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CROSS-COUNTRY RANKINGS IN INTERGENERATIONAL MOBILITY: A COMPARISON OF APPROACHES FROM ECONOMICS AND SOCIOLOGY

Jo Blanden

University of Surrey, London School of Economics

Abstract. This paper summarizes research on the relative level of intergenerational mobility – whether classified by income, education or social class. The literatures on education and income mobility reveal a similar ranking with South America, other developing nations, southern European countries and France tending to have rather limited mobility although the Nordic countries exhibit strong mobility. Estimates of mobility based on social class point to rather different patterns, and we demonstrate that these differences are most likely generated by intergenerational earnings persistence within social classes. The second part of the paper looks for explanations for the differences in earnings and education persistence and finds that mobility is negatively correlated with inequality and the return to education but positively correlated with a nation's education spending.

Keywords. Education; Inequality; Intergenerational mobility; Public policy

1. Introduction

Intergenerational mobility is concerned with the relationship between the socio-economic status of parents and the socio-economic outcomes of their children as adults. This can be measured in a variety of ways, by family income, individual earnings, social class, occupational status or education. If most individuals' socio-economic outcomes are strongly related to those of their parents, this means that children from a poor family are likely to be relatively poor as adults and consequently that inequality will perpetuate. This has implications for economic efficiency if the talents of those from poorer families are under-developed or not fully utilized, as those from poorer backgrounds will not live up to their productive potential.

Most people would agree that equality of opportunity is an important goal; nonetheless it is difficult to imagine a world with no link between outcomes across generations. Genetic transmission alone is likely to lead to some positive association between the educational achievements, career prospects and earning power of parents and children, while learning within the family will accentuate the advantages of children from better-off families. Hence the policy implications of the study of intergenerational mobility are unclear. If intergenerational income inequality is solely a consequence of the automatic transmissions of ability and other attributes within the family, its reduction would require strong intervention by the state, and might lead to inefficiency. Our understanding of this can be improved by making comparisons of the levels of intergenerational mobility across countries. With such comparisons

in hand, it is possible to assess mobility as 'relatively weak' and 'relatively strong', and then to begin to consider potential explanations for differences in intergenerational mobility.

The first objective of this paper is to summarize the literature on the relative strength of intergenerational mobility across different countries. In contrast to most other summaries, work on earnings, education and social class will all be considered, with observations of mobility included from 46 countries. The data requirements to measure the transmission of income or earnings are very strict so estimates are only available for a limited number of countries. In addition there is considerable uncertainty about country rankings for those nations for which estimates are available (as highlighted in Björklund and Jäntti, 2009). For both these reasons it is helpful to supplement the estimates on income and earnings with those from the literatures on education and occupations.

We find that the results for earnings and education tend to be fairly well correlated; this implies that information on educational mobility is a good proxy for earnings mobility in countries where earnings information is not readily available. Combined, the results indicate that South America and southern Europe have low mobility and the Nordic nations are rather more mobile.

International rankings of the association of social class across generations (social class fluidity) differ markedly from those for income and education. There are three possible explanations for this. First, it could be that the true ranking is similar, but practical issues mean that measured rankings differ; we discuss the reasons why this might be the case. Secondly, it could be that social class and income/education are not well correlated; in this case the different approaches can be seen as complementary as they are based on different conceptual approaches. Finally, and most plausibly, (as suggested by the evidence) it could be that although social class and income are related there is a large amount of persistence within social classes for some nations, so that income matters for the life chances of the next generation even for those with the same parental class. We demonstrate these relationships using data from the US Panel Study of Income Dynamics (PSID) and the British 1970 birth cohort.

In the final part of the paper we begin with a short review of the theoretical literature that seeks to model the determinants of intergenerational mobility within society. This includes income inequality, educational investment, and returns to education. Finally we take our preferred measures of mobility and correlate them with these variables. Earnings and education mobility are negatively related both to economic inequality and the returns to education but are positively related to education spending.

These descriptive correlations cannot be thought of as identifying the causal relationships that drive intergenerational mobility. However, owing to the intense interest in the relationship between inequality and immobility, it seems worthwhile to explore the extent of our knowledge in this area. The conclusions attempt to answer to the question: How much can we learn from international comparisons of intergenerational mobility?

2. Measures and Concepts

We begin by reviewing the key methodological issues that arise in obtaining estimates of income and earnings mobility, an issue that has achieved substantial attention in recent years. We then discuss the measures and concepts used when social status, class and education are used as outcome measures.

2.1 *Income Mobility*

A central tenet of economics is that individual welfare is best achieved by providing individuals with resources and allowing them to decide how to spend them. Friedman's (1957) permanent income hypothesis states that it is the permanent expectation of income that determines consumption and ultimate economic welfare. For economists therefore, the intergenerational relationship of interest is

the relationship between parents' *permanent* income and child's *permanent* income. As is common we denote permanent variables by * and logs by lower case variables.

Intergenerational mobility can be summarized byβ from the following regression:

$$y^*_{ci} = \alpha + \beta y^*_{pi} + u_{1i}. \quad (1)$$

β is therefore the elasticity of children's income with respect to their parents' income, giving the proportion of each 1% difference in parental income between families that will be passed on as an income difference between their children.[1] Hypothetically, $\beta = 0$ represents a case of complete mobility where the incomes of parents and children are unrelated, and $\beta = 1$ represents the case where the proportionate earnings advantage of parents is precisely mirrored in their children's generation. Estimates of β tend to lie between 0 and 1, implying that an initial income advantage will decay over several generations.

Economic mobility can be conceptualized either in terms of income or earnings but the literature is dominated by estimates of the elasticity of sons' earnings with respect to fathers' earnings. This means that the importance of non-labour income is not acknowledged, those without paid employment are dropped and the experience of women as both mothers and daughters is mostly neglected (Chadwick and Solon, 2002; Raaum *et al.*, 2007; Hirvonen, 2008, are notable exceptions regarding daughters). As this paper is seeking comparable measures of mobility we follow the literature and focus on the earnings mobility of men, but other measures are also interesting, and they certainly deserve more widespread attention.

Ideally, one would like to measure earnings mobility in terms of permanent or long run income; however, most survey data sets that cover two generations only have short-term measures, although the use of administrative data from tax records can resolve the problem in some countries (so far these sources have been primarily exploited in the Nordic nations and Canada). Under classical measurement error assumptions[2] it is straightforward to show that measurement error in the dependent variable (the son's earnings) will not bias the estimate of β, although it will lead to a loss of precision and larger standard errors. As explained by Solon (1992) and Zimmerman (1992), measurement error in the explanatory variable will lead to downward-biased and inconsistent estimates of β.

The strategy for reducing the downward bias associated with measurement error used by Solon and Zimmerman is to average fathers' earnings over several periods to better approximate permanent income. Under the classical measurement error model there will be a fall in the attenuating factor as more periods of data are used to generate the average.

Work by Mazumder (2005) has shown that averaging fathers' earnings over 5 years or so may not be sufficient to overcome measurement error because the observations are too close together to be representative of lifecycle income. Haider and Solon (2006) suggest that this is indicative of variation in the relationship between permanent income and current income through the lifecycle. As age-earning profiles are steeper for those with higher permanent income, their income at young ages is low and their income at older ages is high, compared to their permanent income.

Haider and Solon (2006) show that with this type of measurement error the direction of the bias is determined by the age at which earnings are observed. Unlike in the classical case, measurement error in the dependent variable (sons' earnings) will have an impact. The data used for intergenerational mobility often focus on young sons and older fathers. Haider and Solon show that this combination is likely to lead to downward bias through both the dependent variable and the explanatory variables, and possibly to substantial underestimation. Estimations of the relationship between current and permanent income reveal that incomes should be measured between the early 30s and mid-40s for the USA. Similar results are found for Sweden and Germany (Böhlmark and Lindquist, 2006 and Brenner, 2010).[3]

An alternative solution to the classical measurement error problem is to use instrumental variables (IV). A valid IV is correlated with fathers' permanent income but uncorrelated with measurement

error. In addition it should not independently affect children's economic status. The obstacle to using IV in this context is that almost every variable that is correlated with parents' permanent income might also have an independent impact on sons' status. This leads to an upward bias in IV estimates of intergenerational persistence, so that they provide an upper bound on the true extent of intergenerational transmission in a country.

The standard measurement approach requires information on parental incomes and then children's incomes 20 or 30 years later, this severely limits the number of countries for which we can estimate intergenerational mobility. The two-sample IV approach (TSIV) can be used when researchers have matched information on sons' earnings and fathers' characteristics (such as education and occupation) but no information on fathers' earnings. Fathers' earnings during the child's teenage years are predicted using information on the relationship between earnings and education from other data from that period. Sons' earnings are then regressed upon this prediction. Björklund and Jäntti (1997) first applied this approach to make comparisons for Sweden and the USA, its increasing use has expanded the number of countries for which we have information on intergenerational income mobility.

Subject to certain assumptions, this estimator will be upward biased if an invalid instrument is used in the same way as for other IV estimators. As discussed by Nicoletti and Ermisch (2007) the extent of the bias will depend upon the degree to which the instruments are directly related to the child's income and the strength of their ability to predict father's earnings. The larger the R^2 in the first-stage regression the smaller the bias will be. More recently this approach has been extended to other nations, for example, Italy (Mocetti, 2007; Piraino, 2007), France (LeFranc and Tannoy, 2005) and in the international comparisons by Grawe (2004) and Andrews and Leigh (2009) see Appendix Table A1 for more details and other studies.

An alternative measure of intergenerational persistence is the correlation of parents' and children's incomes. This adjusts for differences in income variance between the two generations. Mobility can be thought of as measured by $1 - r$.

$$r = \mathrm{Corr}_{y_p^*, y_c^*} = \beta \left(\frac{SD^{y_p^*}}{SD^{y_c^*}} \right). \tag{2}$$

The intergenerational correlation provides a measure of rank mobility between the generations, and provides an interesting comparison with the intergenerational elasticity. As argued by Björklund and Jäntti (2009) it provides a measure which is not mechanically affected by changes in inequality across generations. For example, Aaronson and Mazumder (2008) find a growth in the US intergenerational elasticity which mirrors changes in income inequality, but less similarity between trends in inequality and trends in the intergenerational correlation. Unfortunately very few measures of mobility include information on r alongside estimates of β. In order to correctly estimate r information on the inequality of permanent incomes in both generations is required. These estimates are not readily available leading to a gap in the literature.

In making international comparisons of intergenerational income mobility it is therefore essential to take account of the approach taken to measurement error and the age of fathers and sons. It would also be helpful to have information on both the intergenerational elasticity and correlation.

2.2 *Socio-Economic Mobility and Social Class Fluidity*

Measuring mobility by the statistical association of income or earnings across generations is a rather recent endeavour, with the majority of papers published since 1990. Measurement of the links between fathers' and sons' social class or occupational status has a longer history.

One advantage of measuring intergenerational mobility by class or occupation is that the data requirements are less demanding. Retrospective information on father's occupation does not require

the investment in longitudinal data necessary for intergenerational income studies (although we may still have concerns about the quality of this information). We may also think that occupation, broadly defined, varies less over the lifecycle making age-related biases less problematic. Of course, in order to make international comparisons of mobility in social class or occupation across generations the measures used need to be comparable. This is a huge undertaking and has led to some large-scale international projects and considerable controversy within the sociology discipline.

One approach to measuring mobility taken by sociologists is to create a socio-economic index for ranking occupations, match this index to fathers' and sons' occupations and then correlate this index across generations. Generally the index depends on a weighted contribution of the average income and education within an occupation (where weightings are chosen to maximize the relationship between the prestige index and education and earnings). Ganzeboom and Treiman (1996, 2003, 2007a) have worked extensively on applying this approach across countries. These socio-economic indices can be correlated across generations using similar approaches to those reviewed in the measurement of income mobility. The strength of these correlations can then be compared across countries. Ganzeboom and Treiman (2007b) provides the correlations which generate the results in Ganzeboom and Treiman (2007a). These give results for 43 countries over nine cohorts and for three different levels of labour market experience. It is not, however, possible to formulate a robust picture of differences across countries from these data as the conclusions are highly dependent on the cohort and level of experience for which the correlation is calculated.[4] In light of these difficulties we do not offer any further comment on this strand of the literature in this review.

As socio-economic indices are designed to be closely associated with education and income, then mobility in these measures clearly shares a conceptual basis with income and education mobility. An alternative approach to measuring mobility is based on class. Class divisions are also based on occupation but are formed of broad occupational groupings, which are supposedly unordered. As expressed by Jonsson *et al.* (2009, p. 977)

> These classes are often assumed to convey a package of employment relations and consumption opportunities, a resulting social environment that structures behaviour and decision making, and a culture that may be understood as an adaptation (or maladaptation) to this environment.

Given this motivation behind the definition of social classes, it is not entirely obvious that class mobility will capture the same mechanisms as income mobility, although some evidence suggests that social class provides a good proxy for economic welfare (Goldthorpe and McKnight, 2006). An aim of this review is to explore the links between mobility measured on different bases.

A frequently used schema is the Erikson, Goldthorpe and Portocarero (EGP) classification based on Erikson *et al.* (1979) and shown in Table 1. It focuses on aggregating occupations according to the employment conditions they experience.[5] As social class is not a continuous variable, the measurement of social class fluidity (as it is commonly called) is based on the analysis of two-way contingency tables which document the moves between classes across generations. Modelling the patterns of mobility in contingency tables is a more difficult enterprise than correlating continuous variables and a large literature has evolved on how this can best be achieved. The major difficulty stems from the fact that structural class shifts between generations will necessarily force some families away from the diagonal; increasing the appearance of absolute mobility. As a consequence it is important to have a measure of relative mobility which is invariant to compositional changes across generations.

Odds ratios provide one measure of relative mobility. For a contingency table with two origin and two destination classes, the relative association between classes across generations is $(\frac{F_{11} \times F_{22}}{F_{12} \times F_{21}})$, where F_{ij} is the frequency of observations in cell $_{ij}$, where i and j index father's and son's classes, respectively. Each set of four cells in a larger contingency table will generate an odds ratio, taken together these provide a complete description of the patterns of mobility in the data. Log-linear models provide a related, but more parsimonious, way of describing the total pattern of mobility in a contingency table.

Table 1. The Erikson–Goldthorpe–Portocarero Social Class Schema.

I + II Service class	Professionals, administrators and managers; higher-grade technicians; supervisors of non-manual workers
III Routine non-manual workers	Routine non-manual employees in administration and commerce; sales personnel; other rank-and-file service workers
IVa + b Petty bourgeoisie	Small proprietors and artisans, etc., with and without employees
IVc Farmers	Farmers, small holders and other self-employed workers in primary production
V + VI Skilled workers	Lower-grade technicians; supervisors of manual workers; skilled manual workers
VIIa Non-skilled workers	Semi- and unskilled manual workers (not in agriculture, etc.)
VIIb Agricultural labourers	Agricultural and other workers in primary production

If we take as the dependent variable the expected F_{ij}, in other words the frequency of observations with origin class i and destination class j, then this can be explained by a scaling parameter μ, the influence of the origin class, τ_i, the influence of the destination class, τ_j, (the effects of both origin and destination classes are represented by a categorical variable for each class) and the influence of the association between origins and destinations for this particular cell, τ_{ij} (modelled by dummy variables capturing the interaction effects).

Therefore $F_{ij} = \mu\tau_i\tau_j\tau_{ij}$ for all i and j.

If we take logs of this model it becomes linear

$$\ln F_{ij} = \lambda + \lambda_i^O + \lambda_j^D + \lambda_{ij}^{OD}. \tag{3}$$

In this way the model is fully saturated by the inclusion of dummies for origin (superscript O), destination (superscript D) and full interaction effects (OD), so the frequencies in each cell will be predicted perfectly. In a model of perfect relative mobility the λ_{ij}^{OD} terms will be equal to zero. The aim of log-linear modelling is to avoid including all the λ_{ij}^{OD} terms but still achieve an acceptable fit for the model. The λ_{ij}^{OD} terms omitted depend on the particular pattern of mobility the researcher has in mind, models depicting different mobility schemes can be evaluated depending on how well they fit the observed data. For more detail on the precise nature of these models see Erikson and Goldthorpe (1992) or Breen (2004).

When a cross-country approach is taken a third dimension is added to the model, k. In this case F_{ijk} is the frequency of observations with origin class i and destination class j in country k. If the researcher believes that association effects are common across countries the log-linear model becomes where λ_{jk}^{DC} and λ_{ij}^{OD} are represented by dummies for origin and destination class in each country.

$$\ln F_{ijk} = \lambda + \lambda_i^O + \lambda_j^D + \lambda_k^C + \lambda_{ik}^{OC} + \lambda_{jk}^{DC} + \lambda_{ij}^{OD}. \tag{4}$$

A way of measuring variations in fluidity across nations is to examine how well this model performs; if it provides a good fit then this indicates that variation in the extent of class associations across countries is limited. Models allowing variations in the extent of particular origin-destination effects across countries enable a more complex pattern of similarities and differences to be investigated.

Erikson and Goldthorpe's book *The Constant Flux* compared the extent of class fluidity for a number of countries in the late 1960s and early 1970s. The study initially concentrated on Europe with England and Wales, France, Northern Ireland, Scotland, the Republic of Ireland, West Germany, Sweden, Poland and Hungary all examined closely. Analysis was also added for Czechoslovakia, Italy, the Netherlands

the United States, Australia and Japan. More recently Breen (2004) has followed up this study with an analysis of 11 countries, with significant overlap with those included by Erikson and Goldthorpe. Breen's aim is to understand trends in mobility for these countries from the 1970s onwards. In this literature the time period refers to the point at which sons' occupations are measured; all of the data from a national general purpose survey is used so that these studies do not generally focus on a particular birth cohort.

The models estimated in both of these books produce a very large number of parameters, and a great deal of detail on mobility patterns. It is one of the disadvantages of the social class literature that there is not a more intuitive summary measure of mobility; for the purpose of this summary we would benefit greatly from a single mobility parameter for each nation and point in time, which could be easily compared with the measures for income and education mobility. Erikson and Goldthorpe's (1992) UniDiff model provides the nearest to such a statistic that is available.

$$\ln F_{ijk} = \lambda + \lambda_i^O + \lambda_j^D + \lambda_k^C + \lambda_{ik}^{OC} + \lambda_{jk}^{DC} + \lambda_{ij}^{OD} + \beta_k \lambda_{ij}^{OD}. \tag{5}$$

As before the interaction terms in λ_{ij}^{OD} depict the pattern of association between origin and destination class. The coefficient β_k allows this association to be generally larger in some countries than others, but does not allow for differential variation in the different components of λ_{ij}^{OD}. β_k is normalized to some baseline so that a relatively high β_k indicates relatively low mobility and a low β_k indicates high mobility.

This has necessarily been a very brief introduction to measuring social class fluidity. However it should give some intuition about the processes involved in the complex world of log-linear modelling, and give an overview of how these methods have been used to make comparisons across countries.

2.3 *Educational Persistence across Generations*

An alternative measure of mobility is the extent to which parents' and children's education levels are related. The literatures on intergenerational income and social class or status persistence emphasize the role of education as a transmission mechanism; it seems natural to measure this association directly.

As with occupation, information on educational achievements across generations is quite widely available. Once again there are difficulties in ensuring that education has the same meaning across countries. One approach is to measure education in years of schooling, assuming that the meaning of this variable is constant across nations and generations. In this case educational persistence can be measured using the intergenerational coefficient and correlation, similar to the approach used for income mobility.

$$YearsEd_i^{children} = \pi + \psi\ YearsEd_i^{parents} + u_{2i}, \tag{6}$$

and

$$\text{Corr}_{YearsEd^{parents}, YearsEd^{child}} = \psi \left(\frac{SD^{YearsEd^{parents}}}{SD^{YearsEd^{child}}} \right). \tag{7}$$

Cross-national comparisons and 50-year trends in the coefficient and correlation of years of schooling have recently been reported by Hertz *et al.* (2007) for 42 nations. Although the data are not perfect, sometimes relying on relatively small samples, it is informative to have such a broad sample of nations and we draw heavily on this work when we come to summarize the international findings.

A weakness in Hertz *et al.*'s approach is that it assumes (as does the measurement of income mobility, as presented here) that the impact of years of education on the next generation is linear and monotonic. It seems unlikely that this will be true, and even more unlikely that this will be true in all countries.[6] As

an example, the structure of the UK schooling system means that it is inappropriate to estimate simple years of schooling effects on earnings (Dearden *et al.*, 2002). To overcome this problem we might wish to consider education in terms of qualification levels. This is more demanding in terms of cross-national comparability. Chevalier *et al.* (2009) use the UNESCO designed International Standard Classification of Education (ISCED) classification as the basis of the five-category coding of education to measure the intergenerational association of education in Europe and the USA. In Appendix Figure A1 we compare the results from Chevalier with those from Hertz and find a moderate correlation of 0.49, implying common ground between the two approaches.[7]

3. Is There a Consensus?

3.1 *Income Mobility*

The comparison of intergenerational income elasticities has become a fairly well-travelled path. Solon (2002), Corak (2006), d'Addio (2007) and Björklund and Jäntti (2009) all draw together the international evidence on earnings mobility. The introduction to income mobility provided in Section 2 has outlined the crucial measurement issues which can cause estimates of income mobility to be biased. It is essential that the estimates of mobility chosen for different countries are similar in their approach to measurement error and the age at which income is measured for each generation. In addition, as income mobility may change over time it is important that comparisons are made for cohorts as close in birth date as possible. The estimates preferred here are for cohorts born in the late 1950s or early 1960s. Most of these focus on the earnings of fathers' and sons' in mid-career, however we might worry that sons in Solon's US work (aged 25–34), in the UK (aged 33) and in the Canadian study quoted (aged 29–32) are slightly on the young side, given our comments on lifecycle bias.

The selected estimates are listed in Table 2. They are based on three techniques, ordinary least squares (OLS) using a time average of fathers earnings (based on around 5 years of data), IV or TSIV. As discussed in the methodology section, we would expect the IV estimates to be upward biased compared to those based on OLS. Here I follow Corak (2006) in scaling down the IV estimates to make them more comparable. This is done on the basis of the bias detected in Solon (1992) and Björklund and Jäntti (1997), in both cases the OLS estimates based on time averaging in US PSID are smaller than those based on IV approaches by a factor of 0.75. It is a strong assumption to carry across this bias to other countries, but seems preferable to leaving the estimates uncorrected.[8]

For the UK Dearden *et al.* (1997) uses IV approaches for the 1958 cohort to get an estimate of 0.58, this is scaled down to give 0.44, but even this is high compared to Ermisch and Nicoletti's (2007) estimate from the British Household Panel Study, which is 0.29 for the relevant cohort. In order to recognize the fact that 'there is a lot of uncertainty about the UK' (Björklund and Jäntti, 2009), we average the two estimates to give our preferred figure. This is in contrast to other surveys; Solon (2002) and Corak (2002) rely exclusively on Dearden *et al.*, whereas Björklund and Jäntti (2009) prefer Ermisch and Nicoletti's estimate.

Figure 1 provides a visual comparison of our preferred estimates of intergenerational income persistence. Twelve countries are represented, which is small compared to the number of countries with information on education mobility. Although it is tempting to immediately form the estimates into a 'league table' we must pay attention to the size of the standard errors; these are large in many cases. Although it does seem to be the case that the Nordic nations have higher mobility, it is impossible to statistically distinguish the estimates for Sweden and the USA. The appropriate ranking at the top end is difficult to detect with large standard errors for the Australian, French, British and US estimates making it unclear how these countries should really be ranked. We should also consider the impact of lifecycle bias, which might downward bias results for the USA, UK and Canada. A resulting downward

Table 2. Preferred Estimates of Income Mobility.

Country	Source	Elasticity
Brazil	Dunn (2007) (scaled)	0.52 (0.011)
USA	Solon (1992)	0.41 (0.09)
UK	Dearden *et al.* (1997) (scaled) and averaged with Nicoletti and Ermisch (2007)	0.37 (0.05)
Italy	Piraino (2007) (scaled)	0.33 (0.026)
France	Lefranc and Trannoy (2005) (scaled)	0.32 (0.045)
Norway	Nilsen *et al.* (forthcoming)	0.25 (0.006)
Australia	Leigh (2007a) revised as in Björklund and Jäntti (2009)	0.25 (0.080)
Germany	Vogel (2008)	0.24 (0.053)
Sweden	Björklund and Chadwick (2003)	0.24 (0.011)
Canada	Corak and Heisz (1999)	0.23 (0.01)
Finland	Pekkarinen *et al.* (2006) Österbacka (2001) Averaged as in Björklund and Jäntti (2009)	0.20 (0.020)
Denmark	Hussein *et al.* (2008)	0.14 (0.004)

Note: Estimates based on IV regressions are scaled down by 0.75 to allow a legitimate comparison to be made with those based on OLS and time averaging. This reflects the difference in these estimates found for the USA in Solon (1992) and Björklund and Jäntti (1997). Nicoletti and Ermisch (2007) assert that their results are less subject to IV bias than others put forward in the literature and offer as evidence the fact that they lay between the OLS and IV estimates in Dearden *et al*. As a consequence we do not scale these estimates, although we appreciate that this is controversial.

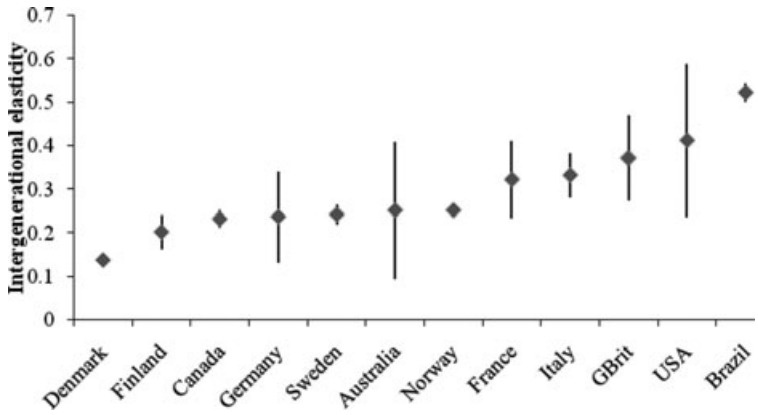


Figure 1. Preferred Intergenerational Income Parameters.

Sources: for these estimates are listed in Table 2 and Appendix Table A1. Lines give 95% confidence intervals

bias would not change the general ranking for the USA and UK very much (as they are towards the high persistence end) but it is possible that mobility in Canada is overstated by the results listed here.

Brazil sticks out clearly at the top of the graph as having low mobility (which is quite precisely measured). This is our first evidence that there may be stark differences between estimates of mobility

for developed and developing countries or across different regions of the world. Grawe (2004) considers mobility for a broader range of countries and finds persistence in Ecuador, in particular, to be far higher than any estimate for developed countries.

3.2 *Social Class Fluidity*

Erikson and Goldthorpe (1992) provide an analysis of international comparisons of social class fluidity for the 1970s which has been recently updated in Breen (2004). The discussion of cross-national similarities and differences in both Erikson and Goldthorpe (1992) and Breen (2004) is incredibly rich with a great deal of detail concerning the extent of mobility between particular classes.

Both studies also provide summary measures from the UniDiff model. These are included here in Figures 2 and 3.[9] In the earlier study the average extent of mobility is normed to 0 whereas in Breen this normalization is on 1. Our discussion of mobility so far has indicated notable differences between the Nordic nations and the USA. As discussed by Björklund and Jäntti (2000) and revealed clearly in Figure 2 Sweden and USA both appear to be rather high mobility nations when measured by social class in the 1970s.[10] Germany has the least mobility in Breen (2004) and is among the lower mobility nations in Erikson and Goldthorpe (the sample of comparator countries is rather different); this is in contrast to our earlier results for income mobility for which Germany looks rather mobile. As Erikson and Goldthorpe consider mobility for all sons in the 1970s they include those born several decades before the 1960s; the main cohort considered for our summary measure of income mobility.

Breen updates the UniDiff model up to the 1990s, again selecting all adult males rather than a particular cohort. His results for the most recent time period are given in the final bar for each country in Figure 3. Once again we observe differences between these results and those for income mobility, with Germany being the least mobile country. There are clearly some striking differences between international rankings of mobility depending on whether they are measured by income or social class.

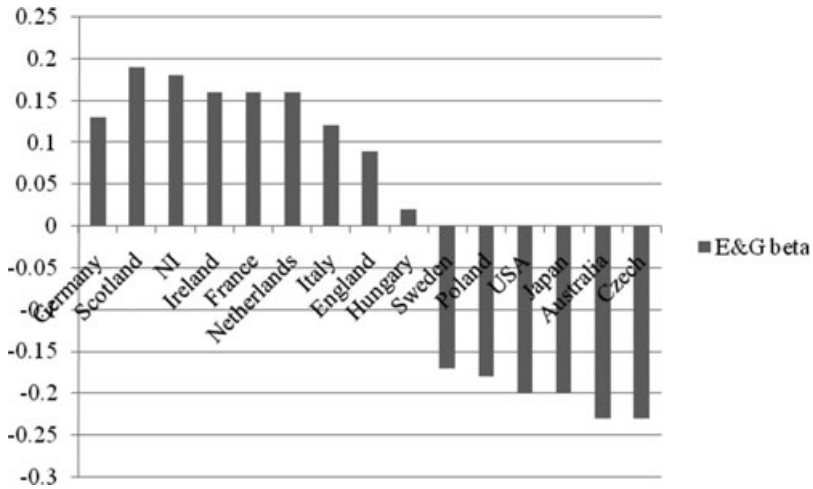


Figure 2. Parameters from Erikson and Goldthorpe Social Class Fluidity Model.

Source: Erikson and Goldthorpe (1992; Table 11.1).

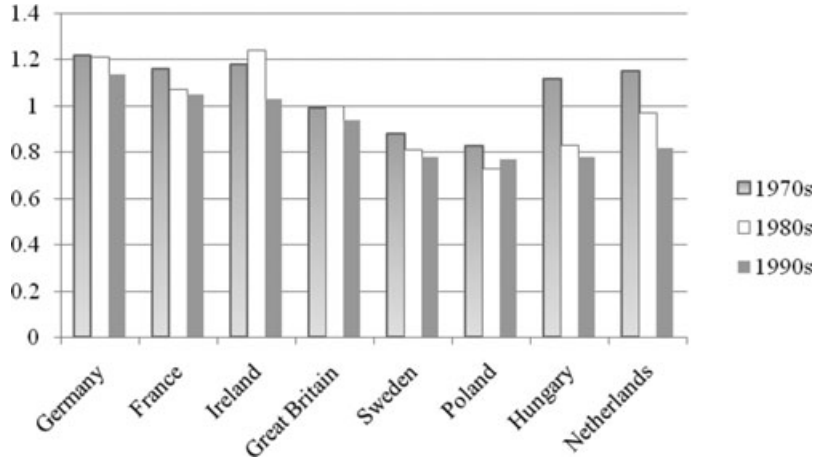


Figure 3. Parameters from Social Class Fluidity Models from Breen (2004).

Source: Breen (2004) Figure 3.3. With thanks to Richard Breen for providing these figures.

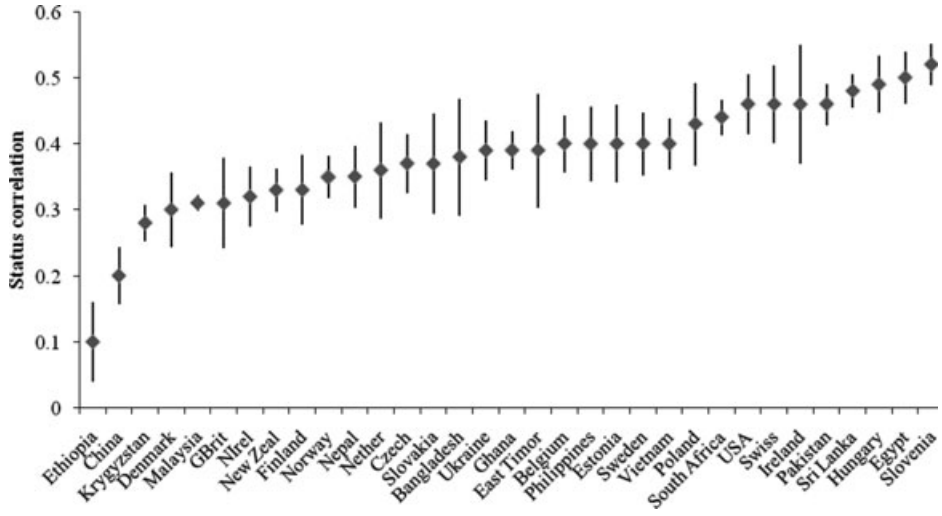


Figure 4. Parents–Child Correlation in Years of Schooling from Hertz *et al.* (2007).

3.3 *Educational Persistence across Generations*

Hertz *et al.* (2007) measure the intergenerational association using years of education for a large number of countries and results for both the regression coefficient and correlation are provided in Table 3, with a graphical representation of the correlations in Figure 4. The first striking result is that Hertz *et al.* (2007) find confirmation of two results found for income mobility; that intergenerational mobility is low in South America and high in the Nordic nations. Of the western nations, Italy and the USA are the least mobile as measured by the intergenerational correlation in years of education. Great Britain is

Table 3. Measures of Association in Years of Schooling.

	Elasticity	Rank	Correlation	Rank
Peru	0.88	6	0.66	1
Ecuador	0.72	12	0.61	2
Panama	0.73	11	0.61	3
Chile	0.64	18	0.60	4
Brazil	0.95	4	0.59	5
Colombia	0.80	8	0.59	6
Nicaragua	0.82	7	0.55	7
Indonesia	0.78	9	0.55	8
Italy	0.67	17	0.54	9
Slovenia	0.54	27	0.52	10
Egypt	1.03	2	0.50	11
Hungary	0.61	20	0.49	12
Sri Lanka	0.61	19	0.48	13
Pakistan	1.00	3	0.46	14
USA	0.46	33	0.46	15
Switzerland	0.49	30	0.46	16
Ireland	0.70	15	0.46	17
South Africa	0.69	16	0.44	18
Poland	0.48	31	0.43	19
Vietnam	0.58	23	0.40	20
Philippines	0.41	36	0.40	21
Belgium	0.41	35	0.40	22
Estonia	0.54	28	0.40	23
Sweden	0.58	26	0.40	24
Ghana	0.71	13	0.39	25
Ukraine	0.37	40	0.39	26
East Timor	1.27	1	0.39	27
Bangladesh	0.58	25	0.38	28
Slovakia	0.61	21	0.37	29
Czech Republic	0.44	34	0.37	30
Netherlands	0.58	24	0.36	31
Norway	0.40	38	0.35	32
Nepal	0.94	5	0.35	33
New Zealand	0.40	37	0.33	34
Finland	0.48	32	0.33	35
Northern Ireland	0.59	22	0.32	36
Great Britain	0.71	14	0.31	37
Malaysia	0.38	39	0.31	38
Denmark	0.49	29	0.30	39
Kyrgyzstan	0.20	42	0.28	40
China (rural)	0.34	41	0.20	41
Ethiopia (rural)	0.75	10	0.10	42

Source: Table 2 of Hertz *et al.* (2007)

Table 4. Correlations between Different Intergenerational Mobility Measures.

	Preferred Income β	E & G β	Breen β (1990s)
E & G β	0.035 [8]		
Breen β (1990s)	−0.315 [5]	0.687 [8]	
Years of education correlation	0.732 [6]	−0.122 [10]	−0.526 [7]

Note: The number of countries used to calculate the correlation is given in brackets.

immobile when measured by the regression coefficient but mobile when measured by the correlation. This difference stems from the low variability in years of schooling for parents in the sample (almost everyone left at the end of compulsory schooling). For the full sample of countries the correlation between the coefficient and correlation is 0.40.

3.4 *What Are the Similarities and Differences?*

Throughout our selected summaries of the income, social class, status and education mobility literature, we have made comments on the ways in which the measures and rankings have pointed towards common patterns of mobility across nations and we have also drawn attention to stark differences in the implications of these literatures for particular countries.

Table 4 provides an overall picture of the similarities and differences in the different measures by listing the correlation coefficients between them. In many cases the sample of countries used do not overlap very much resulting in rather small sample sizes, we therefore would not want to over-emphasize these results. One thing that is very clear is that although the measures of income and education links across generations tend to be positively correlated (also shown in Figure 5) this is not the case for the measures of social class fluidity. It appears that these constructs are tapping into rather different mechanisms. Note that the two measures of social class fluidity are closely linked for the eight countries for which both are available; this is true even though they relate to different periods. In the next section we will attempt to explain how differences in rankings between different measures can come about.

4. Reconciling Different Measures of Mobility

4.1 *Measurement and Data Quality*

Before exploring the conceptual reasons why measures based on social class might differ from those based on income or education it is first important to assess whether prosaic differences in data or measurement might be driving the divergent results.

Section 2.1 described the difficulties in obtaining solid measures of intergenerational earnings persistence. These primarily stem from difficulties in acquiring the necessary long term data (a problem which can be solved by making use of two-sample methods) and problems in ensuring that the measures used are not subject to measurement error or lifecycle bias. This review has taken care not to allow differential measurement error to affect the comparisons, but as we have seen there is a possibility that lifecycle bias may be influencing the position of Canada in our comparisons. One issue that is less stressed in the context of intergenerational income mobility is whether income has the same relationship to the standard of living in each country; we might think that this relationship is weaker in countries with extensive welfare provision. The data reveal low persistence in the Nordic nations

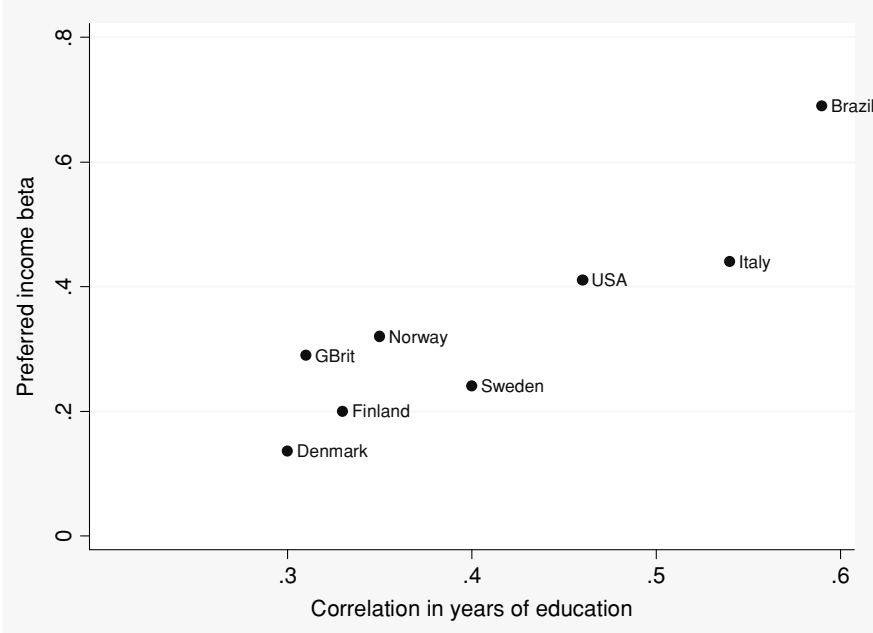


Figure 5. Income and Educational Persistence Compared.

which are characterized by large welfare states; however, it seems unlikely that this is concealing strong persistence in true welfare in these nations. We might also worry about the impact of compensating wage differentials and price variation (Björklund and Jäntti, 2000); and it could be that some of the strong mobility in the USA is likely to reflect geographic diversity (although Aaronson and Mazumder, 2008, argue that this is not the case).

It is perhaps more straightforward to obtain information on the occupation and education of two generations through surveys than it is to obtain this information on income. However, we still face the challenge of ensuring that the variables obtained are a good measure of permanent status. We might expect that adult education is less subject to change than occupation, but it should be noted that increasing numbers of adults are engaging in lifelong learning to improve their education level. The sociology literature has generally been quiet about the impact of intragenerational changes in social class on the validity of international comparisons. Again, as career change becomes more common this lacuna becomes more difficult to justify.

Both the social class and income mobility literatures (as presented here) take very little account of the role of mothers. Erikson and Goldthorpe (1992) justify the use of father's social class as the origin status by arguing that although participation has increased, women's attachment to the work-force, the continuity of their work history and their contribution to family incomes has remained substantively unchanged. Although this might be the case in the 1970s and 1980s, the validity of these assertions is becoming increasingly dubious in the wake of the women's increasing contributions to household income[11] and the growing number of families with no male head (see Office for National Statistics, 2007, for figures for UK). This limitation is not found in the Hertz *et al.* (2007) study of educational mobility, which measures parental education as the average of mother's and father's education whenever possible.[12]

As has already been noted, sociologists take the construction of comparable class measures very seriously (Erikson and Goldthorpe, 1992) in spite of this we may still have concerns about the comparability of measures across countries. Although it should be relatively straightforward for respondents to list their own or their father's occupation, it is a harder job to code these occupations into classes with the same meaning across nations. Changes in occupational structures across time add an additional dimension; can we be confident that the classifications are being adapted equally well across nations? We may also be concerned that the meaning of different education levels might vary across nations, but here there is less room for the subjectivity of the coder as data on years of education is used in the same form as it was recorded.

Given these comments we can see a number of practical reasons why the results for income/education and social class might differ. The fact that two of our measures yield a similar pattern leads us to look for reasons why the social class measures are unreliable. It could be that comparable occupation coding is too difficult to achieve; or that results are influenced by differing rates of intragenerational class mobility between nations; or that the neglect of the role of mothers means that the social measures do not show the full picture. However, it should be noted that all of these criticisms can also be directed at either the income or education approaches. It is possible the combination of all these factors has a more profound effect on social class but there is no compelling reason why this should be so. An alternative explanation is that there are genuine conceptual differences in the rankings and it is to these that we now turn.

4.2 *Conceptual Differences*

Take first the relationship between measured intergenerational persistence in income and education. For the purposes of this exposition we shall assume all variables are measured perfectly.

Recall the linear model of intergenerational income mobility in equation (1):

$$y^*_{ci} = \alpha + \beta y^*_{pi} + u_{1i}.$$

For each generation education has a return in the labour market so that

$$y^*_{pi} = \theta_p + \phi_p Ed_{pi} + v_{pi}, \tag{8}$$

and

$$y^*_{ci} = \theta_c + \phi_c Ed_{ci} + v_{ci}. \tag{9}$$

ψ is the coefficient on parents' education in a regression of child's education. It can be easily shown that the relationship between β and ψ is:

$$\beta = \left(\frac{\phi_c}{\phi_p}\psi\right) * R^2_{Edp} + \frac{\mathrm{Cov}\left(y^*_{ci}, v_{pi}\right)}{\mathrm{Var}(v_{pi})} * \left(1 - R^2_{Edp}\right) + \frac{1}{\phi_p}.\frac{\mathrm{Cov}(v_{ci}, Ed_{pi})}{\mathrm{Var}(Ed_{pi})} * R^2_{Edp}. \tag{10}$$

The first term is the extent of intergenerational persistence in income and earnings if education were the only route for intergenerational transmission. This relationship is moderated by the relative size of returns to education. In addition, it is affected by the size of R^2_{Edp}, if education and income are closely associated then there will be closer relationship between mobility based on the two measures. The second term is the impact of the relationship between within-education group inequalities in parental income and the child's income whereas the third term is the cross effect between parental education and the child's residual earnings. It is clear that although income and education persistence are likely to have a positive correlation there are other components which will lead to this correlation being

less than one. One important element of this is the influence of differences in parental income among parents with the same level of education.

The same framework can be used to express the relationship between social class mobility and income mobility. Once again we need to define the returns to social class in each generation, where *Soc* is a set of categorical variables in the EGP tradition.

$$y^*_{pi} = \eta_p + \delta_p Soc_{pi} + \varepsilon_{pi} \text{ with an } R^2 \text{ of } R^2_{Socp}, \tag{11}$$

$$y^*_{ci} = \eta_p + \delta_c Soc_{ci} + \varepsilon_{ci}. \tag{12}$$

As noted in the review of the social fluidity literature, there is no obvious summary measure of social class fluidity, and in addition the categorical nature of social class means we are unable to estimate a single return parameter for each generation. Instead we combine these two elements and think of the decomposition as a function of the elasticity between income predicted on the basis of social class rather than social class persistence itself.

$$\beta_k = \frac{\text{Cov}(\hat{\delta}_p Soc_{pi}, \hat{\delta}_c Soc_{ci})}{\text{Var}(\hat{\delta}_p Soc_{pi})} * R^2_{Socp} + \frac{\text{Cov}(y^*_{ci}, \varepsilon_{pi})}{\text{Var}(\varepsilon_{pi})} * (1 - R^2_{Socp}) + \frac{\text{Cov}(\varepsilon_{ci}, \hat{\delta}_p Soc_{pi})}{\text{Var}(\hat{\delta}_p Soc_{pi})} * R^2_{Socp}. \tag{13}$$

Björklund and Jäntti (2000) assert that differences in the extent of mobility by income and social class can be explained by the extent to which income not explained by social class is transmitted across generations. Blanden *et al.* (2010a) make a similar argument about the relationship between social class fluidity and income mobility in the UK; asserting that the transmission of income inequality within classes is essential to explaining why the UK has become more immobile on the basis of income at the same time as social class mobility was unchanged (Erikson and Goldthorpe, 2010).

Our literature review indicated more coherence between the income and education results compared to those that measure persistence in social class. The decomposition provides several possible explanations for this. First the decomposition shows that the association between the parameters is affected by the R^2 term. All else equal, different mobility indices will tell a similar story if the measures used to form them are strongly related. In addition, it could be that within social-class transmissions of income are stronger than within-education group income transmissions. If this is true it implies that education explains more of what matters for the economic success of the next generation than social class does.

4.3 *Comparison for the USA and UK*

Although we will never be able to entirely settle the question of whether results based on the different approaches differ for conceptual or measurement reasons, a consideration of different measures within the same data set is useful for two reasons. First, it provides some confirmation that the international rankings for different measures are not entirely spurious; driven perhaps by the use of different data sources. Second, it allows the demonstration of how the decompositions described above are able to reconcile different estimates and rankings.[13]

To investigate we explore two of the commonly used data sets; the PSID for the USA and the 1970 British Cohort Study (BCS). We use the comparable data sets generated for Blanden *et al.* (2010b) which examine the relationship between sons' earnings and total parental income, and merge in information on fathers' and sons' education in years and class for both generations (see notes to Table 6 for more details).

Table 5. Reconciling US and UK Results for Income and Education Persistence.

	β	ψ	ϕ_c	ϕ_p	R^2_{Edp}	$\frac{\text{Cov}(y^*_{ci}, v_{pi})}{\text{Var}(v_{pi})}$	$\frac{Cov(u_i, Ed_{pi})}{Var(Ed_{pi})}$
UK	0.301	0.349	0.144	0.170	0.142	0.260	.039
USA	0.480	0.470	0.268	0.251	0.195	0.412	.065

	β	$(\frac{\phi_c}{\phi_p}\psi) * R^2_{Edp}$	$\frac{\text{Cov}(y^*_{ci}, v_{pi})}{\text{Var}(v_{pi})} * (1 - R^2_{Edp})$	$\frac{1}{\phi_p} \cdot \frac{Cov(v_{ic}, Ed_{pi})}{Var(Ed_{pi})} * R^2_{Edp}$
UK	0.301	$(0.847^{*} 0.349)^{*}$ $0.142 = 0.042$	0.223	.033
USA	0.480	$(1.067^{*} 0.470)^{*}$ $0.195 = 0.098$	0.332	.050
USA–UK	0.181	0.056	0.109	.017

Notes: See page 18 in text for notation.
UK data are derived from the British Cohort Study of those born in 1970. The sample is 2595 sons who have information on parental income (at ages 10 and/or 16), individual earnings (at ages 30 and/or 34) and education and social class for both generations. β is from a regression of averaged earnings on averaged parental income.
US data are from the PSID and it is used to match the BCS data as closely as possible. Years of birth for sons are restricted to 1965–1975. The number of observations used is 355.

The rankings of the UK and USA on income and education mobility are comparable to those shown in the literature review, despite the use of parental income rather than fathers' earnings. The elasticity between sons' earnings and parental income is 0.27 for the UK and 0.48[14] for the USA. In Table 2 our preferred estimates are 0.37 and 0.41. For the education measure we relate standardized[15] years of education across generations and obtain coefficients of 0.35 for the UK and 0.47 for the USA, these results are consistent with the correlations found in Hertz *et al.*, which are 0.31 for the UK and 0.46 for the USA.

The results given in Table 5 show how the findings for income and education relate to one another according to the decomposition given in equation (10). Of a difference of 0.18 in estimated intergenerational income persistence about one third can be accounted for by the difference in education persistence. The majority of the greater income persistence in the USA is due to income transmissions that occur within parental education groups.

We repeat this exercise comparing the income and social class results, showing the results in Table 6. The elasticity of the social class components for the UK is 0.36 and 0.31 for the USA. Even though this does not precisely measure persistence in class, these results are consistent with the findings of the literature review which showed less mobility in social class for the UK; a reversal of the results for income and education. As noted above, this could reflect a closer relationship between income and education compared to income and social class, but this is not the case here; rather more of the variance of parental income is explained by father's social class than by father's education. Instead, Table 6 shows that the within-class components drive all of the stronger income mobility in the USA.

The headline results in Tables 5 and 6 are exactly what we would expect given the findings of the literature review; estimates of mobility diverge more for social class and income than they do for education and income. However, this is not because education provides a better proxy for income but rather because of more persistent within-social class income differences in the USA. Social class and education are similarly correlated with parental income, but in the USA at least, social class does not have the same effect on the economic prospects of the next generation. This could be for a number of reasons, perhaps because individuals with the same level of education are more similar in the ways they invest in their children than those with the same social class, or because parental education is

Table 6. Reconciling US and UK Results for Income and Social Class Persistence.

	β	$\frac{\text{Cov}(\hat{\delta}_p Soc_{pi}, \hat{\delta}_c Soc_{ci})}{\text{Var}(\hat{\delta}_p Soc_{pi})}$	R^2_{Socp}	$\frac{\text{Cov}(y^*_{ci}, \varepsilon_{pi})}{\text{Var}(\varepsilon_{pi})}$	$\frac{\text{Cov}(\varepsilon_{ci}, \hat{\delta}_p Soc_{pi})}{\text{Var}(\hat{\delta}_p Soc_{pi})}$
UK	0.301	0.356	0.221	0.232	0.181
USA	0.480	0.313	0.254	0.410	0.373
	β	$\frac{\text{Cov}(\hat{\delta}_p Soc_{pi}, \hat{\delta}_c Soc_{ci})}{\text{Var}(\hat{\delta}_p Soc_{pi})} * R^2_{Socp}$		$\frac{\text{Cov}(y^*_{ci}, \varepsilon_{pi})}{\text{Var}(\varepsilon_{pi})} * (1 - R^2_{Socp})$	$\frac{\text{Cov}(\varepsilon_{pi}, \hat{\delta}_p Soc_{pi})}{\text{Var}(\hat{\delta}_p Soc_{pi})} * R^2_{Socp}$
UK	0.301	0.079		0.181	0.040
USA	0.480	0.079		0.306	0.095
USA–UK	0.181	0.000		0.125	0.055

Notes: See page 18 in text for notation.
See Table 4 for information on data.
The social class variable in the US data is the 8-category NS-SEC (Rose and Pevalin, 2005) for both generations (measured around age 34 for sons, and when the son was around 14 for fathers).
The NS-SEC is used for sons in British BCS data (age 34) and a modified Goldthorpe scheme is used to measure social class when the son is 10 (Goldthorpe and Jackson, 2007).

a better predictor of childhood socio-economic status than fathers' social class is. It is also possible that the greater importance of within-group income differences in the USA could be generated by less measurement error in income relative to social class there than in the UK; we cannot altogether dismiss issues of data quality.

So what should we take away from this discussion? Should we conclude that results based on income and education are preferable to those based on social class? Or should results be selected depending on whether the reader is primarily interested in economic status, or the broader concept of social status as measured by social class. Although there are undoubted difficulties with social class as a measure, this is also true of the income and education measures used, and consequently it does not seem correct to dismiss the measure of social class mobility as inherently poorer. The analysis here indicates that there is real variation across countries in the extent to which parental income and father's social class predict later outcomes, indicating that the two have different, but arguably equally valid, conceptual bases.

5. Explaining Patterns in Income and Education Mobility

This paper has so far provided a (selective) review of the literature on international comparisons of intergenerational mobility and found some common themes in the story presented by the different approaches. The next step is to try to explain the differences between nations. We first review the theoretical perspectives that have been taken on this question before considering some evidence from a cross-country comparison. Our findings so far encourage us to use the income and education measures of mobility here as these share more common ground. We are conscious of the limitations of this cross-country approach, and use our findings to motivate future directions for this research agenda.

Becker and Tomes (1986) provide the original economic model of intergenerational income mobility. The framework is based on the idea that parents make optimal financial investments in their children. In a model where parents and children have perfect access to credit markets there will be no direct relationship between parental income and investments. Any relationship between incomes across generations will be driven entirely through the inheritance of characteristics rewarded in the labour market (labelled endowments). Public policy can lead to an increase in mobility in two ways, by making

investments in less-favoured children (weakening heritability) and by financing higher education to ameliorate the effect of credit constraints. As pointed out by Goldberger (1989) the investment argument is only valid if public and private investments are substitutes in the production of human capital, if the two are complementary then public investments can reduce mobility.

Solon (2004) builds on the Becker–Tomes framework and provides an economic model which explains intergenerational mobility as a function of parental and public investments in children. He shows that intergenerational income persistence will be higher if heritability is higher, if the productivity of investment in education is higher, if the returns to education are higher and if government investment in human capital is less progressive. Solon also shows that the same parameters are important for generating income inequality so that inequality and intergenerational persistence will tend to have a positive relationship.

We might also think of other more direct connections between inequality and mobility. If the distribution of income is wider in country A than country B children at the bottom may be relatively more disadvantaged in country A and will face greater barriers to upward movement. The desire to improve intergenerational mobility in the UK is one motive for policies that aim to eradicate child poverty.

The preceding discussion leads us to focus on two broad dimensions by which countries may differ and which may help to explain differences in the extent of mobility; inequality and education (both investments in and returns from). It should be noted from the outset that there are strong connections between inequality, educational returns and educational investments, which will make it difficult to disentangle the differential importance of these effects. Both the Solon and Becker models illustrate clearly that increases in the return to education will increase inequality, and this is shown empirically by Katz and Autor (1999) for the USA and Machin (1998) for the UK.

The extent and progressivity of educational investments are also likely to be influenced by the degree of inequality with society; the direction of the effect will depend on where political power is located. If power resides with the median voter then greater inequality may lead to more redistributive spending (Romer, 1975), but if it resides with the economic elite then the reverse might be the case (Burtless and Jencks, 2003). Educational investments are likely to depend on the returns that they yield, adding yet another layer of interrelation. As well as interactions between the explanatory variables it is also possible that some of the explanators are endogenous with respect to intergenerational mobility, for example, if intergenerational mobility is low the state may try to improve it by making progressive investments in education. In the remainder of the paper we shall correlate measures of inequality, public educational investment and private educational returns with our preferred measures of income and education persistence, keeping in mind the difficulties of interpretation discussed above.

5.1 *Cross-Sectional Income Inequality*

The relationship between mobility and inequality is of considerable interest. The American Dream is based on the hypothesis that inequality is less of a concern if it is coupled with high mobility. If greater inequalities go hand-in-hand with fewer opportunities it is much more alarming. Our basic picture of Nordic countries at the top of the mobility ranking and South America at the bottom certainly points towards a negative correlation between the two. This relationship has also been demonstrated internationally by Corak (2006), Björklund and Jäntti (2009) and Andrews and Leigh (2009) whereas Aaronson and Mazumder (2008) demonstrate a close positive relationship over time between US inequality and the intergenerational elasticity. We check that this holds in the countries we have here, but our innovation lies in experimenting with using different measures of inequality and child poverty.

Our inequality measures are predominantly taken from the Luxembourg Income Study (LIS) which provides cross-nationally comparable estimates for various measures of income inequality and child

Table 7. Correlations between Inequality and Intergenerational Mobility.

	Preferred Income β	Years of Education Correlation
LIS measures early-mid 1980s		
Income Gini	0.58 [11]	0.63 [13]
Atkinson coefficient $\varepsilon = 0.5$	0.58 [11]	0.62 [13]
90/10	0.59 [11]	0.56 [13]
90/50	0.65 [11]	0.64 [13]
80/20	0.61 [11]	0.51 [13]
Child poverty	0.64 [11]	0.54 [13]
World Bank measure late 1970s to early 1980s		
Income Gini	0.64 [12]	0.49 [22]
Later LIS inequality		
Gini 1995	0.87 [11]	0.49 [13]
Gini 2000	0.84 [11]	0.33 [15]

Note: The number of countries used to calculate the correlation is given in square brackets. The 11 countries used to calculate the correlations in the first column are those in Table 1 apart from Brazil, which joined the LIS in the most recent wave. The 13 countries with information in the LIS and in the Hertz study are Switzerland, USA, Ireland, Poland, Sweden, UK, Italy, Norway, Denmark, Finland, Hungary, the Netherlands and Belgium. The world bank measures is available for all of these apart from the last two plus New Zealand, the Czech Republic, Chile, Peru, Brazil, Indonesia, Egypt, Philippines, Nepal, Malaysia and China.

poverty. Led by the theoretical discussion above we consider inequality measured at two points, when the children were growing up and when their adult outcomes are measured. As we have focused on children who were born around 1960 we would ideally require income inequality measures for the 1970s. The number of nations for which inequality data is available in the LIS increases as we consider more recent years. We start with 1982, but for those countries where this is not available we use the earliest that is. LIS inequality data are available for 11 of the 12 countries which have a preferred income β, and 13 of the 42 countries included in Hertz *et al*. We supplement this information with income inequality taken from the World Bank data set based on Deininger and Squire (1996), which is also used by Andrews and Leigh (2009). This provides inequality measures for the late 1970s/early 1980s, and covers 12 of the countries with information on income inequality and 22 of the countries in the Hertz *et al.* study. Information on inequality in the adult years is available for 1995 and 2000 from the LIS.[16]

Table 7 provides the correlations between income inequality and our measures of intergenerational immobility. In all cases these are positive. Nations with high inequality tend to have high persistence in income and education. There are some interesting variations in the strength of these correlations; these are worth noting although we must bear in mind the small sample sizes involved.

Taking the table as a whole the majority of correlations are quite large (over 0.5), indicating a strong positive relationship between inequality and intergenerational mobility. It is notable that the correlation between educational mobility and inequality is very similar using the LIS and World Bank measures, even though the World Bank measure includes many more developing countries. There are some interesting differences across the measures, with our preferred income beta tending to be most strongly correlated with income inequality in adulthood whereas the education measure shows a larger association with inequality levels earlier in the relevant cohort's life. This is not surprising as the

income beta is most likely to pick up the influence of labour market returns whereas the education measure is more dependent on the opportunities available to the cohort as young people.

There is no consistent evidence that the child poverty measure is more strongly correlated with immobility than are the general measures of inequality. Indeed, rather counter-intuitively it appears that the measures related to income inequality at the top of the distribution (the 90–50 ratio) has a stronger association with immobility than the other measures of income inequality, although the size of these differences is too small for us to discriminate such patterns with any certainty.

Our theoretical discussion of the relationship between inequality and mobility highlighted two possible mechanisms. One was that inequality and immobility tend to be generated by the same factors and that we would therefore expect the two to be correlated at the end of the process (when the second-generation are adults). The second is that inequality in childhood inhibits equality of opportunity. The evidence presented in Table 7 indicates that it is inequality in childhood that matters for both income and education persistence although our preferred income mobility estimates are also very strongly correlated with inequality in adulthood. This is because intergenerational income mobility is influenced by the adult returns to characteristics such as education and occupation.[17]

Figures 6a and b show the relationship between the preferred beta and the Gini coefficient in the early 1980s and in 1995. These figures reveal why the correlation with income mobility is stronger for inequality measured in 1995 than in the early 1980s. The two key observations seem to be Denmark, for which inequality fell by about an eighth to match the low level of intergenerational persistence, and Britain where inequality rose by 25% over the period. One should be cautious in interpreting these results as a consequence, especially given the uncertainty about the British estimate of beta.

This preliminary analysis of the relationship between inequality and mobility has indicated several interesting pieces of evidence. (1) There is the expected relationship between inequality and mobility. (2) The relationship between mobility and poverty is not driving this, inequality at the top is important as well. (3) Inequality in childhood has a strong negative relationship with both of the measures of equality of opportunity, but income mobility is also affected by inequality in adulthood.

5.2 *Educational Investment*

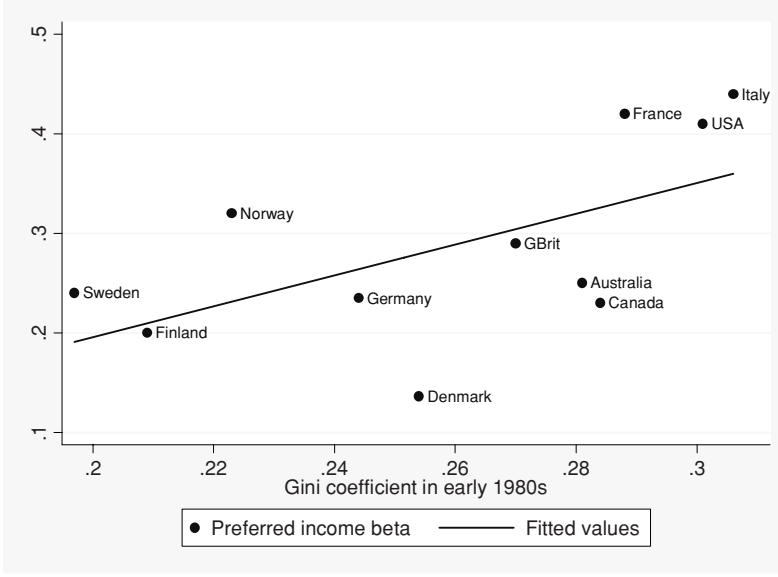
Solon (2004) highlights the importance of the progressivity of educational expenditure as a factor leading to greater mobility, although as noted above complementarity between public and private investments may mean that state involvement is mobility reducing.

We are rather limited in the way we can operationalize this concept. The OECD *Education at a Glance* provides a large amount of information on education spending, such as the proportion of spending coming from private and public sources. However this information is not available for the 1970s. Instead we use information from Barro and Lee's (1994) international panel data set. This provides Government education spending as a proportion of GDP, for both total and recurring expenditures. This measure will confound the level of total spending relative to GDP with the extent to which spending on the education is carried out by Government. We take average figures from 1965 to 1969 (the primary school years for the 1960 cohort) and 1970 to 1974 (the early secondary school years) and once again correlate these with our measures of mobility.

Table 8 shows the expected negative relationship between education spending and intergenerational persistence. Those countries which devote more of their income to public spending on human capital investment tend to be more mobile. This correlation is slightly stronger with the income beta than with the education correlation, and these two variables are graphed in Figure 7. There is no consistent pattern for which measure of spending is most strongly correlated.

The international correlations have tended to support Becker's prediction about the relationship between educational investment and mobility. However, this is in contrast to recent papers which

a) Early 1980s



b) 1995

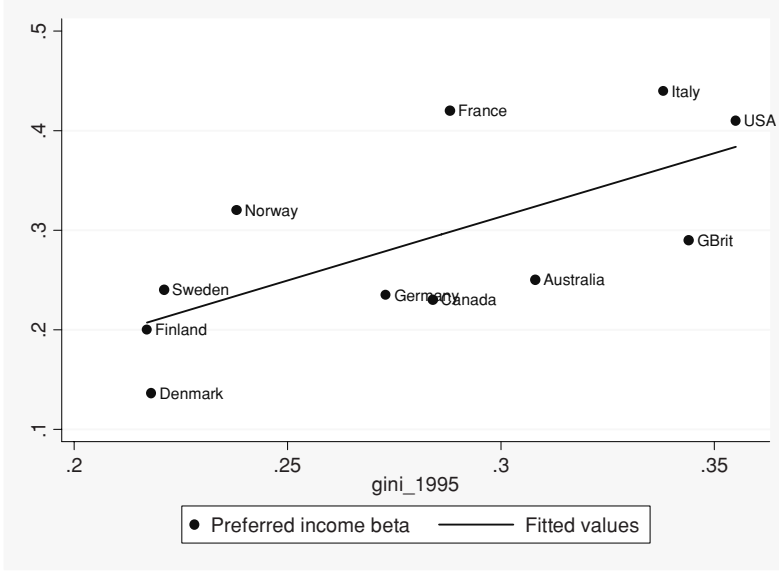


Figure 6. Associations between the Income Beta and Gini coefficient. (a) Early 1980s. (b) 1995.

Table 8. Correlations between Education Spending and Intergenerational Mobility.

	Education spend% GDP 1965–1969	Education Spend% GDP 1970–1974	Recurring Education Spend% GDP 1965–1969	Recurring Education Spend% GDP 1970–1974
Preferred Income β	−0.566 [12]	−0.627 [12]	−0.594 [12]	−0.573 [12]
Years of education correlation	−0.462 [21]	−0.498 [22]	−0.434 [23]	−0.487 [22]

Note: The number of countries used to calculate the correlation is given in square brackets.

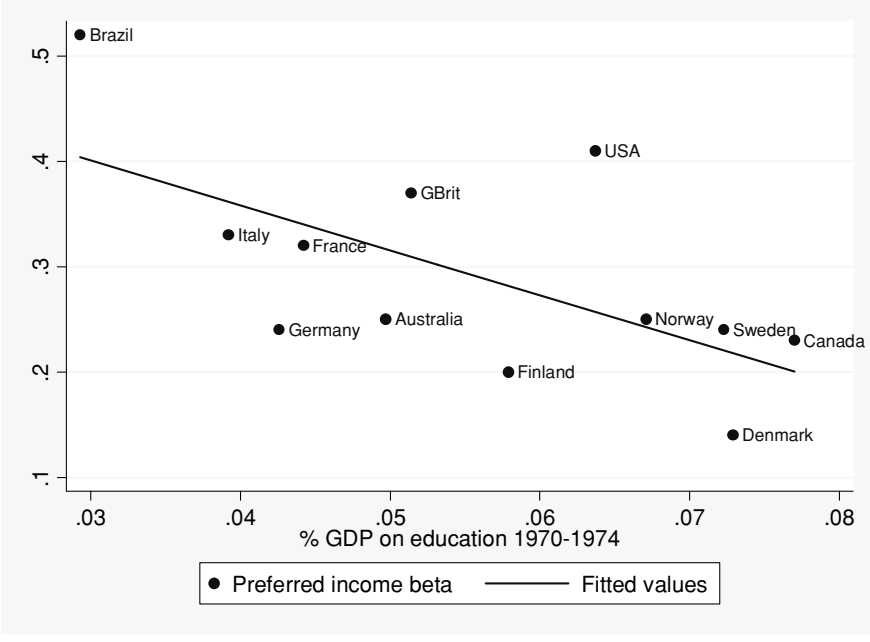


Figure 7. Association between Income Beta and Education Expenditure.

empirically test this relationship using US only data. Grawe (2007) uses state level variation in pupil–teacher ratios and mobility to assess this relationship and finds that states with lower pupil–teacher ratios tend to have less mobility. This finding is also confirmed by Parman (unpublished data) for a more specific setting; improved school access tended to lead to reduced mobility in early-20th century Iowa. A possible explanation between the conflict between international and within US findings is that there is a strong relationship between education spending and other important variables across countries. For example, the correlation between the Gini coefficient and education spending is in the region of –0.3 to –0.5. Unfortunately we do not have enough data to robustly compare the influence of individual variables and this is an argument for the increased use of innovative approaches which do not rely entirely on international comparisons.

Table 9. Correlations between Education Returns and Intergenerational Mobility.

	Returns to Each Year of Education	Returns to Higher Education
Preferred Income β	0.625 [13]	0.826 [9]
Years of education correlation	0.278 [32]	0.318 [22]

Note: The number of countries used to calculate the correlation is given in square brackets.

5.3 *Returns to Education*

A further prediction from Solon is that income mobility will be weaker when the returns to education are larger. Recall the relationship between intergenerational income mobility in country (β) and the correlation in education across generations (ψ). Clearly the return to education for the child has a positive relationship with the income β. We might also suspect that ψ will have a positive link to the return to education as better-educated parents will have a greater incentive to invest their extra resources in their children's education if the returns to this are higher.

Table 9 gives correlations between our mobility measures and the returns to education as listed in Psacharopoulos and Patrinos (2004). Two measures are used, the average return to a year of education and the return to higher education. The higher education measure is more strongly related to mobility than the average measure. This could be interpreted as being because higher education is the most important route for intergenerational persistence/mobility, but it may also be the case that the higher education return is subject to less measurement error across countries. Our predictions concerning the relative strength of correlations with different measures of mobility are also found to be accurate. Both measures of returns are correlated more strongly with income mobility than with educational mobility. This is because income mobility is influenced by income returns through the final outcome (earnings) whereas educational mobility will only be influenced by returns because of the incentives to invest.

Figure 8 shows a scatterplot of the relationship between higher education returns and the income beta. This graph provides a clue as to why the income and education rankings differ for Germany; Germany has a low return to education compared with Italy and France. The trend results reported in Psacharopoulos and Patrinos show that Germany has experienced a falling return to education which would also lead to a lower β relative to ψ.

6. Conclusions – How Much Can We Learn from International Comparisons of Social Mobility?

As with many other papers on intergenerational income mobility this paper has pointed to some important gaps in our knowledge. We can only find high-quality estimates of income persistence for 12 nations, and we cannot be confident about how to rank the mobility of these nations. It is therefore essential that longitudinal data sets continue to be developed and updated and that administrative income registers are exploited wherever possible. Politicians' interest in social mobility shows no sign of waning and it is essential that researchers continue to offer up-to-date estimates of equality of economic opportunity for as many nations as possible.

In light of our current knowledge, this paper suggests that findings on intergenerational income and education persistence point to a similar ranking of countries. It seems that for economists interested in the intergenerational transmission of economic status education mobility provides a reasonable guide when data on income is unavailable or unreliable. We find South America, other developing nations

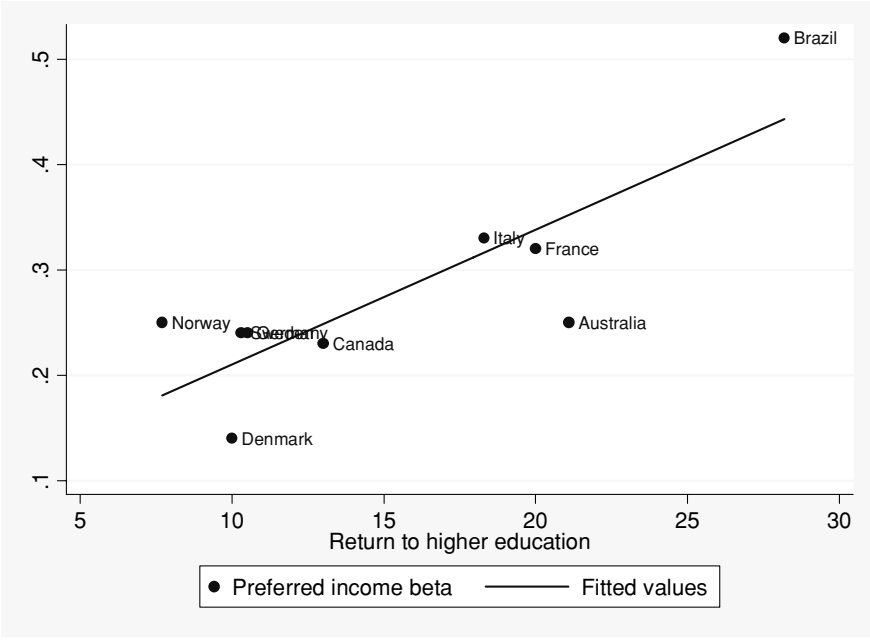


Figure 8. Relationship between the Income Beta and the Return to Higher Education

and southern Europe at the more persistent end and the Nordic nations consistently exhibiting high mobility. Father's social class is less good at tapping into the factors that shape *economic* success in the next generation, but that is not to say that it is not interesting in its own right.

Our examination of the factors generating differences in mobility provides some explanations for the international rankings that we find. Lower mobility in both income and education tends to be correlated with greater inequality, lower educational spending and higher returns to education. Our results on the relationship between inequality and mobility also point towards some other conclusions. The first is that inequality in childhood/youth is strongly related to both education and earnings persistence, whereas measures of inequality in adulthood are more strongly related to earnings persistence. These findings work against the hypothesis that inequality and mobility only vary together because they are driven by the same processes. A second finding is that inequality at the top end of the distribution is more strongly linked to mobility than inequality at the bottom; it is not simply differences in child poverty that drives the inequality–mobility relationship. This is worth bearing in the mind for the UK where most measures of inequality have levelled off since 1997 but top income shares have continued to rise (Brewer *et al.* 2008). These results also appear to chime with the recent literature on non-linearities in intergenerational income persistence (Bratsberg *et al.*, 2007; Björklund *et al.*, 2010), which finds strong income correlations at the very top of the parental income distribution, where incomes are very unequal.

The finding that countries with greater education spending have more mobility also has obvious policy implications. However, one should be cautious about assuming that any rise in spending relative to GDP will have a positive effect on mobility; we do not know enough at this stage about how the money must be spent to be effective.

Coming to our third explanatory variable, the returns to education, it is not obvious that Governments should seek to reduce this as an end in itself. However it is the case that as more young people become highly qualified and educational opportunities are expanded the returns are likely to fall due to a rise in supply. An even expansion in educational qualifications across all family backgrounds will therefore have a 'double whammy' effect on mobility, reducing the heritability of education and the reward to education in terms of income.

In order to derive more robust policy recommendations we would need evidence that when education spending, inequality, and education returns change the rate of mobility changes, with sufficient observations to allow us to unpack the influence of different variables. Some evidence on this comes from Blanden *et al.* (2004) who find a fall in mobility as inequality widened in the UK. However, a more persuasive assessment of these questions would require a large panel data set to link changes in mobility across countries to changes in our other variables of interest.

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Notes

1. This linear formation is common, but the literature is increasingly taking into account the impact of nonlinear relationships in earnings across generations. Bratsberg *et al.* (2007) consider this issue in an internationally comparative context, whereas Björklund *et al.* (2010) demonstrate strong income persistence for those with very high-income parents in Sweden and Corak and Piraino (2010) stress the intergenerational correlation of employers as a possible explanation for the non-linearities they find in Canada.
2. These assumptions are that permanent income is uncorrelated with the size of the measurement error, and that measurement errors are uncorrelated across generations (Zimmerman, 1992, footnote 9).
3. All the studies quoted show that current income underestimates permanent income in early career; this implies that intergenerational persistence is biased downwards for young sons. Results for late career indicate stark differences between the US and European results. In the USA late career current income underestimates permanent income but in Sweden and Germany current income overestimates permanent income for older workers, implying that the impact of fathers' age on estimates might vary across these nations.
4. These data provide correlations by nation, cohort and level of experience. We might expect that intergenerational correlations for the same nation and cohort would be similar; however, this does not appear to be the case. If we consider results for those joining the labour market between 1980 and 1985 the intergenerational socio-economic index correlation at 5 years experience has a 0.06 correlation with the same correlation at 15 years experience and a correlation of 0.30 with the same measure at 25 years of experience. These figures are based on 18 countries, the greatest number available for this type of comparison.
5. Jonsson *et al.* (2009) provide an alternative approach to measuring mobility based on taking occupations as a unit in themselves. As this approach is only beginning to be used to measure international

comparisons we shall not consider this further here, but rather mark this new literature as 'one to watch'.

6. This weakness is not shared by the log-linear approach to social class fluidity which allows complete flexibility in the relationship between different social classes across generations.
7. There is also a large literature on educational inequalities in sociology; however, this focuses for the most part on the relationship between origin social class and educational attainment. Breen and Jonsson (2005) provide a review of cross-country comparisons and conclude that 'there is only scattered knowledge about how different contemporary countries 'rank' in terms of inequality of educational attainment' (p. 227).
8. Another concern is that the bias may differ for different combinations of instruments. In our favour is that Solon (1992) uses only the father's years of education, whereas Björklund and Jäntti (1997) use his education and occupation, the scaling factors from the two papers is the same. Zimmerman (1992) uses the Duncan occupational index and finds a similar difference between the results based on time-averaging and IV. For full details of the instruments used in the studies selected here see Appendix Table A1.
9. In contrast to the other measures of mobility we do not have standard errors available to add to these graphs, so we are not able to comment on their precision. There is possible to obtain standard errors using maximum likelihood estimation (see Turner and Firth, 2008) and it would be useful if this became standard practice in this literature.
10. However Erikson and Goldthorpe urge caution due to measurement problems in the US data and assert that this may over-state the extent of mobility in this nation; 'the true position of the USA in the rank order should be seen as lying much closer to that of England' (p. 382, footnote 8). Acknowledgement of this would shift the US towards the middle, but there is no suggestion that the USA is particularly immobile in social class.
11. Fry and Cohn (2010) show that among prime-age couples in the USA, 22% of wives now earn more than their husbands, compared to just 4% in 1970).
12. With information on father's education available in 87% of usable cases and information on mother's education available for 92% of these cases, it seems that the great majority of observations of parental education will be based on the average (Hertz, 2007, footnote 8).
13. A similar approach is used by Hertz *et al.* (2007) who use it to compare findings on education and income mobility in the PSID.
14. Blanden *et al.* (2010b) report a lower estimate of intergenerational income mobility for the USA, based on slightly different sample selection decisions. However, the USA–UK ranking is the same in this case.
15. Standardization moderates the very narrow distribution of education among UK fathers which would otherwise distort the results. The bivariate regression coefficient between two standardized variables is identical to the correlation.
16. An alternative source of inequality information is the share of top incomes, as brought together by Leigh (2007b); unfortunately these are only available for seven of the countries for which we have information on intergenerational income mobility.
17. Given our discussion of the impact of changes in inequality on the intergenerational elasticity (page 7) we might expect that the beta will be closely related to the ratio of inequality in 1995 to inequality in 1982. In fact this correlation is 0.4 (on 16 observations). It seems that the relationship with inequality in the son's generation is not driven by this.

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Journal of Economic Surveys (2013) Vol. 27, No. 1, pp. 38–73

Appendix

Table A1. Summary of International Literature on Intergenerational Persistence for Sons.

Study	Country	Data Source	Son's Outcome Variable	Father's Income Variable	Approach to Measurement Error	$\hat{\beta}$	$\hat{\rho}$
Solon (1992)	USA	Panel Survey of Income Dynamics	Log annual earnings in 1984, ages 25–33.	Log annual earnings, 1967–1972.	5-year average of father's earnings.	0.41 (0.09)	
			Log annual earnings in 1984, ages 25–33.	Log annual earnings in 1967.	Father's education used as an IV.	0.53 (0.014)	
Zimmerman (1992)	USA	National Longitudinal Survey	Log annual earnings in 1981, ages 29–39.	Log annual earnings over 1966–1971.	4-year average of father's earnings.	0.54 (0.08)	
			Log annual earnings in 1981, ages 29–39.	Log annual earnings in 1971.	Duncan Index used as IV.	0.67 (0.15)	
Mazumder (2005)	USA	Survey of Income and Program Participation matched to Social Security Record	Log of average earnings over 1995–1998; sons born 1963–1968.	Log annual earnings over 1970–1985.	16-year average of father's earnings.	0.61 (0.10)	
Couch and Dunn (1997)	Germany and the USA	German Socio-Economic Panel and PSID	Log annual earnings averaged over 1984–1989, sons on average aged 23 in Germany, 25 in the USA.	Log annual earnings averaged over 1984–1989.	5-year averages	Germany: 0.11 (0.06)	
						USA: 0.13 (0.06)	
Wiegand (1997)	Germany	German Socio-Economic Panel	Log monthly earnings in 1994; sons aged 27–33.	Log monthly earnings averaged over 1984–1989.	5-year average	0.32 (0.07)	
Vogel (2008)	Germany	German Socio-Economic Panel	Sons observed in 2003 at ages 25–50 with average 34.4. Thus they were born: 1953–1978.	Fathers observed at ages 27–56 with average 43.4.	5-year average	0.246 (0.084)	

(*Continued*)

Table A1. *Continued*.

Study	Country	Data Source	Son's Outcome Variable	Father's Income Variable	Approach to Measurement Error	$\hat{\beta}$	$\hat{\rho}$
Björklund and Jäntti (1997)	Sweden and the USA	Swedish Level of Living Survey and PSID	Log annual earnings in 1990, sons born 1952–1961.	Father's earnings predicted from education and occupation in a separate data set.	TSIV	Sweden: 0.36 (0.11) USA: 0.52 (0.14)	Sweden: 0.29 (0.09) USA: 0.41 (0.11)
Gustafsson (1994)	Sweden	Matched register and tax data, for fathers in Stockholm 1955	4-year average of log individual income; sons born 1939–1945.	Father's individual income in 1955.	4-year average	0.14 (0.07)	
Österberg (2000)	Sweden	Matched register data	Sons aged 25 and over in 1990, earnings averaged 1990–1992	Fathers' average earnings in 1978–1980	3-year average	0.129 (0.011)	
Björklund and Chadwick (2003)	Sweden	Matched register data	Sons born 1962–1965, earnings observed in 1999.	Father's income averaged from 1970 to 1975	5-year average	0.24 (0.01)	
Hirvonen (2007)	Sweden	Matched register data	Sons born 1960–1966 earnings averaged over 1997–2000	Parental income averaged 1970–1975.	5-year average	0.275 (0.004)	
Österbacka (2001)	Finland	Finnish quinquenniel population census	Log average annual earnings in 1985, 1995, 2000; sons born 1950–1960.	Log average annual earnings in 1970 and 1975.	2-year average but 5 years apart	0.13 (0.005)	0.156 (0.006)
Pekkarinen *et al.* (2009)	Finland	Finnish quinquenniel population census	Son's earnings in 2000 at ages 34–40, born 1960–1966.	Father's earnings averaged over 1970,1975, 1980, 1985, 1990 at an unknown age.	Average over 5 periods, in total 20 years apart.	0.23–0.30 (around 0.020)	
Nilsen *et al.* (forthcoming)	Norway	Matched register data	Sons earnings averaged over ages 36–40; born 1959–1962.	Father's earnings averaged over different periods. Fathers born 1927–1942.	Time averaging, as reported in next column	67–71: 0.338 72–76: 0.282 77–81: 0.253 82–86: 0.163 67–91: 0.292	

Hussein, Munk and Bonke (2008)	Denmark	Matched register data	Son's annual earnings in 2000 at ages 30–40, born 1960–1970.	Father's aunnual earnings averaged over 1984–1988 when aged 30–66.	Average over 5 years	0.136 (0.004)	Not reported
Corak and Heisz (1999)	Canada	Matched income tax data	Log annual earnings in 1995; sons born 1963–1966.	Father's log annual earnings averaged over 1978–1982.	5-year average of father's earnings	0.23 (0.01)	
Atkinson (1981)	UK	Follow-up of Rowntree York Sample	Log weekly earnings at survey date (1975–1978).	Log weekly earnings in 1950.	None	0.36 (0.03)	
Dearden *et al.* (1997)	UK	National Child Development Survey	Log weekly earnings at age 33 for a cohort born in 1958.	Father's log weekly earnings when son aged 16.	IV using father's education and social class	0.58 (0.06) OLS results are 0.24 (0.027)	
Nicoletti and Ermisch (2007)	UK	British Household Panel Survey	Average log earnings over 1991–2003 for sons born 1952–1970	Information on occupation, education and age of fathers used to predict their earnings. Prediction is from older men in 1991 or as close to as possible.	TSIV	0.29 (0.06)	
Lefranc and Trannoy (2005)	France	French Education–Training –Employment surveys 1964–1993 (FQP)	Log annual earnings for sons aged 30–40, 1993 FQP.	Information on father's education and social class used to predict earnings from similar-aged men in FQP.	TSIV	Approx. 0.4	

(*Continued*)

Table A1. *Continued*.

Study	Country	Data Source	Son's Outcome Variable	Father's Income Variable	Approach to Measurement Error	$\hat{\beta}$	$\hat{\rho}$
Piraino (2007)	Italy	Bank of Italy Survey on Household Income and Wealth (SHIW)	Log annual earnings in 2000, 2002, 2004 for 30–45 year olds whose fathers were born between 1927 and 1949	Information on father's education, employment status, occupation and region used to predict income from men in 1977–1979 SHIW aged 30–50.	TSIV	0.435 (0.035)	
Mocetti (2007)	Italy	SHIW as above	Log annual earnings in 2000, 2002, 2004 for 30–50 year olds	Information on education, sector, region and occupational qualification used to predict income from men in 1977–1980 aged 30–50.	TSIV	0.499 (0.051)	
Leigh (2007a)	Australia	Household Income and Labour Dynamics in Australia	Log annual earnings in 2004 for sons aged 25–54.	Average earnings in 2004 for men in father's occupation where father's occupation is recalled by adult son.	TSIV	Australia: 0.2–0.3	Correlation likely smaller than elasticity
		PSID				USA: 0.4–0.6	
Dunn (2007)	Brazil	PNAD cross-sectional data	Log annual earnings in 1996 for sons aged 25–34.	Earnings are predicted from father's education, education and earnings relationship is obtained from males aged 30–50 in the 1976 survey.	TSIV	0.688 (0.014)	

Journal of Economic Surveys (2013) Vol. 27, No. 1, pp. 38–73

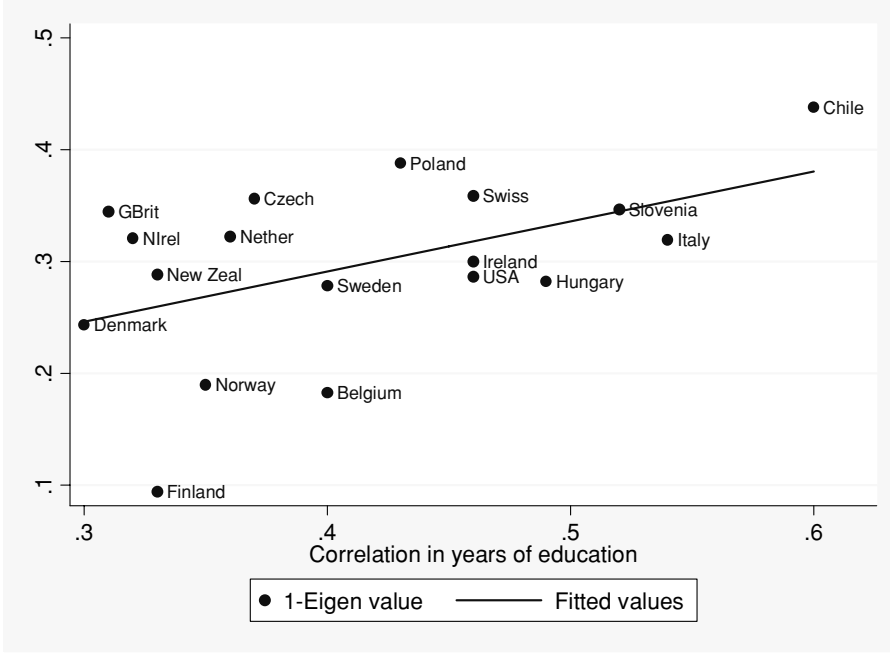

Figure A1. The Relationship between Our Two Measures of Educational Mobility.

Source: Correlations are from Hertz *et al.* (2008) and Chevalier *et al.* (2009). The correlation between two measures is 0.49, regression line has slope 0.45. If Chile is excluded the correlation and coefficients reduce to around 0.33.