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How Much Scope for a Mobility Paradox? The Relationship between Social and Income Mobility in Sweden

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Abstract: It is often pointed out that conclusions about intergenerational (parent–child) mobility can differ depending on whether we base them on studies of class or income. We analyze empirically the degree of overlap in income and social mobility; we demonstrate mathematically the nature of their relationship; and we show, using simulations, how intergenerational income correlations relate to relative social mobility rates. Analyzing Swedish longitudinal register data on the incomes and occupations of over 300,000 parent–child pairs, we find that social mobility accounts for up to 49 percent of the observed intergenerational income correlations. This figure is somewhat greater for a fine-graded micro-class classification than a five-class schema and somewhat greater for women than men. There is a positive relationship between intergenerational social fluidity and income correlations, but it is relatively weak. Our empirical results, and our simulations verify that the overlap between income mobility and social mobility leaves ample room for the two indicators to move in different directions over time or show diverse patterns across countries. We explain the circumstances in which income and social mobility will change together or co-vary positively and the circumstances in which they will diverge.

Keywords: social mobility; class mobility; income inequality; stratification; intergenerational processes; intergenerational mobility

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INTERGENERATIONAL mobility is a topic studied by both sociologists and economists, with the latter focusing on income or earnings mobility (see reviews by Björklund and Jäntti 2009; Black and Devereux 2011) and the former on occupational or class mobility (reviewed by Breen and Jonsson 2005). When societies are ranked according to the extent of their economic and social intergenerational mobility we see a good deal of agreement, with the Scandinavian countries displaying high rates of income mobility and high relative social mobility—or social fluidity[1]—and countries such as Britain, Italy and Germany somewhat lower levels of both (see Breen 2004 for data on social mobility; Corak 2004 and Björklund and Jäntti 2009 for income mobility; and Blanden 2013 for international comparisons of both). However, there seems to be no consistent relationship between the two forms of mobility. For example, U. S. social fluidity is usually found to be relatively high and similar to that of Sweden and the Netherlands (Beller and Hout 2006, Ferrie 2005; cf. Erikson and Goldthorpe 1985) yet the United States has one of the highest intergenerational income elasticities (and thus the lowest mobility) among the OECD countries (Solon 1992; Zimmerman 1992; Mazumder 2005; Gregg et al. 2013). China may be a similar contradictory case, having a very high intergenerational

elasticity of income (Gong, Leigh and Meng 2010) yet high social fluidity (Ishida and Miwa 2012).

One strand of the literature holds that income and social mobility simply capture different phenomena. Björklund and Jäntti (2000:22), for example, write that, "from a purely conceptual point of view, . . . class and income . . . are obviously different aspects of a person's position in society. Hence, we ought to treat these . . . branches of mobility analysis as complementary." Erikson and Goldthorpe (2010:212) take the same position: "intergenerational income mobility and intergenerational class mobility are of course different phenomena, and there is no *a priori* reason why they should change in tandem." However, it is not difficult to find a different view of the relationship between income and social mobility, according to which they are both indicators of a fundamental underlying inequality dynamic—such as the intergenerational reproduction of advantage and disadvantage—which is often taken to reflect inequality of opportunity or societal openness (e.g. , Erikson and Goldthorpe 1992). In this view, the ideal objects of analysis—class position, in the case of sociologists, and lifetime income for economists—claim to capture variations in life chances; that is 'the chances an individual has of sharing in the socially created economic or cultural "goods" which typically exist in any given society' (Giddens 1973:130–1). As Blanden, Gregg and Macmillan (2013:542) state, in their comparison of social and economic mobility trends in the United Kingdom, "The view that we adopt here is that both are trying to assess long-term or permanent socioeconomic status but measure it in different ways." Here discrepancies, such as that found in the case of the United States, have to be explained in terms of differences in the empirical operationalization of the two forms of mobility.

Whether we accept the idea that the two ways of studying intergenerational associations embody something common or take the view that they are different, the fundamental question is the same: how are income and social mobility related, both formally and empirically? Are they so closely related that divergent trends over time, or differences in country rankings, should be seen as paradoxes, or are they so disconnected that viewing them as two indicators of a common phenomenon is likely to be entirely off the mark?

Our first contribution is to address this issue by analyzing the empirical relationship between income and social mobility using uniquely suitable population data from Sweden that allow us to model the two processes simultaneously and estimate the intergenerational associations with great precision. In doing so, we follow both common practice and economic theories to design income mobility models. For social mobility, we use the internationally well known Erikson-Goldthorpe (EGP) social class schema (Erikson and Goldthorpe 1992) as well as the more detailed occupational, or "micro-class", schema to model social class mobility (Grusky and Sorensen 1998). Starting from a framework developed by Björklund and Jäntti (2000), Blanden (2013), and Blanden et al. (2013), we ask how much of the income correlations across generations could be accounted for by social mobility, and we estimate the degree of overlap between income and social class mobility to be 30–50 percent. [2] We show this overlap not only for the conventionally reported father-to-son association, but take a step further by also studying the impact of mothers and the outcomes of daughters.

Our second contribution is to extend this model mathematically in one important respect, by also considering relative (and not only absolute) social mobility rates. Through the use of simulations we can show that, given the way in which sociologists and economists empirically operationalize and analyze mobility, there is no reason to expect the relationship between the two approaches to be particularly close. [3]

Intergenerational Mobility

Social Mobility

The study of intergenerational social class mobility has been a mainstay of sociological research at least since the 1950s (Carlsson 1958; Featherman and Hauser 1978; Erikson and Goldthorpe 1992; Breen 2004). Since the 1980s, mobility tables have normally been analyzed using loglinear models, for which the basic datum is a table whose cells contain the frequencies in each combination of parent's and respondent's class, usually called origin and destination classes (Hout 1983; Sobel, Hout, and Duncan 1985). A distinction is made between absolute mobility, which is the pattern of flows from origins to destinations that can be observed in the mobility table, and relative mobility or social fluidity captured by odds ratios. These are the ratio of the odds, among respondents born into one class origin, compared with those born into another, of coming to occupy one social class destination rather than another. Odds ratios are said to be "margin invariant" because they are unchanged under the multiplication of any row or column of the mobility table by a scalar, permitting comparisons among tables which may have different marginal distributions.

A log-linear model for the mobility table can be written:

$$\log F_{ij} = \lambda + \lambda_i + \lambda_j + \lambda_{ij} \tag{1}$$

where F_{ij} denotes the expected (under the model) frequency in the ij$^{\text{th}}$ cell of the table, where $i = 1, \ldots, I$ indexes origins and $j = 1, \ldots, J$ indexes destinations. The origin and destination (or row and column) main effects are given by λ_i and λ_j, and the origin–destination association parameters are denoted λ_{ij}. Odds ratios in the table are functions of λ_{ij} and not of the other parameters in (1).

There is general agreement on the ranking of countries in terms of their social fluidity. Sweden, the Netherlands, and Israel belong to the group of more socially fluid countries, while Germany, Italy, and Ireland are characterized by a low level of fluidity (Breen and Luijkx 2004). Though comparisons are not straightforward (mainly because of the difficulties of deriving, from US occupational codes, a class classification comparable to the Erikson-Goldthorpe schema used in most comparative research), it seems that the United States is characterized by high social fluidity (Breen and Jonsson 2005), not far off the Swedish figure (Jonsson et al. 2009).

Income Mobility

The study of intergenerational income mobility is a rapidly growing research area within economics (for important contributions, see Atkinson 1983; Solon 1992; Zimmerman 1992; Corak 2004). It focuses on the parent–child (usually father–son) correlation or elasticity of income or earnings. Normally, researchers relate the child's income as an adult to his or her parent's income using a regression model:

$$\log(y_{ic}) = \alpha + \beta \log(y_{ip}) + \epsilon_i. \quad (2)$$

Here i denotes a family (a parent–child pair), y_{ip} is parental income and y_{ic} is child's income. The average log income among children is captured in α, while β, the regression coefficient, estimates the intergenerational elasticity of incomes. The error term, ϵ, is assumed independent of parental income. β can be interpreted as the fraction of the income differences among parents that are transmitted to children. An intergenerational elasticity of around 03 means that almost a third of the income differences of two randomly chosen parents in a population will on average, be found among their children. This representation of intergenerational mobility is a summary measure and as such suffers from the typical weaknesses of summary measures, but it can be made more complex by including non-linearities (e.g., Bratsberg et al. 2007). However, precisely because the elasticity is a summary indicator it is very useful for assessing differences between countries. In general terms it seems income mobility is higher in the Nordic countries and in Canada than in the Unites States, the United Kingdom, Germany, France, and Italy—though several of the estimates reported in the international literature are surrounded by large standard errors.

A minimum requirement for this kind of analysis is data on a parent and his or her child's income, and such data are difficult to obtain, and, even when available, usually relate to different age-ranges of the parents and children. Because incomes typically increase with age, in particular for those in higher social positions, it is usual to add age and the square of age to the specification of equation (2). Furthermore, economists ideally seek to measure "permanent or "lifetime" income and for this many years' income data are necessary in order to average out transitory income components. Early estimates of income mobility in the United States reported an elasticity lower than 0.20, but later studies, using more years of parental income, yielded estimates around 0.40 (Solon 1992; Zimmerman 1992). Mazumder (2005) using very long-run measures of parental earnings, claimed that US elasticity could be as high as 0.6, a result also arrived at by Gregg et al. (2013) when correcting the U.S. elasticity for measurement error.

Sociologists who study social mobility are most often interested in the underlying association between parents' and children's class in the mobility table, controlling for the different marginal distributions of origins and destinations (i.e., structural differences between parents' and children's class distributions). But it is uncommon to find a similar approach among economists. The elasticity depends on both the correlation between parents' and children's (log) incomes and the ratio of the standard deviations of each. If we believe that the former captures the underlying parent–child income association, we can transform the elasticity into

a correlation by multiplying it by the ratio of the standard deviation of the log of parent's income, σ_p to the standard deviation of child's log income, σ_c:

$$r = \beta \frac{\sigma_p}{\sigma_c}, \tag{3}$$

so giving a measure more in line with the sociologists' use of odds ratios. Because it is not yet common practice to report intergenerational income correlations, we are uncertain about differences between countries or trends over time in the intergenerational correlation. For Sweden, however, Jonsson, Mood and Bihagen (2010) showed that the intergenerational household income correlation decreased for 33–37-year-olds during the period 1993–2007, while the elasticities increased, thus demonstrating the advisability of considering both types of income associations.

The Mathematical Relationship between Income Mobility and Social Mobility

A reviewer of the literatures in social and income mobility could not fail to be struck by the very limited degree to which they engage each other. Some commentators have certainly drawn attention to parallel findings in the two literatures (Sweden and Scandinavia most fluid) and to some striking discrepancies of which the United States provides a good example. Björklund and Jäntti (2000) sought to reconcile economic and social mobility by expressing the relationship between them in a simple model of how much of the intergenerational income correlation is mediated via intergenerational social mobility (or persistence). Here we follow their exposition.

Write income in each generation as a function of social class and a residual term:

$$y_{ip} = \bar{y}_p + \sum_j b_{jp} x_{ijp} + e_{ip} \tag{4}$$

for one or both parents (most often the father), and

$$y_{ic} = \bar{y}_c + \sum_j b_{jc} x_{ijc} + e_{ic} \tag{5}$$

for the child. Here y is income,[4] j indexes social classes ($j = 1, \ldots J$), x_{ij} are dummy variables indicating which class is occupied, the b's capture mean income in each class expressed as the deviation from overall mean income, $\bar{y}_p$ and $\bar{y}_c$, and e is a residual term, uncorrelated with class,[5] which captures within-class variation in log income. It will be useful to write the coefficients in matrix form, so $\mathbf{b}p$ and $\mathbf{b}c$ are both $J \times 1$ vectors of mean income in each class measured as the deviations from the overall mean in the parent and child classes.

Björklund and Jäntti (2000) argued that the covariance between $y_{ip}$and y_{ic} could be expressed as the sum of two paths. The first path, proceeding via social class, is given by the product of the effects of class on income in each generation and the joint distribution of parent's and child's class: i.e., $\mathbf{b}'_p P(X_p X_c) \mathbf{b}_c$. This captures that part of the intergenerational covariance in income due to intergenerational

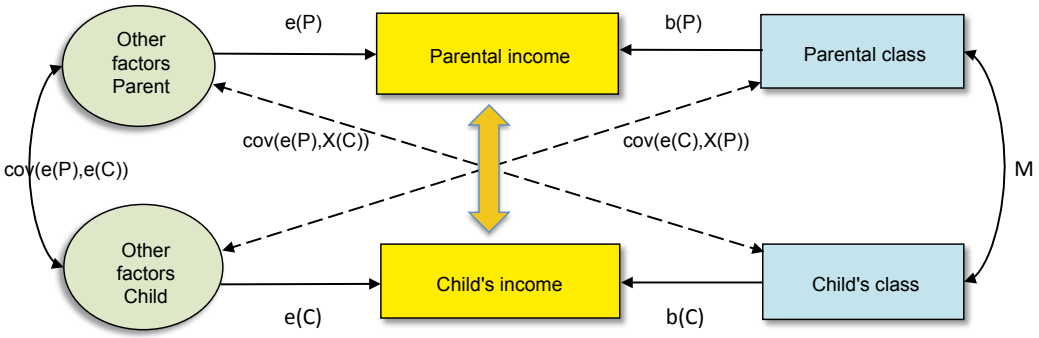

Figure 1: The Income and Social Mobility Process

class mobility. The second path is equal to $\text{cov}(e_p e_c)$ and captures the impact of the transmission of factors other than class. Björklund and Jäntti's insight, however, was to see that $P(X_p X_c)$ is the mobility table; that is, the cross-tabulation of parent's by child's class, albeit normed by dividing the frequencies of the table by the sample size. So we now write $M \equiv P(X_p X_c)$ for notational convenience.

Blanden et al. (2013) pointed out, however, that these two paths are not exhaustive of the ways in which parental and child incomes may be linked. There may be covariances between, on the one hand, the residual term in the parent's equation and child's class position, which establishes a path between parent's and child's income equal to $\text{cov}(e_p X_c)\mathbf{b}_c$, and between the residual from the child's equation and parental class, giving rise to the path $\text{cov}(e_c X_b)\mathbf{b}_p$.

Figure 1 presents the resulting model of the relationship between income and class mobility, with parental characteristics in the upper part and filial in the lower. The thick vertical arrow represents the intergenerational covariance of incomes: our goal is to explain how intergenerational class mobility contributes to generating this covariance. On the right side of the figure we see the arrow linking parent's and child's class and on the left side the covariance between the error terms of equations (4) and (5). The elements added by Blanden et al (2013) are shown by the diagonal lines linking parent and child, and they allow for the possibility that factors independent of parent's class but related to parent's income are correlated with child's class position, and that parent's class is correlated with other child factors, independent of child's class, that influence child's income. We could think of a number of characteristics that we do not observe in normal mobility studies that exemplify these diagonal links. The variation within classes in educational qualifications, skills, and abilities are obvious examples and, when such characteristics are measured (mostly at the child level, where data are more readily available), they account for some—but not all—of the intergenerational income correlation (Blanden, Gregg, and Macmillan 2007; Mood et al. 2012). In many traditional studies using only information on fathers, the error term on the parental side will of course include those characteristics of mothers that are unrelated to father's class but related to his income.

One of the clearest examples of a factor that is captured in e, and thus influences the variation in income within a social class, is occupation. Although classes are, for the most part, aggregates of occupations, we do not expect all occupations within a class to have the same average income, and, if there is a relationship between parent and child occupations beyond that captured by class, this will appear as part of the covariance of residual terms, $\text{cov}(e_p e_c)$. Following the graphical representation in Figure 1, the covariance between parents' and child's income decomposes fully into these four paths:

$$\text{cov}(Y_p Y_c) = \mathbf{b}_p' M \mathbf{b}_c + \text{cov}(e_p e_c) + \mathbf{b}_c' \text{cov}(e_p X_c) + \mathbf{b}_p' \text{cov}(e_c X_p). \tag{6}$$

From this we can derive the regression coefficient (for parent's income on son's income) as

$$\beta = \frac{\text{cov}(Y_p Y_c)}{\sigma_p^2}, \tag{7}$$

where σ_p^2 is the variance of parent's income; and the intergenerational correlation,

$$r(Y_p Y_c) = \frac{\text{cov}(Y_p Y_c)}{\sigma_p \sigma_c}, \tag{8}$$

where σ_c is the standard deviation of child's income.

If we were using logged income, equation (7) would be the intergenerational income elasticity. As noted earlier, in order to compare social mobility with income mobility we focus not on the regression of child's income on parent's income but on their correlation. The part of the intergenerational income correlation due to social mobility is

$$\frac{\mathbf{b}_p' M \mathbf{b}_c}{\sigma_p \sigma_c}. \tag{9}$$

The Case of Sweden

The Swedish case is a valuable one to consider. Studies of social mobility have found that in Sweden class origins are more weakly related to class destinations than in most other countries (Erikson and Goldthorpe 1992; Breen 2004) and there has been a fairly lengthy period during which the impact of origins on destinations has steadily weakened (Erikson 1983; Breen and Jonsson 2007). Furthermore, Sweden, alongside the other Scandinavian countries, is known to have an egalitarian distribution of income and its intergenerational income elasticity is low compared with other OECD countries (see the review by Björklund and Jäntti 2009). Among sociologists, Sweden's distinctive mobility regime is often attributed to egalitarian policies, many of which should affect economic as well as social mobility; these include progressive taxation and redistribution, generous welfare state provision, and active labor market policies (Esping Andersen 1990; Korpi and Palme 2004). Nevertheless, Sweden is representative in that it shows a similar pattern of mobility to other modern welfare states (Erikson and Goldthorpe 1992; Jonsson et al. 2009) and we find no *a priori* reason to believe that the overlap between social mobility

and income mobility should be much different from what we expect from other European countries.

Although there are good substantive grounds for choosing Sweden as a test case, there is also a practical reason: there are very few, if any, data sets in the world outside of the Scandinavian countries that can provide similarly high quality data and a sufficiently large sample for the kind of simultaneous analysis of social and economic intergenerational mobility that we undertake.

Data and Variables

We estimate economic and social mobility, and the individual components of equation (6), using data from official Swedish registers, primarily tax registers and censuses, kept by Statistics Sweden for the Swedish Institute for Social Research. To address different aspects of the intergenerational associations, we use not only income and social class for fathers (as is common in the literature) but also family income and the dominant class in the parental generation (the dominant class here defined as the higher of father's and mother's class). Daughters and sons are analyzed separately, and their outcomes are studied in terms of social class and both personal and family income. We selected children born 1948–52 and, through a unique personal multi-generational identifier we added information on their parents, giving us data on around 300,000 father–child pairs (the exact number of observations varies between the analyses depending on the combination of income and class variables).[6]

We use two income measures: *personal (own) employment income*, defined as the sum of pre-tax income from business, employment and work-related benefits; and *disposable family income*, defined as the sum of the family's employment and benefit incomes after the deduction of taxes. We take the average of parents' yearly incomes in 1968–1972[7] and the average of the child's incomes in 1988–92 (when their ages ranged from 36–40 in 1988 to 40–45 in 1992). These years are chosen because their midpoints are the censuses of 1970 and 1990, respectively, from which we draw occupational information. For parental disposable family income we take the average of mother's and father's incomes (including cases where the mother and father do not live together). We use income spells only if at least three out of five of these years were non-missing. Income is top-coded for incomes four or more standard deviations above the mean (this affects one percent of sons in each cohort and three percent of their fathers), and years with zero or negative incomes have been coded missing. We also exclude those who are reported as self-employed in any of the censuses, as their registered incomes are less reliable indicators of actual living standards.

Occupation is measured by information from the censuses in 1970 (for parents) and 1990 (for children), coded according to the Swedish standard classification, NYK (Statistics Sweden 1989). These data are used to construct classes in two different degrees of aggregation. The first is a "big-class" scheme, closely related to the EGP class schema. Because we omit the self-employed and farmers from our analyses, the usual seven EGP classes are reduced to five, and these are described in the note at the foot of Table 1 (the Roman numerals refer to the EGP classes.)[8]

The second class schema is built on occupations, or "micro-classes," defined as occupational categories that share common features in the technical-functional division of labour, including skill requirements, training, and working conditions (Grusky 2005). We define 77 micro-classes, based on the coding algorithm presented in Jonsson et al. (2009; see Table A2 in the appendix), and described at www.classmobility.org[9] We expect the occupational groupings to pick up income variation within big classes, thus shedding light on what the maximum overlap between social and economic mobility might be. Knowing the difference between the two class schemata in this respect is useful given that, in most normal (survey) data sets, it is not possible to use more than five to ten classes. For both class schemata, we use the individual's own class and also the family's dominant class, where dominant class is the class of the parent whose occupation has the higher status, using the Standard International Occupational Prestige Score (SIOPS) occupational scale for ranking (Ganzeboom and Treiman 1996).

Descriptives

Table 1 shows descriptive statistics. Panel A displays the distribution of class origins and destinations for father, mother, son, and daughter, and for the dominant origin and destination class distributions. Comparing fathers and sons, we see the well known upgrading of the class structure (here, between 1970 and 1990), with the upper middle class (I) expansion from nine to 21 percent and the corresponding decline of the working classes (VI and VII) from 59 to 44 percent. Comparing sons and daughters also brings out much of the gender inequality in modern labor markets, with women being concentrated in lower-grade manual (VII) and non-manual (III) jobs, and being much less represented in professional and managerial positions (I). But we also note the rapid upgrading of women's class positions when comparing daughters with their mothers. Mothers' labor market attachment in 1970 was still weak (43 percent had no recorded occupation) and dominated by unskilled manual work; this large discrepancy between mothers and daughters explains why we do not conduct mobility analysis between them. The distribution of dominant ("household") class origin is similar to that of father's class, but because we include the whole population here (some of whom grew up without a father), there are some small dissimilarities. The minor differences between sons' and daughters' household class distributions are due to the class destinations of single people.

Panel B shows, as an example of the social fluidity for our cohorts, the adjacent odds ratios from the father–son mobility table that cross-tabulates father's class in 1970 with son's class in 1990. The pattern of odds ratios will be familiar to students of intergenerational class mobility, with the largest values being on the (shaded) main diagonal, indicating the marked tendency for intergenerational class persistence.

Table 1: Descriptive statistics for intergenerational mobility

Panel A: Distribution of EGP origin and destination classes for children with valid value on own and father's class, and own and father's employment income

	Parents' class				Own class			
	Father 1970		Mother 1970		Son 1990		Daughter 1990	
EGP Class	N of cases	%	N of cases	%	N of cases	%	N of cases	%
I	26,442	9	3,786	1	33,502	21	1,7274	11
II	45,467	15	26,155	8	36,520	23	40,122	26
III	52,963	17	20,115	7	17,874	11	39,520	26
VI	96,996	31	5,492	2	35,407	23	15,720	10
VII	86,187	28	120,047	39	32,540	21	39,576	26
Missing			132,460	43				
Total	308,055	100	308,055	100	155,843	99	152,212	99

	Dominant class					
	Parents' 1970		Sons' 1990		Daughters' 1990	
EGP Class	N of cases	%	N of cases	%	N of cases	%
I	31,397	8	46,631	23	46,753	23
II	70,391	17	56,158	28	58,378	29
III	65,207	16	32,262	16	39,498	20
VI	99,266	24	36,491	18	27,676	14
VII	139,519	34	32,518	16	29,415	15
Total	405,780	99	204,060	101	201,720	101

Note: EGP classes: I=Upper middle class (professionals, higher administrative, executives), II=Middle class (semi-professionals [e.g., nurses], mid-level administrative, low-level managers), III=Routine non-manual (clerks, secretaries, office-workers), VI=skilled manual workers, VII=unskilled manual workers. Self-employed (classes IV) are not included in the analysis.

Panel B: Adjacent Odds Ratios in Intergenerational Class Mobility table

	Son's EGP class 1990			
Father's EGP class 1970	I vs II	II vs III	III vs VI	VI vs VII
Upper middle (I) vs Middle class (II)	1.69	1.03	1.47	0.77
Middle class (II) vs Routine non-manual (III)	1.27	1.23	1.43	0.92
Routine non-manual (III) vs Skilled manual (VI)	1.42	0.92	2.15	0.85
Skilled manual (VI) vs Unskilled manual (VII)	0.98	1.21	0.86	1.42

Panel C: Parents' and children's income in 2007 Swedish kronor (for children with valid value on own and father's class, and own and father's employment income)

Parents' income 1970	Mean	Median	Std dev	Min	Max	N of cases
Father, employment	250,955	213,342	140,988	1,775	106,1419	30,8055
Mother, employment	95,034	85,642	62,512	85	407,154	221,613
Household disposable	205,732	191,038	84,982	34,955	77,7606	308,000
Child's income 1990						
Son employment	274,810	254,450	97,907	3,636	68,7570	15,5843
Daughter, employment	180,887	175,615	65,648	1,267	671,995	152,212
Son household disp	31,8576	321,110	107,177	10,700	107,9791	155,842
Daughter, household disp	327,039	330,294	112,830	12,983	1,079,791	152,209

Notes: Zero-incomes and negative incomes not included. Incomes top-coded to maximum four standard deviations from the mean Exchange rates as of 2007 (July 1st): 10 SEK=1423 USD; 1061 Euro; 71 GBP.

Panel D: Age of parents and children (for children with valid value on own and father's class and own and father's employment income)

	Mean	Median	Std dev	Min	Max	N
Father's age 1970	51	50	6.2	28	75	308,055
Mother's age 1970	48	47	5.9	27	75	300,045
Child's age 199	40	40	1.4	38	42	308,055

Notes: 75 is the maximum age in the data. The very young minimum ages of parents are explained by adoptions.

Panel C of Table 1 shows the average and dispersion of parents' and children's incomes, with all amounts expressed in 2007 Swedish kronor (exchange rates in the note to the table). Real incomes have grown over time and, given the rapidly increasing labor market participation of women, this is especially so for household disposable incomes. Though income from employment reflects gender inequality favoring men, women, nevertheless, have slightly higher disposable household incomes (assuming a gender-neutral distribution within families). This is probably because single women tend to have higher levels of education than single men, and because women's spouses are usually older than men's.

Finally, panel D shows the descriptive statistics for age. Children's incomes are measured when they are around 40, but parents are about 10 years older, on average, when their incomes are measured, and they display much greater variation in age.

Results

There are several ways of conceiving of and defining the intergenerational income correlation. We use three specifications, derived from previous studies and existing theory. Our first specification focuses on the relationship between father's and child's own income from work and on father's and child's individual class. This is common practice in both the income and social mobility literature, where mother's and spouse's class or income are commonly ignored; we call this the *standard model*. Our second specification, which we call the *origin family model*, replaces father's work income and father's own class with a measure of disposable family income and a measure of class origins based on the dominant class position of father or mother, but it retains the individual work income and class for children. This model seeks to capture origins more fully by including the income and class position of both parents. It comes closest to the Becker and Tomes (1986) child investment model, which posits that it is the total economic resources in the household that influence children's educational and income opportunities.

Our third and last specification—the *gross model*—takes the origin family model and replaces the individual income and class measures of the child with his or her disposable family income and a dominance measure of class (based on whichever of the child or child's spouse's class is considered dominant). This gross model measures family, rather than individual, resources in both generations. As a consequence it captures not only the direct transmission of income from origin to destination family but also the effects of assortative mating in the child generation.

Applying these three specifications to samples of male and female respondents generates six income correlations, shown in Figure 2. The correlations are larger for men than for women. This finding, common in the literature on economic mobility (see Lee and Solon 2009) is, to some extent, a consequence of the gender gap in earnings that introduces a source of father–daughter economic mobility that has no counterpart in the father–son comparison.

For both sexes the correlations are greatest in the standard model and weakest in the gross model. The latter result is expected, given that the gross model includes the impact of spouse's income, which, despite the tendency towards assortative

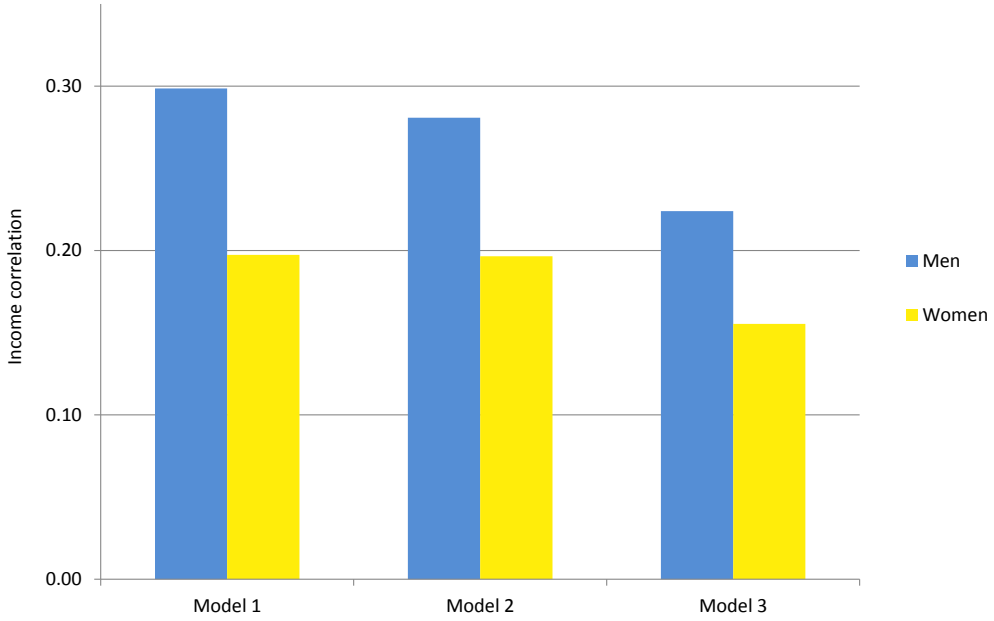

Figure 2: Income correlation between parents (average incomes 1968–72) and children (average incomes 1988–92, adjusted for inflation) for sons and daughters born 1948–52, for three models of intergenerational correlations(models explained below).
Model 1: Father's employment income, child's employment income
Model 2: Parents' household income, child's employment income
Model 3: Parents' household income, child's household income.

mating, dilutes the intergenerational correlation. Nonetheless, this is the true association between disposable incomes in the family of origin and the family of destination. That the income of the father alone is a better predictor of sons' incomes than the income of father and mother together, and the finding that this is not so for women, is probably a further manifestation of the gender gap in earnings. Adding mother's income to father's income adds noise to the father–son, but not to the father–daughter, correlation.

Next, we decompose the income correlations from Figure 2 into the four parts shown in equation (6), using both of our two measures of social class—the EGP five-class schema and the 77 micro-classes. The coefficients are generated from models that include age and age squared, but this makes almost no difference to the results (coefficients with and without age controls differ only at the third decimal place). Figure 3 shows how much of the intergenerational income correlation is accounted for by intergenerational social persistence (in Table A1 of in the appendix we present the full results for each of the 12 decompositions).

As Figure 3 shows, in the standard model among men, intergenerational persistence between EGP classes accounts for 39 percent of the intergenerational correlation of father–son incomes. The remaining three terms—the correlation between the errors, the correlation between the parental error and child's class and the correlation between parental class and child's error—each accounts for around 20 percent (Table A1). Moving to the origin family model, the share of the correlation

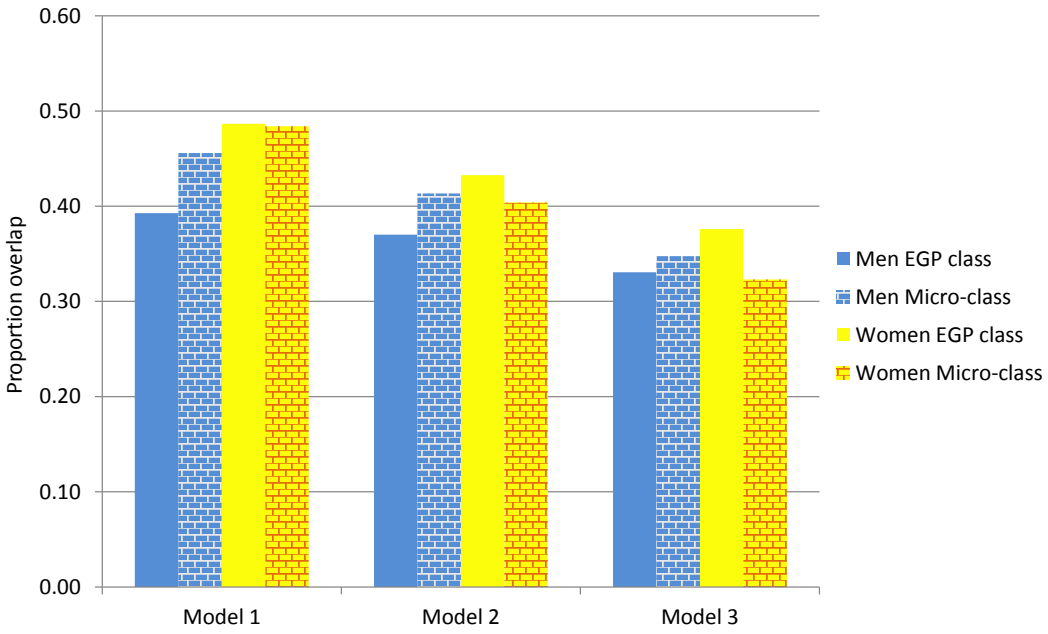

Figure 3: The degree of overlap between income correlation and social mobility for three models of intergenerational correlations (models explained below).
Model 1: Father's employment income and class, child's employment income and class
Model 2: Parents' household income and class, child's employment income and class
Model 3: Parents' household income and class, child's household income and class

in incomes (which we saw in Figure 2) accounted for by class persistence declines to 37 percent for men; in the gross model it declines to 33. This is predominantly because the correlation of the errors increases from 23 percent in the standard model to 32 percent in the gross model (Tabel A1). This means that factors that vary within social classes—even within micro-classes—and that do not influence children's social class position account for a bigger portion of the intergenerational income correlation in the family origin model and the gross model. In the standard model (fathers only), this is likely to be due in part to characteristics of the mother (such as her education). In the gross model, which includes spouse's income, this path may be capturing the consequences of assortative mating (such as attributes of the parents-in-law).

The use of the 77 micro-class mobility table increases the degree to which class mobility and income mobility are directly related: in the standard model applied to men, micro-class persistence accounts for almost 46 percent of the intergenerational correlation (compared with 39 percent for EGP class mobility). As expected, the use of a finer class classification reduces within-class variation and so the impact of the correlation between the errors is lessened. This is also true of the other model specifications for men: micro-class persistence accounts for more of the income correlation even though the impact of class mobility diminishes as we move from the standard model to the origin family model and then the gross model. Overall, however, the improvement brought about by moving from five to 77 classes is

quite modest. The reason for this is most likely that micro-classes largely capture a lateral dimension in the class structure that is rather weakly related to income in Sweden. Although the differences in social networks, skills, and occupational aspirations between, say, bakers, metal workers, and carpenters may be essential for social class inheritance, they do not necessarily imply any income differences. This, in turn, reflects the different processes supposed to generate social and economic persistence, respectively, but here it is best to caution against generalizing beyond the case of Sweden.

The results for women (daughters) are both similar to and different from those of men. For our main question, the most striking difference is that class persistence accounts for more of the income correlation—almost half in the standard model, falling to 38 percent in the gross model (Figure 3), and the residual correlation accounts for less of the overlap among women than among men (Table A1). This difference may come about because men's disproportionate frequency among high-income earners leads to larger within-class variation in income, and the characteristics that account for this can be expected to be correlated across generations. The micro-class model picks up parts of this residual for men, suggesting that some of the unobserved characteristics are related to occupations (such as occupation-specific skills, qualifications, or aspirations). For women, on the other hand, the micro-classes perform particularly poorly: indeed, in the origin family model and the gross model, micro-class persistence accounts for less of the intergenerational income correlation than does EGP class persistence. This is most likely because the relationship between parental class (which is predominantly the father's rather than mother's class in the dominance approach) and daughter's class is stronger at the EGP big-class level than at the level of micro-classes due to occupational gender segregation (Jonsson et al. 2009).

When we move from the conventional model (involving fathers only) to the family origin model, and also to the gross model, we bring in mothers' income and class. If it were the case that there were a gender interaction in the mobility process, the decline in the share of the income correlation accounted for by social persistence across models would not have been as sharp for women. Instead, we find a similar decline for women as for men when we move from the standard to the gross model, and the residual part of the intergenerational correlation increases even more for daughters. This result suggests that there is no obvious mother–daughter interaction in the mobility process.

Social Fluidity and Intergenerational Income Mobility

Thus far our decomposition has followed that of Björklund and Jäntti (2000), as developed by Blanden et al (2013). However, Björklund and Jäntti's attempt to reconcile economic and social mobility did not fully reflect how sociologists analyze social mobility because their decomposition relates economic mobility to *absolute* social mobility, rather than to *relative* mobility. The finding of high mobility in the United States, for example, is actually a finding of high social fluidity, and this is something to which the decomposition shown in equation (6) does not speak

directly. As noted earlier, one of the goals of this paper is to make good that omission.

This presents a difficulty because the frequencies of a mobility table cannot be written as a linear or a log-linear function of odds ratios alone and so there is no analytical expression for the relationship between social fluidity and economic mobility. Instead we proceed by simulation. Using the method described in the appendix, we generate a set of hypothetical mobility tables, each of which has the same marginal distributions as the observed Swedish mobility table but with log odds ratios uniformly weaker or stronger than those observed. We change the strength of the log odds ratios by multiplying the log-linear model's interaction parameters by a scalar, s, which we vary from 0.1 to 4. Each value of s gives rise to a counterfactual mobility table, M^s. By using these counterfactual tables to calculate that part of the income correlation due to social mobility, we can see how varying social fluidity (weaker or stronger odds ratios) leads to different intergenerational income correlations.

Figure 4 plots the relationship between the income correlation implied by social mobility for different degrees of social fluidity in the Swedish data, using tables generated by the method described in the appendix. The x-axis shows the scaling—this is the value by which the log odds ratios in the original table have been multiplied to generate the counterfactual tables used in the computation of the correlation. Thus the value of the correlation when the scaling equals one is the observed implied mobility correlation, 0.126. As Figure 4 shows, as the association between origins and destinations in the mobility table increases, so does the implied intergenerational income correlation, reflecting the fact that the covariance of origins and destinations itself increases as the odds ratios in the table become larger. As the odds ratios become very large—that is, more than twice as large as in the Swedish data—the relationship grows at a weakening rate, so that, at very low levels of social fluidity (high levels of association), further reductions in fluidity have less effect on the intergenerational income correlation.

The concave shape of the line in Figure 4 arises because, for a given set of marginal distributions of origins and destinations and for the patterns of odds ratios shown in panel B of Table 1, as the odds ratios capturing the association between origins and destinations grow larger, an increasing share of cases clusters on the main diagonal, maximizing the covariance of origins and destinations[10] But this clustering is subject to the constraint that the marginal distributions are fixed, and thus the share of cases on the main diagonal has a limit and so, therefore, does the overall covariance of origins and destinations. In turn this means that the correlation of parent–child incomes arising through intergenerational persistence also tends towards a limit (given fixed values of $\mathbf{b}_p$ and $\mathbf{b}_c$). Expressing this more formally, let Q^s denote the share of cases on the main diagonal of table M^s and ρ^s be the income correlation due to intergenerational persistence when M^s is used in equation (6), the decomposition. Then we find that, as $s \to \infty$, $Q^s \to Q^*$ and as $Q^s \to Q^*$, $\rho^s \to \rho^*$. That is, as s becomes large, the share of cases on the main diagonal reaches a limiting, maximum value (Q^*); in our Swedish data the maximum share of cases on the main diagonal is 0.584. As the share of cases reaches its limit, so does the implied income correlation (its limit is ρ^*): in the

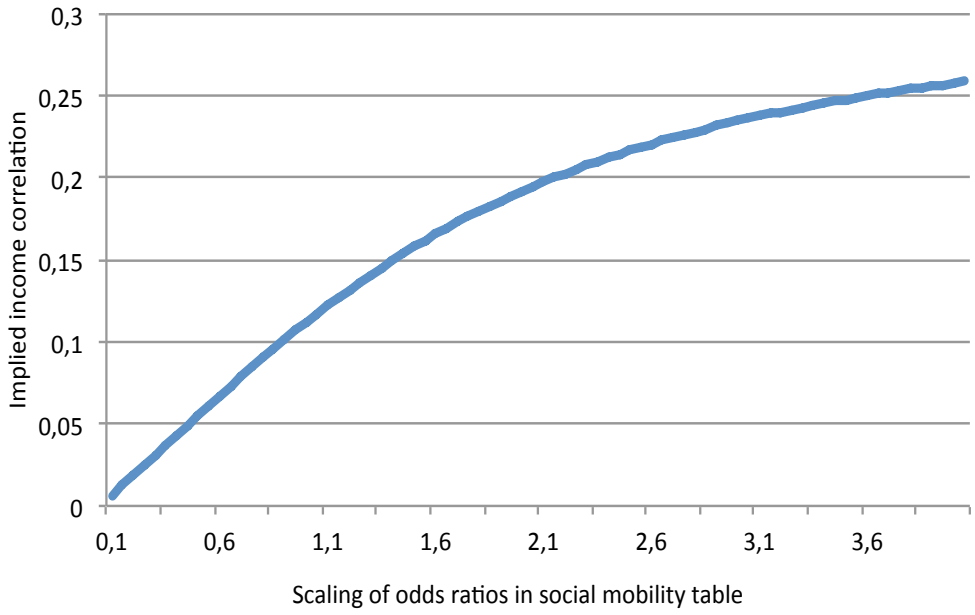

Figure 4: The relationship between the income correlation implied by social mobility for different degrees of social fluidity

case of Swedish men this is 0.306. But this limit is approached very slowly. The maximum implied correlation shown in Figure 4 is 0.259, and this corresponds to an origin–destination association four times greater than that observed in Sweden. The limit of 0.306 in fact exists at a point far beyond the (lower) range of social fluidity observed in previous studies[11] Over the observed range the relationship between fluidity and economic mobility is approximately linear.

Notice that changing fluidity will not, of itself, change the variance of either parent or child incomes. To see this we can draw on equations (4) and (5) (but bearing in mind that we are now using un-logged incomes) to write

$$\sigma_p^2 = \mathbf{b}_p' \mathbf{V}_{X(p)} \mathbf{b}_p + \text{ var } (e_p), \tag{10}$$

where $\mathbf{V}_{X(p)}$ is the variance-covariance matrix of the parental class dummies and var (e_p) is the within-class variation in parental incomes. We can write the equivalent expression for the variance of child incomes:

$$\sigma_c^2 = \mathbf{b}_c' \mathbf{V}_{X(c)} \mathbf{b}_c + \text{ var } (e_c). \tag{11}$$

The important point is that $\mathbf{V}_{X(p)}$ and $\mathbf{V}_{X(c)}$ both depend only on the marginal distributions of origins and destinations and these are unaffected by changing the association in the mobility table. Thus, although variations in hypothetical fluidity in a given table affect the origin–destination covariance, they do not affect the variance of either origins or destinations.

How are Economic and Social Mobility Related?

The relationship between social and economic mobility depends on: (1) the strength of the relationship between class and income among parents and among children; and (2) the covariance between parents' and children's class position. In turn, this covariance depends on (2a) social fluidity; and (2b) the marginal distributions of origins and destinations. Because these elements can vary independently we should not expect to see any necessary empirical relationship between social fluidity and the intergenerational income correlation. Nevertheless, if we hold two of them constant, we can state how variation in the third will be related to variation in the intergenerational income correlation.

Consider first the case in which the relationships between origins and parental income and between destination and child's income are held constant, and so are the marginal distributions of origins and destinations. Then, declining odds ratios in the mobility table (increasing social fluidity) will, as our simulations in the previous section showed, reduce the covariance between origins and destinations, and this will drive down the intergenerational income correlation. Thus, more social fluidity will, as we might have hoped, be associated with more income mobility. Now consider the situation in which the class–income relationships are held constant and so are the odds ratios in the mobility table: in this case, the more similar are the distributions of origins and destinations the greater the intergenerational correlation of incomes. If Swedish sons had the same marginal class distribution as their fathers, the intergenerational income correlation implied by social persistence would increase from its observed 0.126 to 0.186.

Finally, consider the case when the covariance of origins and destinations is fixed. The more strongly class is related to income the stronger the relationship between class and income mobility. When class is more predictive of income, the ratio of the between-class to within-class variance in income among both parents and children will be large; average income differences between classes, captured in the vectors $\mathbf{b}_p$ and $\mathbf{b}_c$ will also be large; and the three terms in equation (**??**) that involve the residuals—namely the residual covariance, $\text{cov}(e_p e_c)$, the correlation between parental residual and child's class, $\text{cov}(e_p X_c)$, and the correlation between parental class and child's residual, $\text{cov}(e_c X_p)$—will be small and so income mobility will be more closely linked to social mobility.

Conclusions

Recent research on the transmission of advantage and disadvantage across generations has seen a burgeoning literature on income mobility as an alternative, or a complement, to the study of social class mobility. These studies have however reported seemingly paradoxical results—the United States, for example, has been portrayed as a relatively equal country in terms of social mobility, but as highly unequal in terms of income mobility. How, then, are social and income mobility related? Our contribution to answering this challenging question is to measure their relationship empirically, using data from Swedish population registers and censuses

that are specially suitable for this endeavor; and to understand the relationship mathematically.

We find, for the standard father-to-son model, that the intergenerational income correlation implied by the pattern of intergenerational class persistence is 0.12 when using a five-class schema and 0.14 when we used a 77 micro-class, or occupational, classification. These represent 39 and 46 percent, respectively, of the observed income correlation of 0.3. We extended this model in several ways: by including daughters; by bringing in mothers' incomes to form a total household income that is integral to the child investment model; and by using total household income both for parents and children, so that the intergenerational income correlation includes the effect of origin on partner selection. The intergenerational correlations for daughters are lower than for sons, irrespective of the definition of parental income, but the part accounted for by social persistence is generally higher. For sons, the residual income correlation (not involving class in either generation) is high, suggesting that characteristics of fathers that vary within classes have a strong effect on sons' incomes. Though these characteristics may include those we normally do not observe (such as skills, abilities, aspirations, and networks), we find that replacing the EGP five-class schema with 77 micro-classes accounts for some of this residual, suggesting that these characteristics are, in part, related to occupations. However, for women, the five-class schema accounts for more of the intergenerational income correlation than the 77 micro-class schema. This, we believe, is predominantly an effect of occupational gender segregation, which leads to a mismatch of fathers' and daughters' occupations, meaning that the micro-class mobility table is more erratic for the father–daughter combination, and so accounts for less of the income correlation than the five-class mobility table.

There are good grounds for supposing that the percentage accruing to the five-class schema is high because of Sweden's centralized wage bargaining and a relatively regulated labor market, with the concomitant low variations in wage within social classes. This is unlikely to be the case in the liberal regime countries like the United Kingdom and the United States, where the difference in results between a more and less aggregated class schema might be expected to be greater. Indeed, it may be that countries such as the United States and China appear to be outliers in the social/income mobility relationship because most of the data we have on both types of intergenerational mobility comes from European societies, in many of which labor market regulations and centralized wage bargaining may lead to a closer relationship between class and income than exists in other parts of the world.

This brings us back, finally, to the question of whether social and income mobility should be seen as two ways of measuring some underlying concept of inequality, or whether they capture distinct social processes. We have not addressed the conceptual issue here but rather attempted to contribute by analyzing the overlap empirically and mathematically. Our overall conclusion is that social fluidity and income mobility are positively related, but whether we observe such a relationship between them is contingent on variation in other circumstances, specifically the degree to which class and income are associated among parents and children, and the degree of similarity in the distributions of origins and destinations. If we wanted

to uncover the empirical relationship between social fluidity and income mobility (for example, if we had measures of the two for a number of countries) we would also need to take account of differences in these other circumstances. Furthermore, the relationship between the two will also depend on how we measure class and income, and whether we study men or women—the overlap between social and income mobility ranges from 32 to 49 percent in our analyses of Swedish data, and this range may be greater with other mobility models and with data from other countries.

That some countries rank quite differently on social fluidity and income mobility has often been thought paradoxical but, as we have shown, there is no paradox. The approach taken in this paper sets out the means by which the relationship between social and income mobility in any specific case may be made more intelligible.

Notes

1 Social fluidity refers to relative mobility rates comparing the class distributions of people from different social class origins. These relative rates are captured through odds ratios, as we explain below.

2 We could also have asked how much of social mobility can be accounted for by income mobility. This leads to a more cumbersome analysis, but the mathematical relationship is shown in Appendix B.

3 We should stress that we are not seeking to make a causal claim about the extent to which social mobility causes economic mobility (or vice versa), nor are we trying to model the pathways through which origin status, whether in terms of class or income, is transformed into destination status. There is a large and growing literature dealing with the latter topic that often brings together sociologists and economists (see, for example, Ermisch, Jäntti, and Smeeding 2012; Smeeding, Erikson, and Jäntti 2011). Our analysis is descriptive and mathematical, aiming to show empirically and explain formally how two types of mobility are related.

4 In our analyses we use income, rather than the more usual logged income, as it leads to a better fit.

5 The error term is uncorrelated with class in the same equation but may be correlated across equations.

6 The matching of parents and children was done by Statistics Sweden, following approval by an ethical vetting committee, and is a routine procedure with very high reliability because of the use of a common personal identification number in all registers.

7 The data cover people up to age 75, so any parents above that age in 1970 are excluded.

8 The classification used is a Swedish standard socioeconomic classification (SEI), with the conversion I = SEI 56, 57, 60; II = SEI 46; III = SEI 33, 36; VI = SEI 21, 22; VII = SEI 11, 12).

9 We deviate from this coding protocol by merging housekeeping workers with janitors and cleaners; cashiers with shop assistants; (employed) fishermen with farm laborers; and nursery school teachers and aides with primary school teachers. Because we do not use self-employed in this study, the micro-class of proprietors is not included. We identify military personnel as a separate micro-class.

10 This is likely to be true for any mobility table because here the odds ratios involving cells on the main diagonal are usually the largest (as in panel B of Table 1), but it will not hold for other sorts of tables where the largest odds ratios may lie elsewhere.

11 Breen and Luijkx (2004) report that, among 11 European countries, the greatest difference in log odds ratios is between Germany and Israel, with the log odds of the former being on average twice those of the latter.

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