attainment that is dependent on socio-economically biased selection (on grades or test results) to educational institutions that give high monetary return (in the British case, this may be due to the indicators of performance in terms of O- and A-level qualifications).

## Conclusions

In asking how the strength and form of the parent-to-son income associations differ across countries, we delve into the nuts and bolts of intergenerational inequality. Our empirical study, using the most comparable recent data and drawing on new and improved ways of correcting for measurement error, strongly supports the view of the United States as a country where income mobility is particularly low. We estimate that around 60 percent, probably more, of the income gap among parents persists to their 40-year-old sons in the cohorts we study. However, Britain is not far behind at 55 percent, while Sweden predictably shows a much lower elasticity, 33 percent; a figure that still reflects a tangible intergenerational persistence. These estimates are all quite high relative to previous findings, but arrived at through the unique possibility of estimating family income during the whole childhood in Swedish data.

Surprisingly, despite the fact that the rewards reaped by college graduates in the United States exceed the ones in Britain and Sweden, the high income

**Figure 2. Decomposing intergenerational elasticities and rank-rank correlations for sons aged 39/42 in the United States, Britain, and Sweden, by education**



**Notes:**

1. **Sources:** Authors' calculations based on NLSY79 (United States), BCS70 (Britain), and Swedish population registers, 1965 cohort. Sample weights are used in the United States for the representative cross-sectional sample.
2. For Sweden, education is the highest education recorded 1990–2007. In the United States and Britain, education is the highest education recorded in 1988 and 1996, respectively.
3. Across all three sources, the sample consists of those with valid observation of parental income at two periods in childhood (16/17 United States, 10/16 Britain/Sweden) and earnings at age 39/42.
4. Excluded from the sample are observations with self-employed sons or zero parental incomes, sons in the bottom 2 percent of earnings (United States and Sweden), and sons in the top 2 percent of earnings (United States).
5. Incomes and earnings above 4 standard deviations are top-coded in Sweden.

persistence in the United States is *not* primarily channeled via education. This is partly because the association between family income and children's education is relatively similar across countries, but mostly because in the United States and Britain parental income is strongly associated with son's earnings *at given levels of attained education*. Arguably, equalizing education, even reducing the returns to higher education, would move neither the United States nor Britain to intergenerational persistence levels close to Sweden's.

There is a concern that this result may come about because we failed to measure education in enough detail, but controlling for national-specific, detailed educational variables and, in addition, for cognitive ability/test results, does not change the main story. Thus, the big difference between our countries lies in the processes that push children of more advantaged family origins to more rewarded jobs than their less fortunate peers with similar education and ability—in the United States and Britain, this is much more common than in Sweden. Thus, the optimistic view of the United States as a country that has come some way from ascription toward achievement, famously heralded by [Blau and](#)

Duncan (1967) and Bell (1973), is clearly challenged when studying recent income mobility: not only is the level of income persistence high, the process behind it—following their terminology—largely ascriptive, or non-meritocratic.

A particular advantage of our analyses is that we could verify that the inter-nation differences in the strength and form of income persistence hold both when using elasticities and rank correlations. Thus, changes in income inequality across generations play a limited role for our results—in fact, they are reducing country differences measured as elasticities because the growth in inequality was greatest in Sweden across the generations we study, as inequality was high in the United States and Britain already in the parent generation.

As a caveat to our results, there is as yet no survey dataset suitable for studying income mobility that does not suffer from potential measurement error, particularly when it comes to panel attrition and other forms of missingness. While our examinations of missing cases convinced us that our results would stand the test of better data, the finer details will certainly need corroboration by further studies.

Our analyses concern earnings for men. The intergenerational association is generally found to be lower for daughters than for sons (e.g., Chadwick and Solon 2002), but with similar patterns across countries (Jäntti et al. 2006). It is difficult to predict whether the cross-country differences in the mediating role of education that we observe would be similar for women, as this depends on, *inter alia*, country differences in educational distributions by gender and parental income, as well as differences in patterns of female labor participation and gender wage gaps. These are complex but important issues to explore in future research.

As mentioned, our income coefficients should not be given a causal interpretation. Both the education-mediated and the “direct” part can reflect unobserved factors associated with both family income and sons’ earnings. In the Swedish case, more than half of the estimated effect of family income on children’s earnings can be accounted for by other parental characteristics such as class and education (Mood 2017), so the associations we observe should be seen as capturing effects of family background more broadly. To the extent that factors such as parental education and social class are related to sons’ earnings *net of parental income*, the income coefficient underestimates overall persistence in advantage. In Sweden, the overlap between income and social class mobility is around 50 percent (Breen, Mood, and Jonsson 2016), and using either parental income or class in predicting sons’ earnings underestimates the impact of parental background on earnings with around 25 percent (Mood 2017). Estimating more comprehensive models in a comparative framework, which requires larger samples than have been available to us, is a natural next step for improving our understanding of intergenerational processes.

## Discussion

How can we explain our finding that the large inter-nation differences in income persistence primarily stem from the part that is unmediated by children’s

education? Because the association need not reflect a causal effect of parental income, we must consider a broad range of potential mechanisms. One is occupational inheritance, which could lead to intergenerational similarities in income even net of education and ability, but the available evidence suggests that the United States is not much different from Sweden in this respect (Jonsson et al. 2009). Another strand of research has noted that the income persistence across generations is partly based on non-cognitive characteristics (cf. Bowles, Gintis, and Osborn Graves 2005). However, results for both Britain (Blanden, Gregg, and Macmillan 2007) and Sweden (Mood, Jonsson, and Bihangen 2012) suggest that such characteristics do not account for more than around 10 percent of income persistence in sons, and could hardly explain much of the differences across countries.

A more conventional type of explanation would focus on the use of family resources for improving sons' labor market chances via social networks, for example by the hiring of offspring in the firm in which a parent works (Bingley, Corak, and Westergård-Nielsen 2012). But why would such social network effects be more important in the United States and Britain than in Sweden? One potential reason could be that public sector employment, where recruitment processes tend to be more meritocratic (Hällsten 2013), is more common in Sweden; another that residential and school segregation—possibly most extreme in the United States—could provide children of disadvantaged origins with very limited social contacts, or perhaps few inroads at all into the labor market (cf. Wilson 1996).<sup>10</sup>

It is tempting to invoke a welfare state or general equality explanation for the outlier position of Sweden in our results, but it is less obvious how such explanations would make intelligible the crucial part of the income persistence that is net of education and ability. Because the poor in Sweden have a high absolute living standard in a comparative perspective (Eurostat 2016), partly because of more generous benefits in kind, it is perhaps possible that young people of disadvantaged background are not immediately forced into dead-end jobs to the same extent in Sweden as in Britain and the United States, and thus that they can maintain an income career more on par with their peers with the same educational credentials but from richer families.<sup>11</sup>

Finally, we return to the issue of inequality and “meritocratic selection.” Some of the partial association between family income and sons' earnings, controlling for education and ability (O.D.E)—often referred to as “non-meritocratic” or “ascriptive”—may reflect processes that most would see as legitimate, such as genetic transmission of non-cognitive abilities and parent-child socialization that is not dependent on budget restrictions (Swift 2005). However, even if not the entire intergenerational income association represents inequality as we normally understand the concept (Roemer 1998), we believe that there is little reason to expect such “ascriptive” factors to differ between our countries. The United States and Britain could certainly move some distance toward the Swedish level of ascription without intruding into family life (and probably much further). Our results have shown that education, albeit not unimportant, is hardly a sufficient vehicle for such equalization—family circumstances, either

in terms of income, or correlated with it, promote children's labor market chances in other ways too.

## Notes

1. It should be said that social class mobility analyses have had other aims than studying inequality of opportunity (cf. [Erikson and Goldthorpe 1992](#)), but over time it has become more and more common to address this issue with these rather blunt tools.
2. The rank correlation functions much like the log-odds and loglinear models, which control for the (parent-child) marginal distributions of occupations or classes in social mobility research (e.g., [Goodman 1979](#)). We also calculated Pearson's  $r$ , and the results were very similar.
3. For the United States, the PSID satisfies (1) and (3) but not (2) with sufficient sample size; the National Longitudinal Study (NLS) 1966 fails all these criteria; for Britain, the National Child Development Study (NCDS) fails (1).
4. These procedures are standard and of high quality; they are possible because all Swedish registers contain the same personal identifier. The matching was done by Statistics Sweden following approval from a vetting board. All analyses were done via Statistics Sweden's secure micro-data online system on anonymized data.
5. Analysis of work patterns for the individuals dropped from our sample in these countries suggests that these people spend the majority of the year out of work in the year that earnings are reported and so are assumed to be similar to the individuals missing from the British sample.
6. Although extensive, our educational measures do not pick up quality or status differences between schools. As the private school sector is more significant in both the United States and Britain, status or quality differences between schools may be more pronounced there than in Sweden. However, results from both Britain and the United States suggest that the field of study (included in our models) matters far more for earnings than attending a high-status education institution ([Sullivan 2015](#); [Thomas and Zhang 2005](#)).
7. To assess the robustness of this assumption for the British case, we estimated the measurement error in male earnings for those of similar ages and cohorts as the fathers in BCS, using the Annual Survey of Household Earnings. Assuming classical measurement error, the elasticity using earnings at child ages 10 and 16 would be 80 percent of the one using a full childhood measure, which is supportive of using the Swedish 81 percent for rescaling. See [Gregg, Macmillan, and Vittori \(2016, appendix\)](#) for full details.
8. The estimated rank correlation (and also Pearson's  $r$ ) of around 0.4 for men in the United States is very close to the figure for intergenerational occupational correlations reported for white men aged 35–44 in various US datasets ([Hauser et al. 2000, table 8.5](#)).
9. The association between parental income and child education can be affected by measurement error in a similar way as the elasticity, meaning that the estimates in table 4 are most likely downwardly biased (and slightly more so for the United States, as income is averaged at 16/17 instead of 10/16). This does not pose a problem for the decomposition if the measurement errors in the income-education association are symmetrical to the ones in the income-earnings association. Using the Swedish data, we find that the part of the elasticity that is mediated by education is



slightly more biased by measurement error than the rest of the elasticity. We therefore carry out the decomposition as outlined in equations (3) to (5), but we adjust for the asymmetry in measurement errors (which makes little difference to the results). We scale up the through-education paths slightly (by around 10 percent in all countries, at the cost of the non-education path) to compensate for the estimated difference in measurement error bias. The components sum to the overall scaled elasticity (or rank correlation).

10. A suggestion sometimes raised is that the results for the United States are due to its purportedly more heterogeneous population in terms of “race.” After testing this, we conclude that the race composition does not explain our cross-national differences. In a study of racial differences in intergenerational persistence on US NLSY data, [Bloom and Western \(2011, table 6\)](#) show that both the intergenerational elasticity and the mediating function of educational attainment are almost exactly the same for blacks and whites.
11. Studies in social mobility suggest that higher education could act as an equalizer by dampening origin effects ([Breen and Jonsson 2007](#); [Hout 1988](#); [Torche 2011](#)). To study this, we fitted interactions between family origin income and respondents’ level of education (also controlling for ability) on son’s income, but the US and British data are too sparse to base any conclusions on. The Swedish data suggest no or little interaction, however.

## Appendix

**Table A1. Comparison of ISCED levels across countries for the four-category classification of respondents’ educational qualifications**

	US	Britain	Sweden
Drop out/<O-level/ comprehensive	1	1	1, 2
HS graduate/O-level/ short upper second	2, 3c) short	2, 3c) short	3c) short
Associates/A-levels/ long upper, short post	3a, 3b, 3c long, 4, 5b	3a, 3b, 3c long, 4, 5b	3a, 3b, 3c) long, 4, 5b
Bachelors/university qualification	5a, 6	5a, 6	5a, 6

**Table A2. Summary statistics for extended measures of sons' educational qualification level in the US, Britain, and Sweden for our sample of parent-son pairs**

Country	US	Britain	Sweden
	1957–65	1970	1965
Birth cohort			
Highest educational level/ field of son in US/Britain / Sweden	Percent		
Drop out/<O-level/comprehensive	7.2	5.5	12.0
GED/NVQ Level 1/Upper secondary dropout	2.5	13.7	2.8
HS graduate/O-level/short upper secondary	30.9	33.9	40.8
Some 2 year college/A levels /long upper secondary	10.6	8.6	17.5
Some 4 year college/tertiary no degree/tertiary no degree	10.3		4.1
Associates/NVQ Level 4/tertiary, semi- or lower professional	6.3	3.2	9.9
Bachelors – no field	0.5	3.7	
Bachelor field: Law, medicine or economics	0.9	2.0	4.0
Bachelor field: Social Science	11.5	4.6	1.8
Bachelor field: Science	8.1	6.3	4.8
Bachelor field: Humanities	2.0	2.0	0.5
Bachelor field: Other	0.3	1.5	0.1
Postgraduate	3.4	6.2	1.5
Missing education data	5.8	9.0	0.1
Total	100	100	100
Number of O levels A*-C		3.1	
Number of A levels		0.81	
Percentile cognitive test	51.2	50.5	50.8
N	985	1,332	49,482

**Notes:**

1. **Sources:** Authors' calculations based on NLSY79 (US), BCS70 (Britain) and Swedish population registers, 1965 cohort. Sample weights are used in the US for the representative cross-sectional sample.
2. For Sweden education is the highest education recorded 1990–2007. In the US and Britain, education is the highest education recorded in 1988 and 1996 respectively.
3. Across all three sources the sample consists of those with valid observation of parental income at two periods in childhood (16/17 US, 10/16 Britain/Sweden) and earnings at age 39/42.
4. Excluded from the sample are observations with self-employed sons or zero parental incomes, sons in the bottom 2% of earnings (US and Sweden) and sons in the top 2% of earnings (US).
5. Incomes and earnings above 4 standard deviations are top-coded in Sweden.

**Table A3. Wage returns to highest extended educational level for sons in the US, Britain, and Sweden**

	US	Britain	Sweden
<b>Model 2: Extended education measures (US/Britain/Swe)</b>			
Drop out/<O-level/comprehensive	-1.131 (.207)	-0.630 (.122)	-0.673 (.013)
GED/NVQ Level 1/Upper second dropout	-1.079 (.227)	-0.502 (.114)	-0.774 (.017)
HS graduate/O-level/short upper secondary	-0.917 (.197)	-0.383 (.109)	-0.568 (.012)
Some 2 year college/A levels /long upper second	-0.816 (.202)	-0.510 (.111)	-0.356 (.012)
Some 4 year college/tertiary no degree	-0.635 (.202)		-0.561 (.015)
Associates/NVQ Level 4/tertiary, semi- or lower professional	-0.754 (.207)	-0.200 (.129)	-0.400 (.013)
Bachelors/university qualification/ bachelor – no field	-0.226 (.331)	-0.228 (.126)	
Bachelor field: Law, medicine or economics	Base	Base	Base
Bachelor field: Social Science	-0.510 (.200)	-0.061 (.119)	-0.461 (.020)
Bachelor field: Science	-0.316 (.204)	-0.096 (.114)	-0.066 (.015)
Bachelor field: Humanities	-0.480 (.234)	-0.502 (.141)	-0.709 (.032)
Bachelor field: Other	-0.731 (.408)	-0.350 (.151)	-0.439 (.058)
Postgraduate	-0.072 (.219)	-0.267 (.113)	-0.180 (.021)
Number of O levels A*-C		0.025 (.005)	
Number of A levels		0.056 (.016)	
<b>Model 3: Including cognitive tests (US/Britain/Swe)</b>			
Drop out/<O-level/comprehensive	-0.837 (.211)	-0.556 (.123)	-0.566 (.013)
GED/NVQ Level 1/Upper second dropout	-0.838 (.227)	-0.448 (.115)	-0.697 (.017)
HS graduate/O-level/short upper secondary	-0.703 (.197)	-0.355 (.109)	-0.485 (.012)
Some 2 year college/A levels /long upper secondary	-0.685 (.200)	-0.505 (.111)	-0.330 (.012)
Some 4 year college/tertiary no degree	-0.522 (.200)		-0.537 (.015)
Associates/NVQ Level 4/tertiary, semi- or lower professional	-0.630 (.205)	-0.197 (.129)	-0.366 (.013)
Bachelors/university qualification/ bachelor – no field	-0.201 (.326)	-0.209 (.126)	
Bachelor field: Law, medicine or economics	Base	Base	Base

*(Continued)*

**Table A3. continued**

	US	Britain	Sweden
Bachelor field: Social Science	-0.457 (.198)	-0.062 (.118)	-0.447 (.020)
Bachelor field: Science	-0.296 (.201)	-0.088 (.113)	-0.069 (.015)
Bachelor field: Humanities	-0.416 (.231)	-0.507 (.140)	-0.703 (.032)
Bachelor field: Other	-0.711 (.402)	-0.342 (.150)	-0.432 (.058)
Postgraduate	-0.075 (.215)	-0.278 (.113)	-0.191 (.021)
Number of O levels A*-C		0.019 (.005)	
Number of A levels		0.054 (.016)	
Percentile cognitive test	0.501 (.090)	0.231 (.064)	0.225 (.010)
N	985	1,332	49,482

**Notes:**

1. **Sources:** Authors' calculations based on NLSY79 (US), BCS70 (Britain) and Swedish population registers, 1965 cohort. Sample weights are used in the US for the representative cross-sectional sample.
2. Coefficients from a regression of ln monthly earnings of sons' at 39/42 on highest education level dummies for sons and ln monthly average family income in childhood. Standard errors in parentheses.
3. A missing dummy is included for missing sons' education (not shown in table).
4. Family income averaged over age 10 and 16 in British data; 16 and 17 in US data; 10 and 16 in Swedish data.
5. Across all three sources the sample consists of those with valid observation of parental income at two periods in childhood (16/17 US, 10/16 Britain/Sweden) and earnings at age 39/42.
6. For Sweden education is the highest education recorded 1990–2007. In the US and Britain, education is the highest education recorded in 1988 and 1996 respectively.
7. Excluded from the sample are observations with self-employed sons or zero parental incomes, sons in the bottom 2% of earnings (US and Sweden) and sons in the top 2% of earnings (US).
8. Incomes and earnings above 4 standard deviations are top-coded in Sweden.

**Table A4. Family income gradients in extended measures of education for sons in the US, Britain and Sweden**

Educational level/field (US/Britain/Swe)	US	Britain	Sweden
Drop out/<O-level/comprehensive	-0.092 (.015)	-0.068 (.014)	-0.106 (.004)
GED/NVQ Level 1/Upper second dropout	-0.017 (.009)	-0.119 (.021)	-0.021 (.002)
HS graduate/O-level/short upper secondary	-0.101 (.028)	-0.046 (.030)	-0.207 (.005)
Some 2 year college/A levels /long upper secondary	-0.010 (.019)	0.035 (.018)	0.086 (.004)
Some 4 year college/tertiary no degree	-0.005 (.019)		0.020 (.002)
Associates/NVQ Level 4/tertiary, semi- or lower professional	0.028 (.015)	0.010 (.011)	0.039 (.003)
Bachelors/university qualification/ bachelor – no field	0.001 (.004)	0.015 (.012)	0.068 (.002)
Bachelor field: Law, medicine or economics	0.009 (.005)	0.025 (.009)	0.016 (.001)
Bachelor field: Social Science	0.103 (.019)	0.052 (.013)	0.075 (.002)
Bachelor field: Science	0.034 (.016)	0.042 (.015)	0.004 (.001)
Bachelor field: Humanities	0.017 (.008)	0.029 (.009)	0.001 (.000)
Bachelor field: Other	0.002 (.003)	0.023 (.007)	
Postgraduate	0.030 (.011)	0.072 (.015)	0.025 (.001)
Number of O levels A*-C		2.352 (.219)	
Number of A levels		0.637 (.074)	
Percentile cognitive test	0.168 (.016)	0.153 (.017)	0.161 (.003)
N	985	1,332	49,482

**Notes:**

- Sources:** Authors' calculations based on NLSY79 (US), BCS70 (Britain) and Swedish population registers, 1965 cohort. Sample weights are used in the US for the representative cross-sectional sample.
- Income gradients from separate bivariate regressions of categorical education dummies on family income in childhood. The base category is therefore all other education categories. Coefficients show the effects of doubling family incomes on attaining one educational qualification rather than any other. Standard errors in parentheses.
- Family income averaged over age 10 and 16 in British data; 16 and 17 in US data; 10 and 16 in Swedish data.
- For Sweden education is the highest education recorded 1990–2007. In the US and Britain, education is the highest education recorded in 1988 and 1996 respectively.
- Sample restricted to those with earnings at 39/42 and parental income observed at child ages 10 and 16 (Sweden, Britain) or 16 and 17 (US).
- Excluded from the sample are observations with self-employed sons or zero parental incomes, sons in the bottom 2% of earnings (US and Sweden) and sons in the top 2% of earnings (US).
- Incomes and earnings above 4 standard deviations are top-coded in Sweden.

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## Supplementary Material

Supplementary material is available at *Social Forces* online, <http://sf.oxfordjournals.org/>.

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