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The link between family background and later lifetime income: how does the UK compare to other countries?

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Abstract

The link between family background and labour market outcomes is an issue of great academic, social and political concern. It is frequently claimed that such intergenerational associations are stronger in Britain than other countries. But is this really true? I investigate this issue by estimating the link between parental education and later lifetime income, using three cross-nationally comparable datasets covering more than 30 countries. My results suggest that the UK is broadly in the middle of the cross-country rankings, with intergenerational associations notably stronger than in Scandinavia but weaker than in Eastern Europe. Overall, I find only limited support for claims that family background is a greater barrier to economic success in Britain than other parts of the developed world.

JEL classification: J62

Keywords: intergenerational mobility, parental education, income, PIAAC, EU-SILC

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1. Introduction

The link between family background and labour market outcomes is an issue of great academic, social and political concern. In no country has this generated more interest than the UK, where Nick Clegg, the Deputy Prime Minister, has described increasing social mobility as the coalition government's '***overriding social policy goal***' (Clegg 2010). One of the key reasons why this has become a major focus of British public policy is the widespread belief that '*the United Kingdom is a low social mobility society compared to other developed countries'* (Social Mobility and Child Poverty Commission 2013). Indeed, stories regularly appear in the British media stating that '*Britain has some of the lowest social mobility in the developed world*' (The Guardian 2012), with the Secretary of State for Education, Michael Gove, even declaring that *'those who are born poor are more likely to stay poor, and those who inherit privilege are more likely to pass on privilege, in England than in any comparable country*' (The Times 2012).

But are such statements really true? A number of academics (Saunders 2012; Erickson and Goldthorpe 1992; Blanden 2013) have noted that the UK falls squarely in the middle of cross-country rankings when social mobility is measured in terms of social class. It is only when one focuses upon intergenerational *income* mobility, the link between the income of fathers and the income of their sons, that there is any evidence that family background is more important in Britain than other developed countries.

Estimates of income mobility are usually based upon the following simple linear regression model:

$$\log(Y_{Offspring}) = \alpha + \beta.\log(Y_{parent}) + \varepsilon \qquad (1)$$

Where:

$Y_{Offspring}$ = Permanent income of offspring (typically sons)

Y_{Parent} = Permanent income of parents (typically fathers)

The parameter of interest from (1) is $\hat{\beta}$, known as the intergenerational income elasticity. This is the most frequently used measure of income mobility within the cross-national comparative

literature[2]. To interpret $\hat{\beta}$ is simple; the greater its value, the stronger the association between a person's family background and the income they acquire during adult life[3].

It is comparisons of $\hat{\beta}$ across countries that have led many to believe that social mobility is low in the UK by international standards. Table 1 presents findings from six widely cited comparative studies of income mobility, with countries towards the bottom of this ranking being the least 'socially mobile'. Britain's position does seem relatively poor; it is placed 7th out of 8 countries included in Blanden, Gregg and Machin (2005: Table 2), 8th out of 11 countries in Björklund and Jäntti (2009: Figure 20.1) and 17th out of 21 countries in Corak (2012: Figure 1). However, '*there is considerable uncertainty about [the] country rankings*' presented in Table 1 (Blanden 2013:39), with it being particularly difficult to reach firm conclusions about the position of the UK (Gorard 2008; Björklund and Jäntti 2009; Saunders 2012). This uncertainty stems from the following four issues.

<< Table 1>>

Limited number and selection of countries. Firstly, as illustrated in Table 1, a limited number of countries are included in such comparisons. Moreover the Scandinavian countries, known for their equality and high social welfare spending (Esping-Anderson 1990), are disproportionately represented. In other words, Britain is usually compared against quite a small and specific set of benchmarks. This limits what one can say about how the UK compares to a broad selection of other developed nations.

Lack of statistical significance. Secondly, differences between the UK and most other countries are <u>not</u> statistically significant at conventional thresholds (a star next to the parameter estimate in Table 1 indicates whether a country is significantly different to the UK at the five percent level). This means that one cannot rule out sampling variation as an explanation for the disappointing position of the UK. Indeed, once statistical significance is considered, the only broadly consistent finding is that income mobility may be lower in

[2] The intergenerational correlation (r) is an alternative measure. This involves re-scaling $\hat{\beta}$ to take into account differences in income inequality between the fathers' and sons' generation. Although Björklund and Jäntti (2009) note that this measure has significant advantages, it is less frequently reported than the income elasticity.
[3] As noted by Beller (2009) and Blanden (2013), if certain traits are to some extent inherited across generations (e.g. beauty, height, strength, intelligence), then it is not plausible, nor perhaps desirable, for there to be absolutely no association between family background and labour market outcomes in any country (including the UK). This, however, leads to difficulties in interpretation; how do we know whether intergenerational associations are particularly weak or strong? To overcome this issue, academics focus upon *comparative* measures of social (income) mobility – has it changed over time and how does it compare across countries?

Britain than Scandinavia (and perhaps Canada). Although insightful, this is rather different to income mobility being lower in Britain than '*any comparable country*' (Gove 2012).

Differences in statistical methodology. Thirdly, different statistical methods have been used to produce income mobility estimates for different countries – including Ordinary Least Squares (OLS), Instrumental Variables (IV) and Two-Sample Two-Stage Least Squares (TSTSLS). This is a particular problem in studies including a larger number of countries (e.g. Corak 2012) where authors have to be less restrictive on the comparability of methods and the data used. Nevertheless, this can severely bias cross-national comparisons. Indeed, in a companion paper (Jerrim, Choi and Rodríguez 2013) I illustrate how IV and TSTSLS estimates of Equation 1 are systematically higher than those based upon OLS. The implication of this can be seen in Table 1, with the IV/TSTSLS estimates (grey cells) tending to be towards the bottom of the table (low mobility) with the OLS estimates (white cells) towards the top (high mobility). This is likely to be due, at least in part, to differences in methodologies applied (see Jerrim, Choi and Rodríguez 2013 for further details). The implications of this are: (i) the estimates presented in Table 1 are probably not as comparable as they may first appear and (ii) in certain studies, the UK's lowly position is likely to be an exaggeration of the truth. Indeed, it is interesting to note that when one compares the UK to other countries where a broadly similar methodology has been applied, differences are usually small and almost never statistically significant at conventional thresholds[4].

Lack of comparable data. Finally, the data used in most studies have not been designed (or harmonised) for the purpose of cross-national comparison. In-fact, many of the estimates included in Table 1 have been produced by separate research teams working independently of one another (e.g. OECD 2007; Björklund and Jäntti 2009; Corak 2012; Blanden 2013)[5]. Specific problems include the use of non-nationally representative samples (e.g. New Zealand in Corak 2012), differences in how parental income has been measured (e.g. father's earnings only or total household income, labour market earnings versus all income; gross versus net income) and differences in the age when the offspring's income has been recorded[6]. Solon (2002:61) summarises this problem as follows:

[4] Note that different instruments have been used in different countries even when IV / TSTSLS has been applied. It is therefore unlikely that even these estimates are comparable with one another.
[5] Jäntti et al (2006) is an exception, where a team of researchers have worked together with the data to produce the most comparable estimates possible.
[6] For instance Gorard (2008) argues that Blanden et al (2005) rely upon father's income only to measure parental income in the UK, but in several other countries an average of mother's and father's income is used

'*Once one recognizes the importance of such measurement issues, one also realises how tricky it is to compare estimates for different countries from different studies. Do differences among estimates appear because of actual cross-country differences in intergenerational mobility or because of differences across studies in their earnings measures, age ranges or other sample selection criteria?'*

This leads to an important question in any cross-national comparison – are we really comparing like with like?

The four difficulties outlined above severely limits one's ability to reach a firm conclusion as to whether the link between family background and later lifetime income is really particularly strong in the UK. The data analysed has not usually been designed or harmonised for the purpose of cross-national comparison, with differences in statistical methodology leading to artificial variation being observed across countries (Jerrim, Choi and Rodríguez 2013). Even if these problems are ignored, the UK is still only typically compared to a quite small and specific set of countries, with most differences *not* statistically significant at conventional thresholds. Indeed, a recent review article by two leading experts from the income mobility field comprehensively stated that:
'*very little is known about how intergenerational income persistence and mobility vary across countries….. More research, using comparable data for multiple countries across multiple cohorts of parents and offspring, is required'* (Jäntti and Jenkins 2013:188)

Hence, if policymakers really want to know whether the link between family background and labour market success is stronger in Britain than other developed nations, further evidence is needed on this issue. In this paper I attempt to provide such evidence by:

i. Comparing the UK to a large (> 30) number of other countries
ii. Using a comparable statistical methodology across countries
iii. Using data that has been specifically designed (or harmonised) for the purpose of cross-national comparison
iv. Conducting a wide range of robustness tests, including different definitions of key variables and measures of social stratification
v. Triangulating evidence from multiple sources using meta-analytic techniques

instead. Similarly, parental income in the UK has been collected via a single banded question, which is of disputed quality (Goldthorpe 2013). In contrast, high quality administrative data is available in certain other countries (e.g. Sweden, Norway, Canada, Denmark and Finland).

vi. Presenting evidence on non-linearities – including the relationship between family background and *high* earnings

As the datasets analysed do not contain measures of parental income, it is not my intention to produce estimates of intergenerational income mobility per se. Rather I investigate the link between respondents' income and several alternative measures of their family background in order to complement the income mobility literature. Given the limitations with the existing evidence base described above, I argue that this provides an important contribution to contemporary academic and public policy debate as to whether social origin is really a greater barrier to monetary 'success' in the UK than other countries.

My results suggest that:

- The UK is ranked 17th out of 34 countries in terms of the strength of the relationship between family background and later lifetime income. It is broadly similar to a number of other OECD countries in this respect (including France, Ireland, Spain, Italy, Switzerland and Japan).
- Consistent with the intergenerational income mobility literature, family background seems to be a greater barrier to future economic success in Britain than in Scandinavia and a handful of central European countries (Germany, Austria, Belgium and the Netherlands).
- On the other hand, intergenerational associations are weaker in the UK than in Eastern Europe (Bulgaria, Hungary, Poland and Romania).

The paper now proceeds as follows. Section 2 describes my empirical methodology, while section 3 describes the three datasets upon which I draw. Results are presented in section 4, with conclusions following in section 5.

2. Methodology

Estimates presented are based upon the following regression model:

$$\log(y_{ij}) = \alpha + \beta.F_i + \gamma.A_i + \delta.B_i + \varphi.X_i + \varepsilon_{ij} \quad \bigvee K \qquad (2)$$

Where:

$\log(y_{ij})$ = The natural logarithm of respondents' earnings or income

F = A measure of respondents' family background

A = The age of respondents at the time of the survey

B = The birth year of respondents' mother and father[7]

X = A set of basic control variables (e.g. whether the respondent is an immigrant)

ε = Error term

i= Individual i

j = Cluster j[8]

K = Country K

The highest level of education achieved by either parent is the primary measure of family background ('F') used in this paper. Parental education is a measure of social origin widely used by economists (e.g. Ermisch and Del Bono 2012; Bradbury et al 2012) and sociologists (e.g. Bukodi and Goldthorpe 2012), and has been shown to influence child development (Dickson, Gregg and Robinson 2013; Chevalier et al 2010), access to higher education (Cunha, Heckman and Lochner 2006; Jerrim, Vignoles and Finnie 2012) and other aspects of the intergenerational transmission process (Lampard 2007). It has also been widely used in international comparisons of intergenerational inequalities (Ermisch, Jäntti and Smeeding 2012a; Jackson 2013), including a recent volume edited by leading experts from the income mobility field (Ermisch, Jäntti and Smeeding 2012b). Indeed, these authors describe parental education as '*a measure of permanent income*' which is '*the most malleable* [indicator of family background] *in terms of being made comparable across countries*' (Ermisch 2012b:15). Parental education is measured using International Standard Classification of Education (ISCED) levels; an international coding schema designed by UNESCO to facilitate cross-national comparisons of educational attainment. Following existing practise in much of the cross-national literature (e.g. the Luxemburg Income Study - http://www.lisdatacenter.org/) the following collapsed version of this schema is used:

- 'Low' = ISCED 0 – 2 (less than upper secondary schooling)
- 'Middle' = ISCED 3 – 4 (completed upper secondary but not tertiary education)
- 'High' = ISCED 5 – 6 (completed tertiary education)

Yet this measure also has certain limitations. Firstly, although the ISCED schema has

[7] This information is only available in the EU-SILC dataset.

[8] As all three data sources described in the following section use a clustered survey design Huber-White adjustments are made to the estimated standard errors. See Appendix 2 for a discussion of clustering in the European Social Survey.

been designed to enhance cross-national comparability, one cannot rule out the possibility that some differences across countries do still remain. This may however be less of an issue when using the broad ISCED groups outlined above, rather than when attempting to disentangle all the intricacies between various national qualifications[9]. Secondly, information on mother's and father's education is typically reported by respondents rather than their parents. Although proxy reports may be subject to measurement error, Jerrim and Micklewright (2012) illustrate that this does not necessarily lead to substantial bias in cross-national comparisons of intergenerational inequalities. Indeed, the aforementioned paper indicates that international comparisons of differences in educational test scores between individuals from 'low' (ISCED 0 -2) and 'high' (ISCED 5-6) parental education backgrounds are relatively robust to who reports parental education (i.e. whether it is the parent themselves or their offspring). There is also little reason to believe that any measurement error in the parental education variable is greater in the UK than other countries, or that this would lead to greater bias in the UK's parameter estimates (in terms of either direction or magnitude). Finally, the distribution of parental education differs across countries. Hence one may question whether parental education is capturing the same extent of socio-economic advantage and disadvantage in each nation. For these reasons, I will demonstrate the sensitivity of my results to various alternative measures of family background – including father's occupation and indices of multiple deprivation – which shall be described in the following section.

When estimating Equation 2, all datasets shall be restricted to male respondents between the ages of 25 and 59. This is consistent with much of the income mobility literature, where individuals who are younger or older are excluded due to their income being subject to non-trivial 'transitory' fluctuations (Chadwick and Solon 2002). Similarly, female respondents are not considered here due to the added complexity of labour market selection. Consequently, the analysis focuses upon men born between roughly 1950 and 1985, with estimates essentially being an average for individuals born across this period. I have experimented with alternative age ranges (e.g. 30 to 45 year olds born between roughly 1965 and 1980) and obtained qualitatively similar results (though with inflated standard errors).

A final feature of Equation 2 is that the parameter of interest ($\hat{\beta}$) has a simple and widely understood interpretation. Firstly, note that Equation 2 is very similar to the income mobility model economists usually estimate (recall Equation 1), with the only key difference

[9] For instance, Steedman and McIntosh (2001) note that the ISCED 0 – 2 category is an appropriate definition of 'low skill' that can be compared across European countries.

being the use of a different measure of family background. Secondly, Equation 2 has striking similarities to a standard Mincer wage equation, a model widely used by labour economists to estimate the monetary returns to education, with parameter estimates being interpreted in a similar way. Specifically, the calculation $\{(\exp(\hat{\beta}) - 1) * 100\}$ provides the estimated returns to *offspring* from their *parents* holding a particular qualification (relative to the reference group). As this paper focuses upon differences between the 'high' and 'low' parental education categories, it will address the question 'how much more do offspring with a university educated parent earn relative to their peers whose parents never completed upper secondary school[10]'?

In section 4 I estimate Equation 2 using both Ordinary Least Squares (OLS) and Quantile Regression (QREG). The intuition behind these techniques is presented in Figure 1, where I present hypothetical log income distributions for individuals from the 'low' and 'high' parental education backgrounds[11]. M^L and M^H refer to the mean log-income of these two groups. OLS regression that includes dummy variables for parental education captures the difference between these two points (conditional upon other factors that have been controlled in the model). Quantile regression estimates can be thought of in a similar way. For instance, Q^L is located at the 90th percentile of the low parental education income distribution and Q^H is located at the 90th percentile of the high parental education income distribution. A quantile regression analysis at the 90th percentile will capture the difference between these two points (again, conditional upon any other factors that have been included in the model). In other words, this will reveal the difference in income between the 'most successful' (highest earning) individuals from low parental education backgrounds and the 'most successful' (highest earning) individuals from high parental education backgrounds. Similar interpretations hold when quantile regression estimates are made at other points of the income distribution (e.g. the 10th percentile). For a more technical description of quantile regression, I direct the reader to Koenker and Bassett (1978).

<< Figure 1>>

[10] In the UK, the 'low' parental education category broadly corresponds to the minimum school leaving age. The 'high' category corresponds approximately to holding an undergraduate degree or higher.

[11] This discussion closely follows Jerrim (2012), where I use similar methodologies to investigate the socio-economic gap in children's test scores.

3. Data

In the sub-sections below three datasets are described, including details on sample selection, response rates, measurement of income / earnings and family background. These are the: (i) European Union Statistics on Income and Living Conditions (EU-SILC); (ii) European Social Survey (ESS) and the Programme for International Assessment of Adult Competencies (PIAAC). Equation 2 will be estimated using each resource, before results are pooled via a meta-analysis. This approach is designed to illustrate the sensitivity of estimates to varying choices regarding the estimation of Equation 2, with a particular focus on the position of the UK relative to other countries.

3.1. EU-SILC

The EU-SILC is an annual survey of income and living standards across Europe. Countries follow guidelines on the information to collect, with data then harmonised by the study organisers. Thus while there may be some differences in data collection methods across countries, the information released is broadly comparable (Atkinson and Marlier 2010). The 2011 wave included a module about the 'intergenerational transmission of disadvantages'. Norway and Sweden are excluded due to low participation rates in this part of the study. Response rates were reassuringly high (see Appendix 1 for details), with the UK (73 percent) broadly in-line with the cross-country average (76 percent). The median age of respondents was 45 within the sample selected, with a median birth year of approximately 1965.

EU-SILC respondents were asked the level of education their mother and father completed using the 'low', 'medium' and 'high' ISCED categories described in section 2. Questions were also asked about maternal and paternal occupation, defined using the nine major ISCO groups (see http://laborsta.ilo.org/applv8/data/isco68e.html), and subjective views on the financial situation of the household in which they grew up (ranging from very good to very poor). Following Goodman, Gregg and Washbrook (2011), I combine these variables into an index of multiple deprivation. Specifically, within each country I estimate the polychoric correlation between these various SES measures and use the first principle component to create an index of multiple deprivation (this broadly follows the recommendation of Kolenikov and Angeles 2009 in creating such indices). I use this index both as a continuous linear term and divided into national quartiles to investigate whether using this measure of

family background (rather than parental education) leads to markedly different results[12].

A significant advantage of the EU-SILC is that it has collected detailed information on labour and non-labour income from respondents using multiple questions. In the following section results are presented using two different definitions of the dependent variable (y_{ij}) – cash labour market earnings only and individual income from all sources – to illustrate how this choice influences results.

3.2 The European Social Survey (ESS)

The ESS is a bi-annual survey carried out in a selection of EU countries since 2002. The five rounds conducted thus far are pooled to maximise the number of observations available. After restricting the sample to 25 to 59 year old men, 2,911 observations remain for the UK (compared to a cross-country average of approximately 2,200). The median age of respondents was 42, with a median birth year of 1964. The survey response rate in the UK was approximately 55 percent against a cross-country median of 62 percent (see Appendix 1). A limitation is that respondents' total household income (y_{ij}) is recorded using a single banded question, which can lead to reporting errors (Micklewright and Schnepf 2010). Note that as income has been recorded in banded format, Equation 2 is estimated using interval regression (rather than OLS or qauntile regression) for this particular dataset[13].

Despite these limitations, the ESS also has certain advantages. A particular strength is that these data have been specifically designed to facilitate cross-national comparisons, with the same survey instrument used to collect data in each participating country. It also includes detailed information on respondents' family background. In addition to the key information on parental education described in section 2, respondents were also asked about the specific job of their father (when the respondent was age 14). This has been coded using the detailed four digit ISCO schema, assigning fathers into one of over 300 occupational groups (see http://www.ilo.org/public/english/bureau/stat/isco/isco88/publ4.htm). A number of occupational scales can be generated from this information, including the ISEI index designed by Ganzeboom et al (1992) to aid cross-national comparison. The creators of the

[12] Note that dividing this index into national quartiles ensures the same proportion of the population is defined as 'advantaged' and 'disadvantaged' within each of the countries considered (thus overcoming one of the limitations with the parental education variable).

[13] Interval regression is a generalised censored regression technique which can be applied when one knows the income band in which an observation falls, but not the exact value. Parameter estimates using interval regression on banded income data are generally considered comparable to OLS estimates using continuous income data.

ISEI index note how this scale captures the part of occupations that convert education into income, with this now being a standard variable included in many cross-national datasets (such as PISA – the Programme for International Student Assessment). I use this as an alternative measure of family background to test the sensitivity of my results. Specifically I re-estimate Equation 2 using father's occupation, rather than the highest level of parental education, to measure family background (mother's occupation is used when information for fathers is not available)[14].

3.3 PIAAC

PIAAC is a cross-national study conducted by the OECD in 2011. It has been designed and centrally administered for the specific purpose of international comparisons, with the same survey instrument used in each of the participating countries. The response rate was 59 percent in England and Northern Ireland (Wales and Scotland did not participate), against a cross-country average of 62 percent (see Appendix 1).

The PIAAC survey design was complex. Geographic areas were first selected as the primary sampling unit (PSU), with blocks of specific areas then usually selected as the secondary sampling unit (SSU). Households were then selected, with one person between the age of 16 and 65 randomly chosen to participate from within. After restricting the data to male respondents between 25 and 59, sample sizes range from 982 in Cyprus to 2,081 in Korea (compared to 2,011 in the UK).

As part of the PIAAC questionnaire, respondents were asked to provide information on their gross labour market earnings, using a range of response options (e.g. hourly, weekly, or monthly pay). Separate questions were asked to employees and self-employed workers to ensure the income information reported were of the highest possible quality. To minimise item non-response, respondents who were unwilling to provide specific information were asked to indicate a particular income category. This information was then used to derive income for all individuals who provided information. Further details can be found in OECD (2013:493). Unfortunately, detailed income data for Australia, Canada, Germany, Sweden and the United States is not provided in the public use PIAAC data files, meaning these countries

[14] The creators of the ISEI index note that 'scores for characteristically female occupations are estimated from relatively sparse data' and that 'the omission of women is of … concern to us' (Ganzeboom, Graff and Treiman 1992:14-15). Given these concerns, preference is given to father's occupation over mother's occupation in the analysis. My experimentations using different occupational scales (e.g. the SIOPS scale of Treiman 1977) have produced qualitatively similar results.

cannot be included in this part of the analysis. Moreover, parental education is the only major indicator of socio-economic status available. Consequently, I am unable to test the robustness of results to using an alternative measure of family background in this particular dataset.

4. Results

OLS estimates

Estimates using EU-SILC can be found in Figure 2. Running along the x-axis is the estimated percentage difference in income between children growing up in 'low' and 'high' education households. Official two letter country codes (unc.edu/~rowlett/units/codes/country.htm) are located at the point estimate, with the thin grey bars representing the 90 percent confidence intervals. Panel A refers to estimates when cash income from employment (i.e. '*earnings*') is the dependent variable. The dependent variable is changed in panel B to total personal *income* (this includes cash and non-cash earnings from work, social security payments, interest from savings and investments).

<< Figure 2 >>

Starting with panel A, there is a strong and statistically significant relationship between parental education and respondents' earnings in almost every country. For instance, in the UK the estimated return to having at least one highly educated parent (relative to the 'low' education group) is 22 percent. However, in contrast to conventional wisdom, there is little evidence to suggest that this difference is significantly bigger in Britain than other European nations. The UK is placed 5th in the rankings, with one unable to reject the null hypothesis that the parental education – earnings gap is significantly bigger than any other country at conventional thresholds.

Does this finding hold if the dependent variable is altered to total individual *income*? Interestingly, the estimated return to having a highly educated parent increases in the UK from 22 percent (Panel A) to 38 percent (Panel B). However, in general cross-national rankings seem quite robust to this change, with the correlation between the two sets of estimates standing at approximately 0.90 (Spearman's rank = 0.85). With regard the substantive question of interest, the UK is now ranked 12th out of 27 countries, though the estimated confidence intervals are reasonably wide. Indeed, one cannot reject the null hypothesis that the UK is the same as either Iceland (ranked 5th) or Lithuania (ranked 21st) at

the five percent level. Nevertheless, it is clear that these results do little to support the view that intergenerational inequalities are greater in Britain than other European countries.

The estimates presented in Figure 2 compare differences between the 'low' and 'high' parental education groups. However, in section 2 I discussed some of the limitations with the parental education variable, including differences in its distribution across countries. Therefore, in Figure 3 I consider how results change when using an alternative measure of family background – national quartiles of the multiple deprivation index described in section 3.1. This alternative measure has the advantage that approximately a quarter of the population in each country is contained within the most advantaged and least advantaged groups. Estimates running along the x-axis are those previously presented in Figure 2 panel B, while the y-axis illustrates the percentage difference in income between men from the top and bottom multiple deprivation quartile. The UK is highlighted using a circle, with a fitted regression line superimposed.

<< Figure 3 >>

Perhaps the most striking feature of Figure 3 is the strong correlation between the two sets of results. Most countries sit tightly around the fitted regression line, with the Pearson correlation coefficient equalling 0.93 (Spearman's rank = 0.93). In additional estimates, available upon request, I find a similarly strong correlation if parental occupation is used to measure family background instead (the correlation between the parental education and parental occupation results is 0.83)[15]. Of particular importance for this paper, the UK is consistently around the middle of the cross-country rankings, with the intergenerational association being broadly similar to most of the other countries considered. Together, Figure 2 and Figure 3 suggest that results are quite robust to using alternative measures of the key dependent and independent variables.

Figure 4 turns to analogous estimates using the ESS. The main results, based upon parental education, can be found in Panel A. Respondents who had at least one highly educated parent earn (on average) 35 percent more than those from a low parental education background in the UK. This figure is very similar to the estimate obtained using the EU-SILC (38 percent). The UK is ranked 11th out of 27 countries, though with little discernible difference compared to Sweden (ranked 3rd) or the Czech Republic (ranked 17th). Indeed,

[15] This is consistent with Marks (2011) who finds that cross-national comparisons of socio-economic differences in children's test scores are generally quite robust to the use of different measures of family background.

variation across countries is generally modest, with most estimates falling somewhere between 30 and 50 percent.

In Figure 4 Panel B I investigate the sensitivity of the ESS rankings to the use of an alternative measure of family background – quartiles of the ISEI index of father's occupational status. The estimates presented refer to differences between the most advantaged (top quartile) and least advantaged (bottom quartile) groups[16]. Interestingly, the UK does now fall below the median (17th out of 26 countries), though cross-national differences are once again modest and usually statistically insignificant at conventional thresholds. Nevertheless, my experimentations with both the ESS and EU-SILC data suggest that the UK's position is consistently slightly lower when parental occupation is used to measure family background rather than parental education. However, the correlation between the estimates presented in Figure 4 Panel A and Panel B is once again reassuringly high (Person correlation = 0.87) confirming the general robustness of cross-country rankings to the measurement of family background.

<<Figure 4>>

Finally, estimates using PIAAC are presented in Figure 5. The difference between the low and high parental education groups in the UK equals 52 percent. This is notably larger than in the EU-SILC and ESS, although one cannot rule the possibility that this is simply due to sampling variation (one cannot reject the null hypothesis that the EU-SILC, ESS and PIAAC figures for the UK are all equal at conventional thresholds). Nevertheless, the UK is clearly in a much lower position in the PIAAC ranking, sitting in 16th place (out of 18 countries). However, the relatively wide confidence intervals means there is only limited evidence that the UK is different to Estonia (in 8th position) or the Slovak Republic (18th). Nevertheless, in contrast to EU-SILC and ESS, PIAAC does lend some support to claims that the link between family background and labour market outcomes is stronger in Britain than other countries.

<<Figure 5>>

[16] The findings presented are qualitatively similar if one uses the ISEI index as a continuous, linear term instead.

Meta- analysis of OLS estimates

I have thus far simply considered the position of the UK in a cross-national ranking. I now attempt to identify specific countries, or groups of countries, that are substantially different to the UK. Table 2 presents OLS estimates from each of the three studies, with grey shading highlighting significant differences from the UK at conventional thresholds. The final column is a meta-analysis of the three studies, where each study has been given equal weight[17]. These meta-analytic results have the advantage of combining all available evidence into an 'overall' estimate, with the standard error greatly reduced. However, the disadvantage is that not all countries took part in each of the three studies, meaning that comparability across countries may be compromised[18]. Discussion will focus mainly upon these meta-results, as it means the UK can be compared to the greatest number of countries while minimizing the chances of a type II error. Nevertheless, evidence of a genuine difference will be strongest when estimates are consistently higher or lower than in the UK across the various studies, rather than in just the meta-analysis alone.

<< Table 2 >>

Out of the 34 countries included in the meta-analysis, the UK is ranked in 17th place. The estimated difference in income between the low and high parental education groups is broadly similar to several other major OECD countries, including Japan, Switzerland, Italy, Spain, Ireland, South Korea and France. There are nine countries where the link between parental education and later lifetime income is significantly weaker than the UK. This includes the four Scandinavian countries (Denmark, Norway, Sweden and Finland), where point estimates are consistently lower across all datasets included in Table 2. These countries are known for their equality and high social welfare spending, and have been consistently identified as more meritocratic than Britain in the intergenerational income mobility literature (recall Table 1). Hence these results are consistent with previous research that has found family background to be a greater barrier to labour market success in Britain than in Scandinavia (Blanden et al 2005; Jäntti et al 2006; Blanden 2013).

Perhaps more surprisingly, there is another group of four central European countries (Austria, Netherlands, Germany and Belgium) where intergenerational associations are

[17] This meta-analysis has been conducted using the STATA 'metan' command.
[18] For example, the meta-results for the UK are based upon EU-SILC, ESS and PIAAC, while those for Japan are based upon PIAAC only.

notably weaker than in the UK. As in the Scandinavian countries, point estimates are consistently lower than those for Britain – as shown in Table 2[19]. One common feature of these countries is that they each have a highly segregated schooling system that 'tracks' children of different academic ability into different types of secondary school at a relatively young age (like the grammar school system that still exists in a small number of counties in England). This does not of course mean that this is the cause of the cross-national variation; indeed previous research has found that such extensive between school tracking may exacerbate intergenerational inequalities (Hanushek and Woessmann 2006). Nevertheless, differences in schooling systems and school-to-work transitions remain a plausible explanation for this result. Establishing whether such differences in institutional structures do indeed influence intergenerational inequalities is beyond the scope of this paper, but remains a key area for future research.

Finally, there are five countries (Luxemburg, Bulgaria, Poland, Hungary and Romania), where intergenerational associations are significantly stronger than in the UK. This broadly follows a more general pattern within the EU-SILC, ESS and PIAAC for Eastern European countries to be disproportionately represented at the bottom of these intergenerational mobility rankings. One should bear in mind that the average birth year of sample members is approximately 1965, and that there were substantial economic and political changes in these countries during the latter part of the twentieth century. This would have had a substantial impact upon economic opportunities, and thus the strong intergenerational associations observed for Eastern Europe should be interpreted in this context.

How do these results compare with cross-country comparisons of intergenerational income mobility? Table 3 provides the estimated correlation between my meta-analytic results (right hand column of Table 2) and various cross-country comparisons of intergenerational income mobility (drawn from Table 1).

<< Table 3 >>

Although one should exercise caution given the limited number of common countries, the estimated correlations in Table 3 are reassuringly high. The Pearson correlation coefficient is always greater than 0.75, and averages 0.85 across the six studies. Analogous figures for

[19] The only exception is Belgium in the ESS, where the percentage difference in income is 36.2 against 35.2 in the UK.

Spearman's rank are 0.70 and 0.82 respectively. Even when the number of common countries is maximized (in the comparison with Corak 2012), the estimated correlation coefficient remains close to 0.90. Indeed, a consensus seems to emerge between my results and the income mobility literature that the link between family background and later lifetime income tends to be weaker in Denmark, Finland, Norway, Sweden and Germany than in the UK, France and Italy. However, there then seems to be relatively little variation within these two broadly defined country groups.

Quantile regression estimates

The previous sub-section has established: (a) that there is a strong association between parental education and sons' income and (b) that the strength of this association varies across developed countries. I now present quantile regression estimates to illustrate how the impact of parental education varies across the sons' income distribution. Of particular interest is the link between family background and *high* levels of income; is it the case that the gap between the 'most successful' (highest earning) individuals from advantaged and disadvantaged backgrounds is greater in Britain that other developed countries? For brevity, I focus upon the EU-SILC results. Appendix 3 provides analogous findings for PIAAC[20].

Results for selected countries can be found in Figure 6. The horizontal axis plots deciles of the sons' national income distribution, while the vertical axis provides the estimated percentage difference in income between individuals from high and low parental education backgrounds. This is supplemented by Table 4, which ranks each country by the size of the parental education – offspring income gap at each income decile (countries with smaller differences can be found towards the top of the table). Grey shading illustrates where the country in question is significantly different to the UK at either the five or ten percent level.

<< Figure 6 >>

<< Table 4 >>

Interestingly, the UK seems to be quite different to other European nations when considering the gap between the *lowest* earning individuals from advantaged and disadvantaged

[20] Quantile regression estimates are not produced using the ESS due to respondents' income being reported in banded form.

backgrounds (i.e. in the bottom half of the sons' income distribution). For instance, at the 20th percentile the estimated difference between the low and high parental education groups is approximately 50 percent in the UK, compared to just 20 percent in Switzerland and essentially no difference in France and Germany (see Figure 6). Indeed, Table 4 places the UK 21st in the rankings at the 20th percentile (p20), with a statistically stronger association than in seven other countries, including the Netherlands, France, Germany and Austria. Estimates from PIAAC and the meta-analysis indicate a similar pattern, with the association between family background and low pay stronger in the UK than other countries (see Appendix 3). There thus seems reasonably robust evidence that the gap between the 'least successful' (lowest earning) individuals from high parental education backgrounds and the 'least successful' (lowest earning) individuals from low parental education backgrounds is particularly pronounced in the UK.

However, a rather different picture emerges towards the top of the sons' income distribution (p70, p80 and p90). First, notice that the advantage of having a highly educated parent in the UK actually *declines* the further one moves up the income scale (at least in percentage terms); Figure 6 reveals the estimated income differential declines from 50 percent at the 20th percentile to 35 percent at the 80th percentile. Yet the same is not true in a number of other countries (e.g. France and Germany) where the benefit of having a highly educated parent *increases* as one moves up the income distribution. For instance, in France the income differential between the high and low parental education groups is essentially zero at p20 but approximately 50 percent at p80, with the lines for the UK and France crossing in Figure 6 at approximately the 60th percentile. Similarly, it is interesting to compare the UK to Switzerland ('CH' in Figure 6). Despite very similar estimates obtained using OLS (a 37 percent difference between the low and high parental education groups in both[21]), Figure 6 suggests that there are interesting differences in the distributional effect across the two countries. Specifically, whereas the UK has a bigger difference at the bottom of the income distribution (p20), in Switzerland the difference is greater at the top (p80). Finally, Table 4 reveals that the link between family background and high earnings (p80) is not significantly bigger in the UK than any other European country. However, one should treat this finding with some caution, as estimates from PIAAC do not necessarily lead one to the same conclusion (see Appendix 3).

Nevertheless, this remains an important result. There is great concern in the UK that

[21] See the EU-SILC column of Table 2.

even the most successful individuals from disadvantaged backgrounds do not achieve the same income or status as individuals from more advantaged homes. As shown in Table 4 and Figure 6, there is some substance to this concern – there remains a sizeable income gap (approximately 30 percent) between even the most 'successful' individuals from advantaged and disadvantaged backgrounds. However, a similarly large gap exists in many other OECD countries, with the UK not being particularly unusual in this respect.

5. Conclusions

The link between family background and labour market outcomes is an issue of great academic and political concern. A number of high impact studies have suggested that intergenerational income mobility is lower in Britain than other developed nations (Blanden et al 2005; OECD 2007; Blanden 2013). This has become a widely cited (if controversial) finding, with leading sociologists stating that '*we should be very cautious about accepting the claim that Britain is lagging significantly behind other countries in social mobility*' (Saunders 2012:11). At the same time, economists have recognised that comparisons of intergenerational income mobility across countries are limited by the small number of countries with high quality data available, a reliance upon ex-post harmonised data and substantial sampling variation surrounding the income mobility estimates (Blanden 2013).

This paper has considered the link between an alternative measure of family background (parental education) and the income individuals achieve in later life. My contribution has been to complement the existing income mobility literature by drawing comparisons across a large number of countries, using data that has been specifically designed for the purpose of cross-national comparisons, and triangulating evidence across multiple datasets. Consistent with the criticisms of the aforementioned sociologists, I do not typically find the UK to be at the bottom of the cross-national intergenerational mobility rankings. Indeed, in a meta-analysis of 34 countries, I find that the UK sits in 17th place. Britain is thus broadly in-line with several other members of the OECD, including France, Ireland, Spain, Italy, Japan, Czech Republic and Switzerland. However, there are a number of Northern and Central European countries where intergenerational associations are notably weaker than in the UK – including Austria, Belgium, Denmark, Finland, Germany, the Netherlands, Norway and Sweden. Interestingly, this is consistent with cross-country rankings found in the intergenerational income mobility literature, which I have shown to be strongly correlated with my results.

It is of course important to also recognise the limitations of this study. Firstly, for many economists household income remains the preferred measure of family background, due to its flexibility, straight forward interpretation and high degree of cross-national comparability (though only when it is defined, collected and measured across countries in the same way). Hence I fully support the conclusion of Blanden (2013:61) that, to improve the quality and comparability of income mobility estimates, '*it is essential that longitudinal data sets continue to be developed and updated and that administrative income registers are exploited wherever possible*.' Secondly, the aim of this paper has been to measure intergenerational inequalities in a robust and comparable manner. Although general patterns and potential drivers have been briefly discussed, further evidence is needed on the impact of institutional structures on intergenerational mobility (e.g. education systems, health systems, early year provision). Although some authors have attempted to address this issue (e.g. Ermisch et al 2012), progress has been somewhat limited due to the lack of high quality comparable data available. Despite such challenges, this important work should continue, with identification of structural barriers to greater intergenerational mobility being a key long-term goal.

In the mean time, it is hoped that this paper has helped to build a better understanding of intergenerational inequalities in the UK. There are undoubtedly large socio-economic differences in lifetime chances in this country, and that these differences are bigger than in some other parts of the western world (most notably Scandinavia). Yet there is little evidence to support claims that Britain sits at the bottom of cross-national intergenerational mobility rankings, or that intergenerational associations are substantially stronger here than in most other countries (as has been previously suggested). Policymakers should therefore stop making such exaggerated claims when discussing this politically sensitive issue.

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Table 1. International comparisons of intergenerational income mobility – a review

Jäntti et al (2006)		Blanden et al (2005)		Björklund and Jäntti (2009)		Blanden (2013)		OECD (2007)		Corak (2012)	
Country	**Beta**	**Country**	**Corr**	**Country**	**Beta**	**Country**	**Beta**	**Country**	**Beta**	**Country**	**Beta**
Denmark	0.07*	Norway	0.14*	Denmark	0.14*	Denmark	0.14*	Australia	0.17	Denmark	0.17
Norway	0.16*	Canada	0.14*	Sweden	0.25	Finland	0.20*	Denmark	0.17	Norway	0.18
Finland	0.17*	Denmark	0.14*	Norway	0.26	Canada	0.23*	Norway	0.18	Finland	0.19
Sweden	0.26	Sweden	0.14*	Germany	0.26	Germany	0.24	Canada	0.19	Canada	0.20
UK	**0.31**	Finland	0.15*	Australia	0.26	Sweden	0.24*	Finland	0.19	Australia	0.26
US	0.52	Germany	0.17	Finland	0.28	Norway	0.25*	Sweden	0.27	Sweden	0.27
		UK	**0.27**	Canada	0.28	Australia	0.25	Spain	0.31	New Zealand	0.28
		US	0.29	**UK**	**0.30**	France	0.32	Germany	0.31	Germany	0.31
				France	0.45	Italy	0.33	France	0.41	Japan	0.35
				Italy	0.46	**UK**	**0.37**	US	0.47	Spain	0.40
				US	0.47	US	0.41	Italy	0.48	France	0.41
						Brazil	0.52*	**UK**	**0.50**	Singapore	0.44
										Pakistan	0.46
										Switzerland	0.46
										US	0.47
										Italy	0.48
										UK	**0.49**
										Chile	0.50
										Brazil	0.58
										China	0.60
										Peru	0.67

Notes:

Figures refer to the estimated intergenerational income elasticity ($\hat{\beta}$) in all studies except Blanden, Gregg and Machin (2005:Table 2), where the intergenerational correlation is reported instead (see footnote 1). Countries are ranked by the estimated elasticity, with those towards the bottom being the least 'socially mobile.' * Indicates statistically different to the UK at the 5 percent level. Standard errors have not been reported in OECD (2007) and Corak (2012), and so statistical significance not considered. Grey shading indicates that estimates have been generated using instrumental variables (IV) or Two-Sample Two-Stage Least Square (TSTSLS) methodology. No shading indicates OLS.

Table 2. Estimated difference in income between individuals from 'low' and 'high' parental education backgrounds: A meta-analysis

	EU-SILC		ESS		PIAAC		META	
	Diff	**SE**	**Diff**	**SE**	**Diff**	**SE**	**Diff**	**SE**
Austria	18.0	5.6	6.8	9.9	-	-	12.3	5.6
Netherlands	13.2	8.2	31.5	3.2	14.4	4.4	19.4	3.2
Denmark	25.8	11.3	16.0	3.2	24.6	5.9	22.1	4.3
Norway	-	-	31.6	3.4	13.9	5.2	22.4	3.1
Germany	15.2	5.8	32.9	5.1	-	-	23.7	3.8
Sweden	-	-	25.1	3.0	-	-	25.1	3.0
Iceland	19.0	8.8	31.9	13.0	-	-	25.3	7.7
Finland	24.3	6.6	32.5	3.0	19.7	5.0	25.4	2.9
Belgium	26.3	5.8	36.2	3.4	14.7	4.5	25.4	2.7
Cyprus	14.2	5.8	40.8	8.0	26.5	5.9	26.7	3.8
France	28.2	5.1	35.7	4.7	39.5	3.8	34.4	2.6
Russia	-	-	57.5	5.3	18.9	20.1	36.8	10.0
South Korea	-	-	-	-	39.4	5.4	39.4	5.4
Ireland	-	-	41.6	6.7	38.4	7.4	40.0	4.9
Spain	28.5	4.3	59.2	4.1	35.5	14.2	40.5	5.0
Czech Republic	44.0	6.3	47.6	7.0	30.5	6.1	40.5	3.7
UK	**37.7**	**6.9**	**35.2**	**3.7**	**52.2**	**7.3**	**41.5**	**3.5**
Italy	47.5	6.0	46.2	12.4	33.3	20.3	42.2	7.8
Switzerland	37.8	4.8	48.2	3.7	-	-	43.0	3.0
Japan	-	-	-	-	43.9	6.8	43.9	6.8
Greece	58.5	7.1	35.1	6.1	-	-	46.3	4.6
Slovak Republic	46.5	6.2	28.9	9.3	74.9	10.9	49.0	5.1
Latvia	50.1	8.3	-	-	-	-	50.1	8.3
Slovenia	32.6	7.6	71.2	5.5	-	-	50.7	4.6
Malta	51.1	6.1	-	-	-	-	51.1	6.1
Estonia	82.8	10.1	-	-	27.8	5.8	52.8	5.7
Portugal	44.7	12.6	68.9	9.8	-	-	56.3	7.9
Luxemburg	69.0	5.8	50.2	7.8	-	-	59.3	4.8
Lithuania	62.7	13.5	-	-	-	-	62.7	13.5
Bulgaria	90.8	6.4	62.2	7.7	-	-	75.9	5.0
Poland	82.7	4.8	91.8	6.4	60.1	10.8	77.7	4.4
Turkey	-	-	96.8	23.4	-	-	96.8	23.4
Hungary	88.3	4.5	137.6	20.0	-	-	111.5	9.8
Romania	112.1	8.1	-	-	-	-	112.1	8.1

Notes:
'Diff' refers to the estimated difference in income between the low and high parental education groups, with 'SE' the estimated standard error. The UK is highlighted using a rectangular box. The final two columns ('Meta') provides the meta-analytic results, where estimates are pooled across the datasets (where information is available). Dark grey indicates significantly different to the UK at the 5 percent level. Light grey indicates significance at the 10 percent level. No adjustment has been made for multiple comparisons. *Source:* Author's calculations using the EU-SILC, ESS and PIAAC datasets.

Table 3. Correlation between meta-analysis results and international comparisons of intergenerational income mobility

Study	Pearson correlation	Spearman's rank	Number of countries in common
Jäntti et al (2006)	0.78	0.90	5
Blanden et al (2005)	0.97	0.70	6
Björklund and Jäntti (2009)	0.76	0.90	8
Blanden (2013)	0.88	0.75	8
OECD (2007)	0.85	0.87	9
Corak (2012)	0.88	0.78	11
Average	**0.85**	**0.82**	-

Notes:
The 'study' column refers to cross-country comparisons of intergenerational income mobility as described in Table 1. The final column provides the number of 'observations' (countries) that the correlations are based upon. Only countries in both my meta-analysis and the 'study' in question are included. *Source*: Author's calculations.

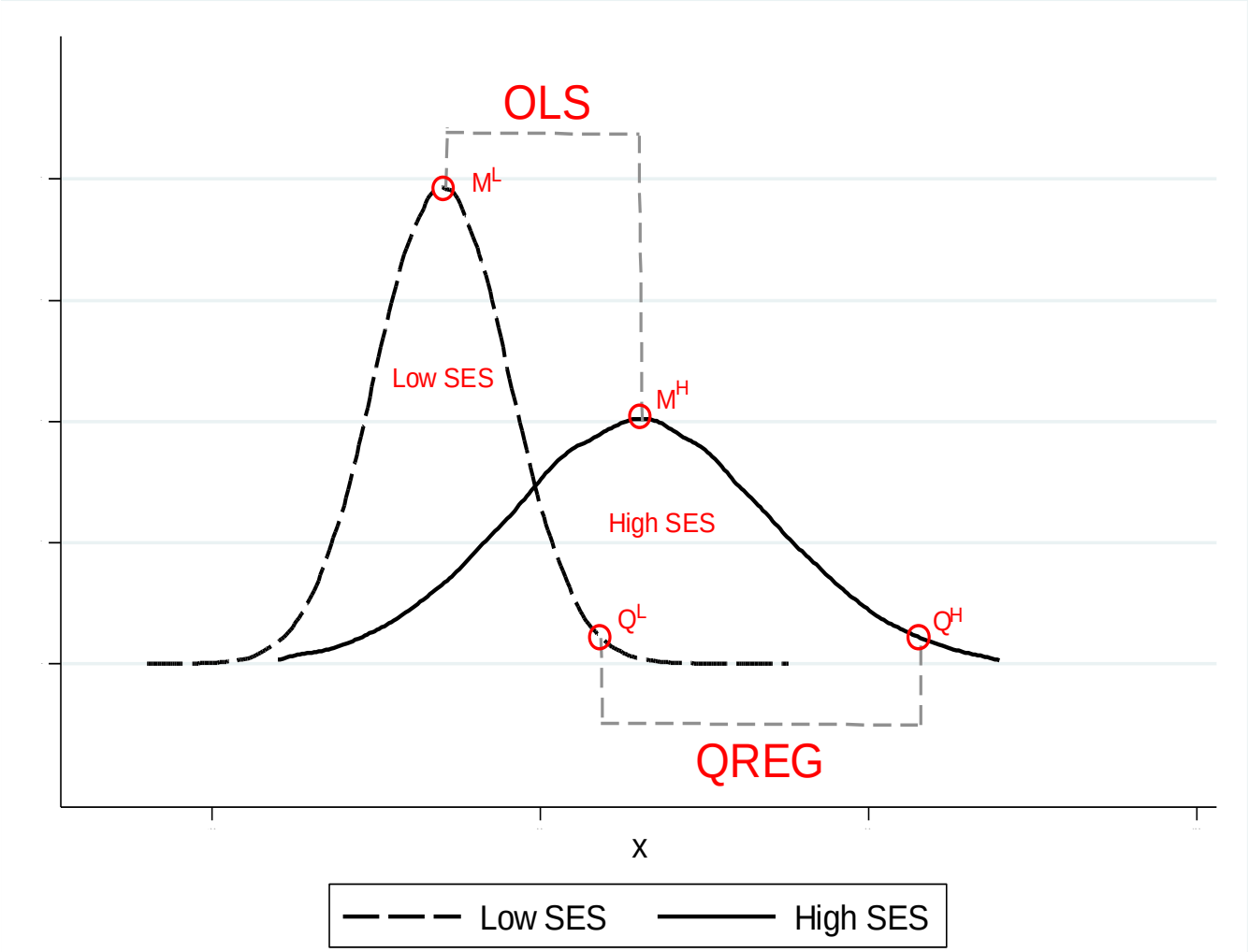
Table 4. Association between parental education and sons' income at different points of the income distribution: the UK's comparative position (EU-SILC)

P20	P30	P40	P50	P60	P70	P80
PT	PT	NL	DE	NL	NL	IS
NL	DE	DE	NL	DE	DK	NL
CY	NL	FR	CY	CY	DE	DK
DE	FR	AT	BE	IS	IS	DE
AT	AT	CY	FR	DK	CY	CY
FR	FI	IS	AT	BE	BE	ES
IS	CY	PT	IS	AT	UK	UK
SI	SI	FI	FI	ES	ES	BE
CH	BE	BE	ES	FI	SI	FI
FI	CH	ES	CH	FR	FI	SK
ES	ES	DK	GR	GR	AT	SI
CZ	DK	CH	DK	SK	SK	AT
BE	CZ	SI	CZ	UK	FR	CH
DK	IS	GR	SK	CH	CZ	FR
IT	GR	CZ	SI	SI	MT	GR
SK	MT	SK	MT	CZ	CH	CZ
LU	IT	IT	IT	MT	GR	MT
MT	LT	MT	PT	LV	LV	IT
LT	UK	LT	UK	IT	IT	EE
UK	SK	UK	LV	EE	EE	LV
GR	LU	LV	LT	PL	LU	RO
LV	LV	EE	EE	LT	PL	LU
PL	EE	LU	LU	BG	BG	PL
HU	PL	PL	PL	LU	RO	LT
BG	BG	BG	HU	PT	PT	BG
EE	HU	HU	BG	HU	HU	HU
RO	RO	RO	RO	RO	LT	PT

Notes:

P20 is the quantile regression at the 20th percentile, P30 at the 30th percentile, etc. Data are sorted in each column by the strength of association between parental education and sons' income. The further down the table a country sits, the stronger the association (i.e. the greater the difference in test scores between the low parental education and high parental education groups). The UK is highlighted in rectangles. Countries near the top of the table that are highlighted in dark grey illustrate where the association between parental education and sons' income is significantly weaker than the UK at the 5 per cent level. Similarly, those at the bottom of the table are where the association is significantly stronger at the 5 per cent level. A cell shaded in light grey indicates a significant difference compared with the UK at the 10 per cent level. No correction for multiple hypothesis testing has been applied. Country abbreviations refer to official two-letter country codes. Further details can be found at http://www.unc.edu/~rowlett/units/codes/country.htm. Table can be cross-referenced with Figure 6.
Source: Author's calculations from the EU-SILC data set.

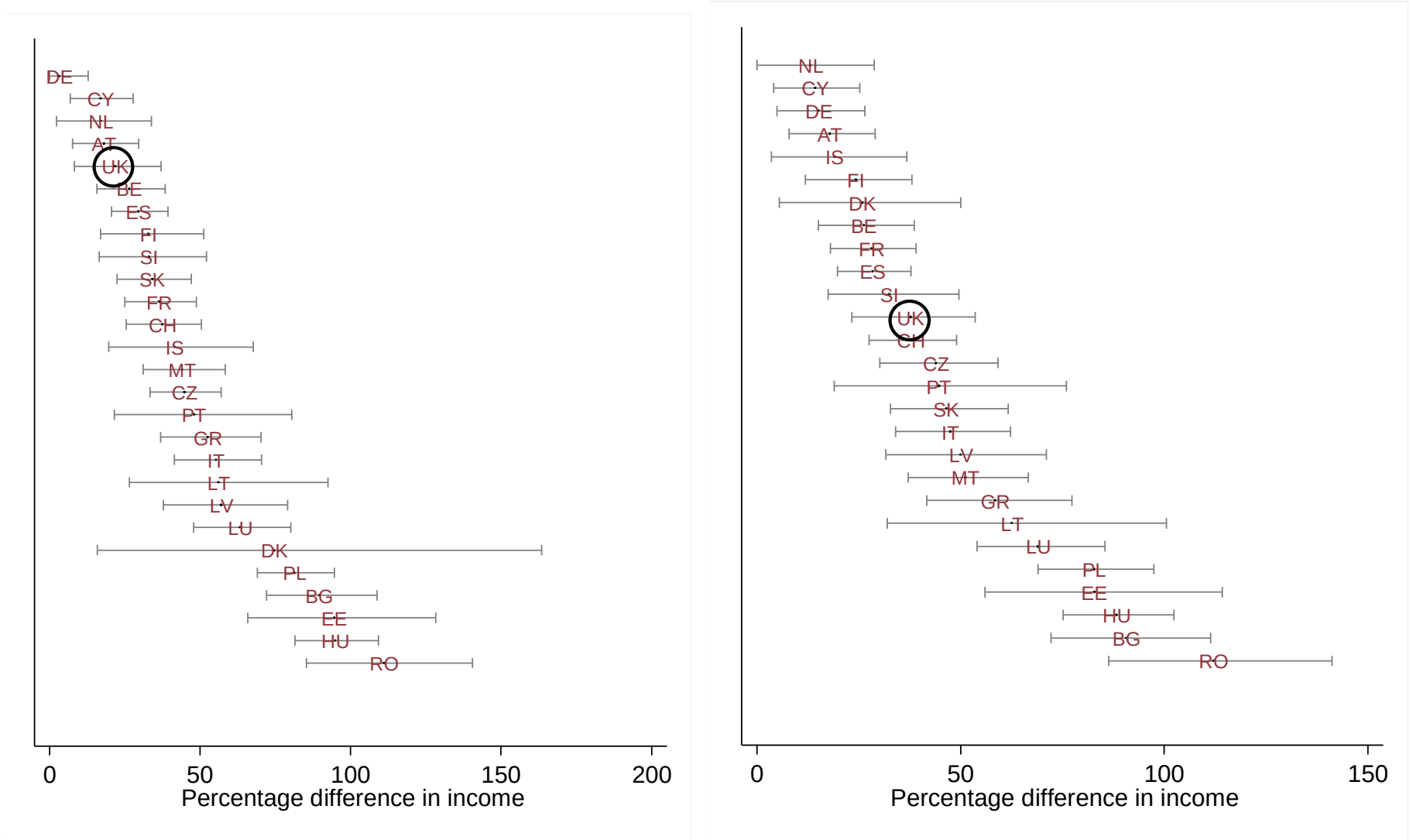
Figure 1. Hypothetical income distributions for low and high SES children: an illustration of the difference between OLS and quantile regression estimates



Notes:
This figure has been produced with simulated data, and is designed to illustrate the similarities and differences between quantile regression and OLS estimation. M^H and M^L refer to mean income of the high and low SES distributions. Ordinary Least Squares regression will calculate the difference between these two points (conditional on the other explanatory terms one includes in the model). Q^H and Q^L , on the other hand, refer to the 90^{th} percentile of the high SES and low SES income distributions. Quantile regression will compare the difference between these two quantities (conditional on the other terms that one includes in the model). In this example, I have set the shape of the high SES and low SES income distributions to be different. Under this scenario, the quantile regression estimate will be greater than the OLS estimate. One can see this as the dashed "QREG" line is greater than the dashed "OLS" line ($M^H - M^L < Q^H - Q^L$). For further information see my discussion in section 2.

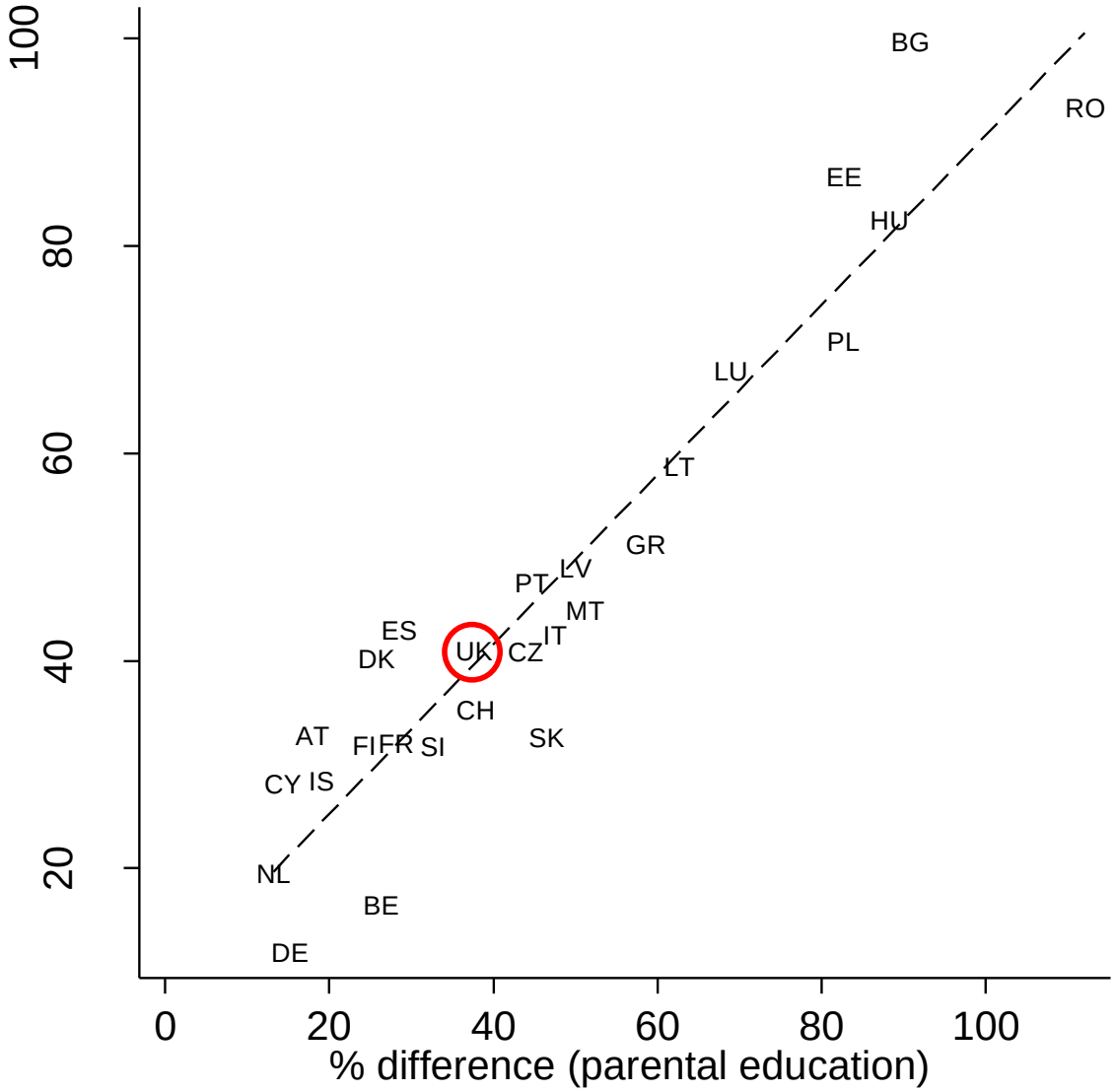
Figure 2. Percentage difference in income between individuals from 'low' and 'high' parental education backgrounds (EU-SILC estimates)

(a) Cash earnings from work **(b) Total income**



Notes: Countries are identified by their two letter country code (see http://www.unc.edu/~rowlett/units/codes/country.htm). Thin grey lines refer to estimated 90 percent confidence intervals.
Source: authors calculations using the EU-SILC dataset.

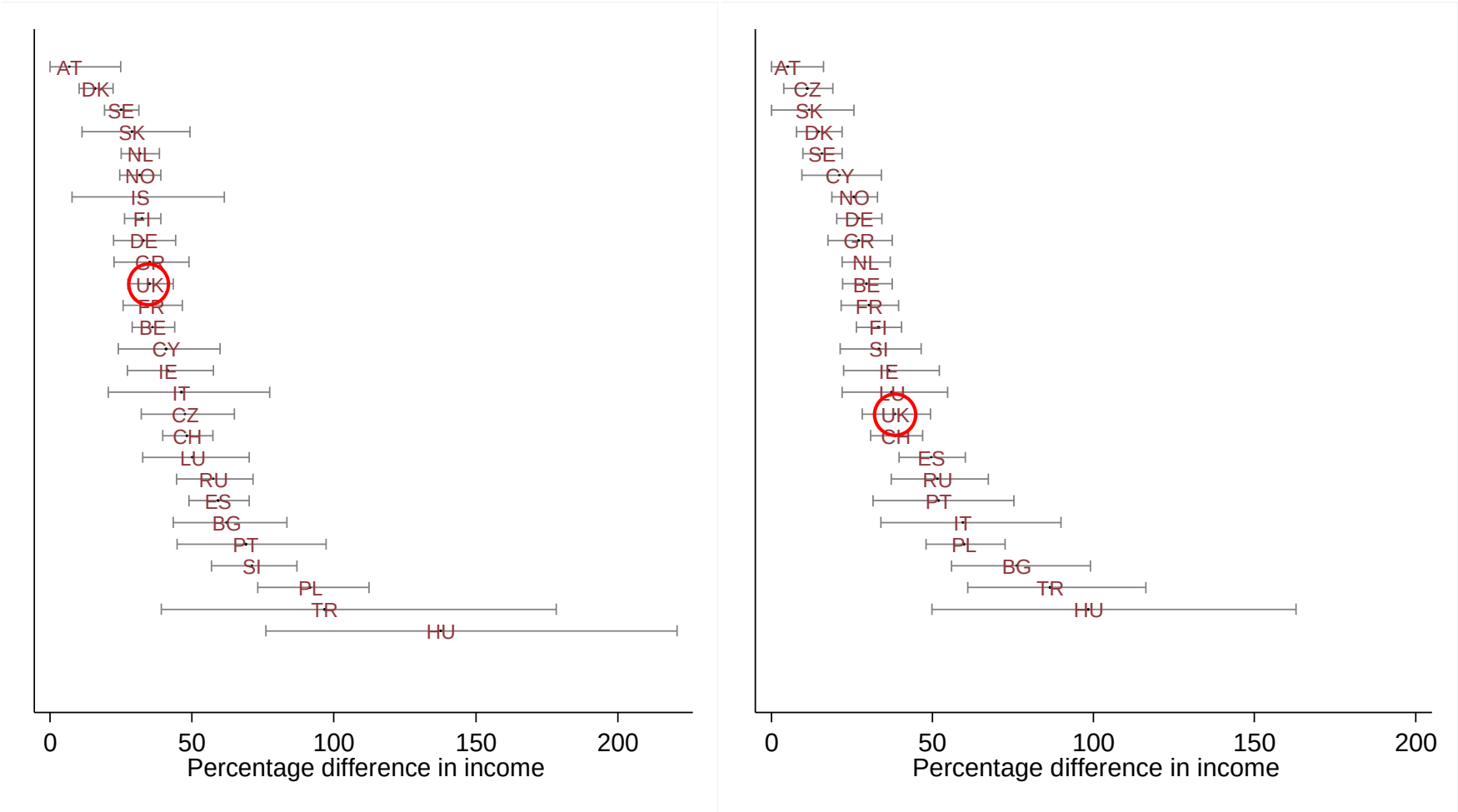
Figure 3. Comparison of EU-SILC results using different measures of family background



Notes:
Countries are identified by their two letter country code (http://www.unc.edu/~rowlett/units/codes/country.htm). A dashed fitted regression line has been superimposed. The UK has been highlighted using a red circle. Correlation coefficient = 0.95; Spearman's rank = 0.92. Figures on the x-axis indicate the percentage difference in total income between the 'low' and 'high' parental education groups. Figures on the y-axis refer to the percentage difference in total income between individuals in the top and bottom national quartile of the multiple deprivation index described in section 3.1. *Source:* authors calculations using the EU-SILC dataset.

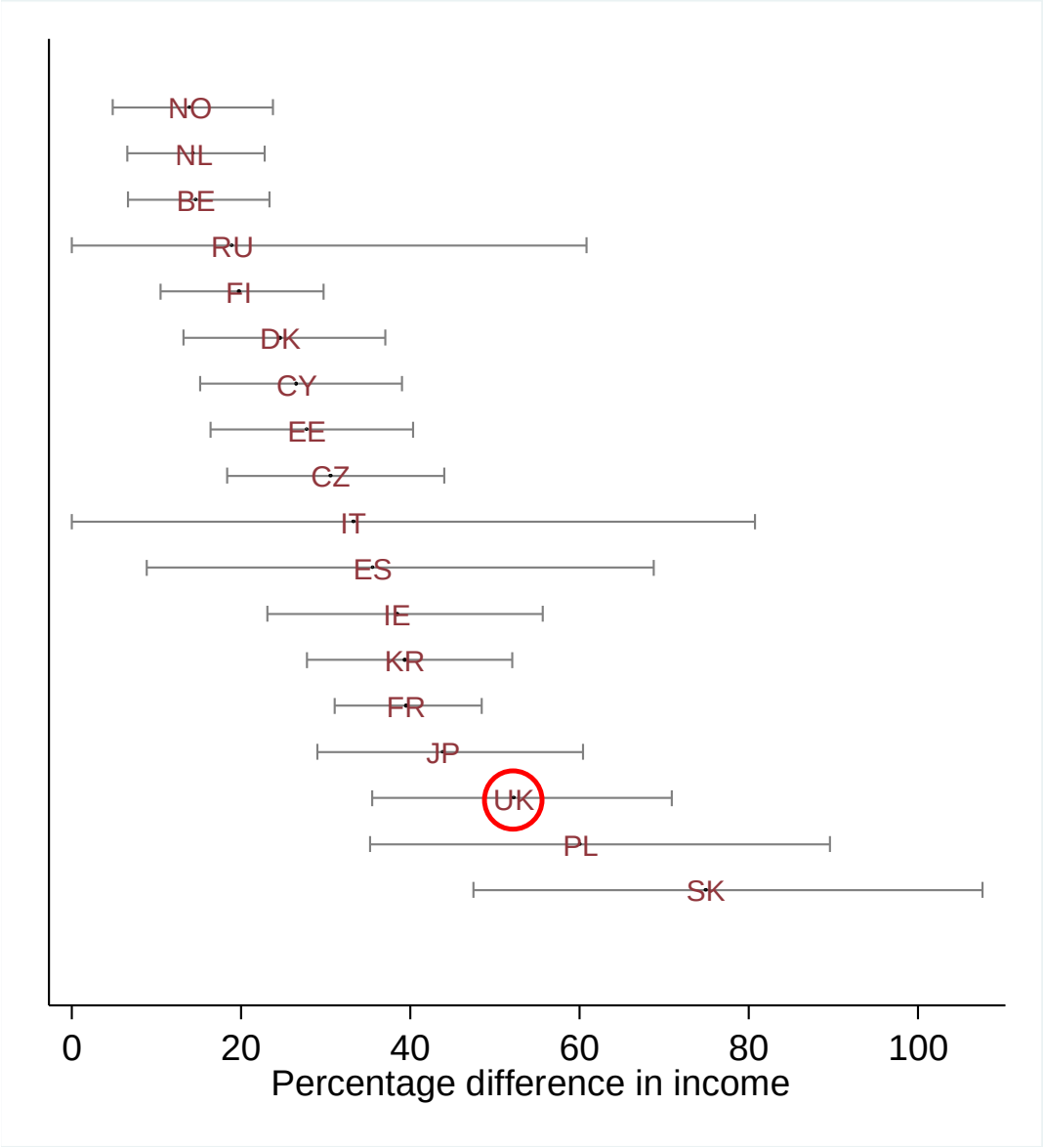
Figure 4. Percentage difference in income between individuals from 'low' and 'high' parental education backgrounds (European Social Survey)

(a) Parental education **(b) ISEI index**



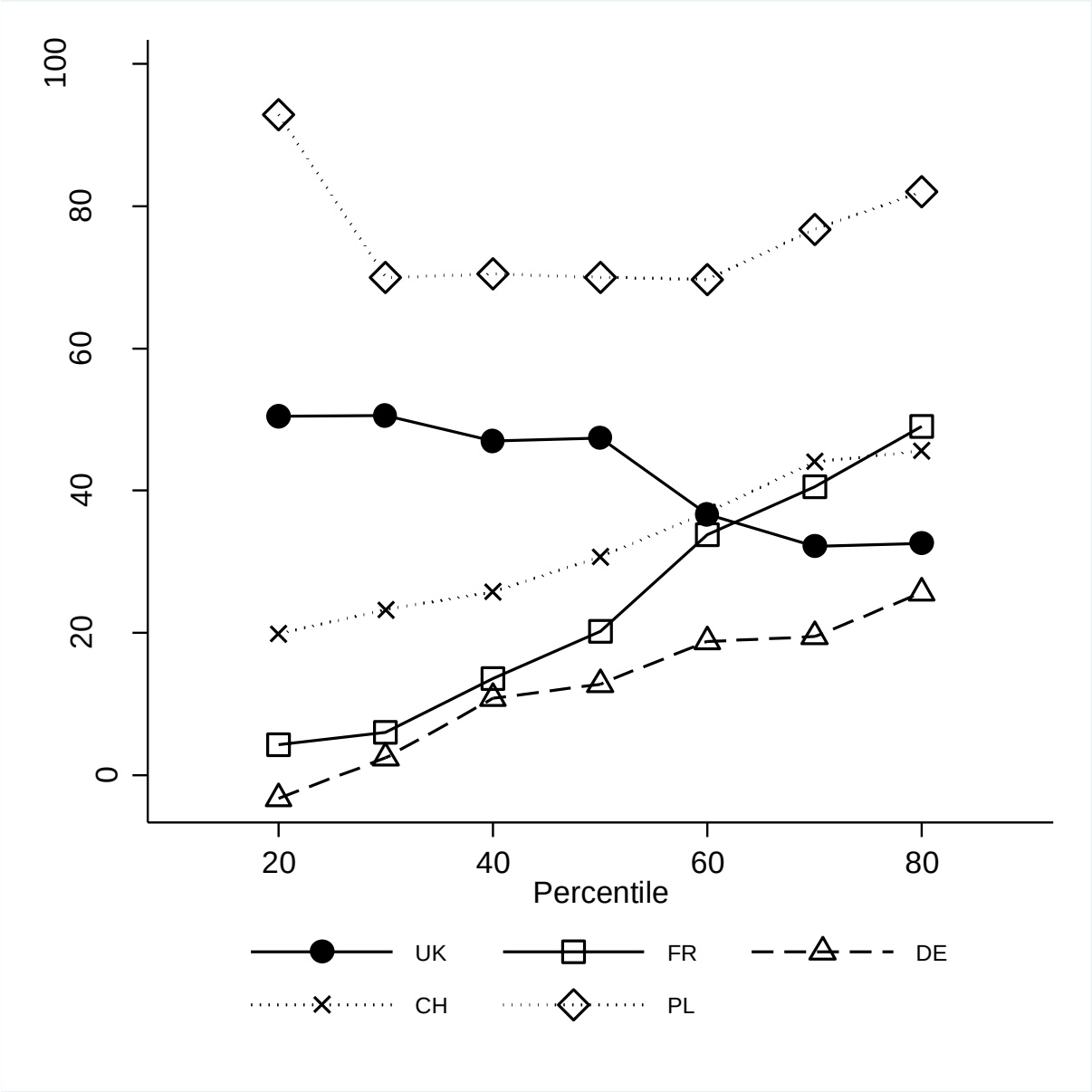
Notes: The left hand panel illustrates the estimated difference in income between individuals from 'low' and 'high' parental education backgrounds. The right hand panel presents analogous estimates for individuals from the top and bottom ISEI (parental occupation) quartile. The thin grey bars illustrate the 90 percent confidence interval. Countries are identified by their two letter country code (http://www.unc.edu/~rowlett/units/codes/country.htm). *Source:* Author's calculations using the ESS dataset.

Figure 5. Percentage difference in total income between individuals with 'low' versus 'high' educated parents (PIAAC estimates)



Notes:
Countries are identified by their two letter country code (see http://www.unc.edu/~rowlett/units/codes/country.htm). Thin grey lines refer to estimated 90 percent confidence intervals. *Source:* Author's calculations using the PIAAC dataset

Figure 6. Estimated parental education – sons' income gap at various points of the sons' income distribution (quantile regression estimates)



Notes:

Running along the horizontal axis are the percentiles of the national income distribution. Figures on the vertical axis refer to the estimated difference in income between individuals from the 'high parental education' and 'low parental education' backgrounds. Figures can be cross-referenced with Table 4. Results are presented for five countries: UK, France (FR), Germany (DE), Switzerland (CH) and Poland (PL). *Source:* Author's calculations based upon EU-SILC.

Appendix 1. Response rates

	EU-SILC		ESS		PIAAC	
	HH Response %	**Parental education response %**	**HH Response %**	**Parental education response %**	**HH Response %**	**Parental education response %**
Austria	-	99	62	98	53	-
Belgium	-	94	59	95	62	96
Bulgaria	-	97	74	98	-	-
Switzerland	-	92	47	98	-	-
Germany	-	98	48	97	55	
Hungary	-	99	63	99	-	-
Netherlands	-	95	60	97	51	98
Portugal	-	100	71	98	-	-
Slovak Republic	-	99	71	98	66	99
Finland	-	96	67	99	66	98
Japan	-	-	-	-	50	94
Korea	-	-	-	-	75	99
Luxemburg	-	100	47	95	-	-
Romania	97	99	70	-	-	-
Cyprus	90	100	72	100	73	97
Malta	88	97	-	-	-	-
Poland	85	90	72	98	56	97
Czech Republic	83	75	60	99	66	97
France	82	99	46	94	67	84
Lithuania	81	98	46	-	-	-
Latvia	81	97	65	-	-	-
Slovenia	76	98	66	99	-	-
Iceland	75	98	51	95	-	-
Italy	75	97	52	99	55	99
Greece	75	100	75	100	-	-
Estonia	74	96	64	97	63	93
United Kingdom	73	82	55	90	59	83
Sweden	64	82	63	98	45	
Spain	63	99	62	97	48	98
Denmark	56	94	59	99	50	99
Norway	49	98	63	99	62	98
Turkey	-	-	58	100	-	
Russia	-	-	68	96	-	94
Ireland	-	-	60	94	72	96
Median	**76**	**98**	**62**	**98**	**61**	**97**

Appendix 2. Complex survey design in the European Social Survey

A complex survey design is used to collected data in the European Social Survey, with 'clusters' firstly selected and then respondents selected from within. The use of a clustered sample design typically increases standard errors relative to a simple random sample, and should be taken into account during the analysis to ensure accurate confidence intervals and hypothesis tests are presented.

Unfortunately, the information required to adjust for such clustering is not routinely made available for all countries that participate in the ESS. The author made contact with the survey organisers regarding this point, who confirmed that it is *not possible* for those analysing the secondary data made publicly available to fully take into account the complex sample design for data confidentiality reasons. Consequently, I am unable to adjust for clustering in the analysis presented in this paper.

What impact does this have upon the results I present in this paper? Firstly, note that this issue does not have any impact upon the point estimates – rather it affects the standard errors and statistical inference only. Secondly, in some countries and certain rounds, information on the clustering is made available from the ESS data download website (e.g. see http://www.europeansocialsurvey.org/data/country.html?c=united_kingdom for the UK). I have used this information to investigate how the standard errors change in the specific model estimated in this paper (recall equation 2), with and without an adjustment for the complex survey design (Huber-White adjustments are made to the standard errors using the STATA 'svy' command). Appendix Table 2.1 illustrates the standard error for the high parental education parameter estimate (the group of interest in this paper). The 'inflation factor' refers to the ratio of the adjusted to unadjusted standard error

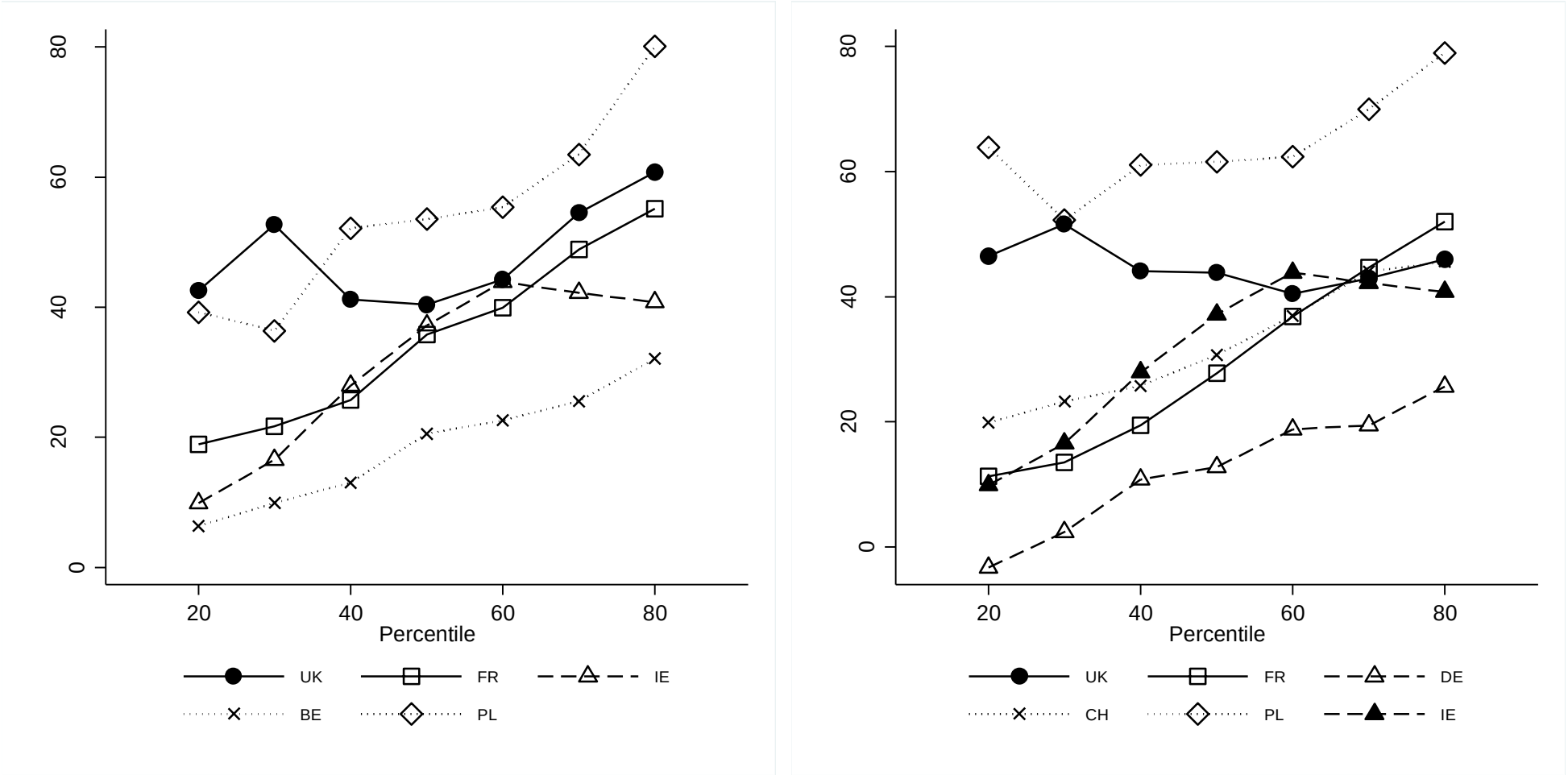
Appendix Table 2.1 Standard errors – with and without adjustment for the complex survey design in the ESS

	No clustering	Clustering	Difference	Inflation Factor
Belgium	0.0588	0.0536	-0.0052	0.9109
Ireland	0.1090	0.1017	-0.0073	0.9330
Slovak Republic	0.1188	0.1142	-0.0045	0.9618
Poland	0.0887	0.0880	-0.0008	0.9914
Czech Republic	0.0907	0.0915	0.0008	1.0088
Bulgaria	0.0801	0.0833	0.0032	1.0393
Croatia	0.0882	0.0917	0.0035	1.0397
Germany	0.0839	0.0884	0.0044	1.0529
Slovenia	0.1192	0.1255	0.0063	1.0530
France	0.1003	0.1095	0.0092	1.0921
Spain	0.0612	0.0670	0.0058	1.0945
Russia	0.0755	0.0844	0.0089	1.1184
Ukraine	0.1235	0.1395	0.0160	1.1293

The results presented in Appendix Table 2.1 are re-assuring. They suggest that, for my particular model of interest, the impact of the complex survey design on the estimated standard errors is limited. In most (but not all) countries, the standard errors do increase when an adjustment is made. However, the change is usually quite small (there is less than a 10 percent increase in most countries). For this reason, I do not make any alteration to the estimated standard errors when using the ESS in this paper.

Appendix Figure 3.1. Estimated parental education – sons' income gap at various points of the sons' income distribution (quantile regressions)

(a) PIAAC **(b) Meta-analysis**



Notes:
Running along the horizontal axis are the percentiles of the national income distribution. Figures on the vertical axis refer to the estimated difference in income between individuals from the 'high parental education' and 'low parental education' backgrounds. Figures can be cross-referenced with Appendix Tables 3.1 and 3.2. Results are presented for five UK, France (FR), Ireland (IE), Germany (DE), Switzerland (CH), Poland (PL) and Belgium (BE). *Source:* Author's calculations based upon PIAAC and EU-SILC datasets.

Appendix Table 3.1. Association between parental education and sons' income at different points of the income distribution: the UK's comparative position (PIAAC estimates)

P20	P30	P40	P50	P60	P70	P80
RU	BE	BE	NO	FI	DK	DK
NL	FI	FI	FI	DK	NL	RU
BE	DK	DK	DK	BE	BE	NL
FI	NO	NO	RU	NO	FI	JP
IE	NL	NL	BE	NL	CY	FI
DK	IE	CY	CY	CY	JP	BE
ES	FR	FR	NL	JP	NO	NO
NO	CY	RU	CZ	RU	RU	EE
FR	RU	IE	KR	KR	CZ	IE
CY	ES	KR	ES	EE	EE	CY
KR	KR	ES	FR	FR	ES	KR
CZ	CZ	JP	JP	CZ	KR	ES
IT	EE	CZ	EE	ES	IE	CZ
EE	IT	EE	IE	IE	FR	FR
JP	JP	IT	UK	UK	IT	IT
PL	PL	UK	IT	IT	UK	UK
UK	UK	PL	PL	PL	PL	PL
SK	SK	SK	SK	SK	SK	SK

Notes:
P20 is the quantile regression at the 20th percentile, P30 at the 30th percentile, etc. Data are sorted in each column by the strength of association between parental education and sons' income. The further down the table a country sits, the stronger the association (i.e. the greater the difference in test scores between the low parental education and high parental education groups). The UK is highlighted in rectangles. Countries near the top of the table that are highlighted in dark grey illustrate where the association between parental education and sons' income is significantly weaker than the UK at the 5 per cent level. Similarly, those at the bottom of the table are where the association is significantly stronger at the 5 per cent level. A cell shaded in light grey indicates a significant difference compared with the UK at the 10 per cent level. No correction for multiple hypothesis testing has been applied. Country abbreviations refer to official two-letter country codes. Further details can be found at http://www.unc.edu/~rowlett/units/codes/country.htm. Table can be cross-referenced with Appendix Figure 3.1 (panel a).
Source: Author's calculations from the PIAAC data set.

Appendix Table 3.2. Association between parental education and sons' income at different points of the income distribution: the UK's comparative position (Meta-analysis)

P20	P30	P40	P50	P60	P70	P80
PT	PT	DE	DE	DE	DE	IS
DE	DE	NL	NO	NL	NL	NL
RU	NL	AT	NL	IS	IS	DE
NL	AT	BE	BE	NO	DK	DK
AT	FI	NO	CY	CY	CY	JP
IS	FR	FI	RU	DK	BE	NO
CY	NO	FR	FI	BE	JP	RU
IE	BE	DK	AT	FI	NO	ES
FR	IE	IS	IS	AT	FI	FI
SI	SI	CY	DK	JP	RU	BE
NO	CY	PT	FR	KR	SI	CY
FI	DK	CH	KR	ES	ES	IE
BE	CH	SI	CH	GR	KR	EE
CH	RU	RU	GR	RU	CZ	KR
ES	ES	IE	ES	FR	AT	SI
KR	KR	ES	CZ	CH	IE	AT
DK	CZ	KR	JP	SI	MT	CH
CZ	IS	GR	IE	CZ	UK	UK
JP	JP	JP	SI	MT	CH	CZ
IT	IT	CZ	MT	UK	FR	GR
LU	GR	IT	UK	LV	GR	IT
MT	MT	MT	PT	IE	EE	MT
UK	EE	UK	EE	IT	LV	FR
LT	LT	LT	IT	EE	IT	LV
SK	UK	EE	SK	SK	SK	SK
GR	PL	LV	LV	PL	PL	RO
LV	SK	SK	LT	LT	LU	LU
PL	LU	PL	PL	BG	BG	PL
EE	LV	LU	LU	LU	RO	LT
HU	BG	BG	HU	PT	PT	BG
BG	HU	HU	BG	HU	HU	HU
RO	RO	RO	RO	RO	LT	PT

Notes:

P20 is the quantile regression at the 20th percentile, P30 at the 30th percentile, etc. Data are sorted in each column by the strength of association between parental education and sons' income. The further down the table a country sits, the stronger the association (i.e. the greater the difference in test scores between the low parental education and high parental education groups). The UK is highlighted in rectangles. Countries near the top of the table that are highlighted in dark grey illustrate where the association between parental education and sons' income is significantly weaker than the UK at the 5 per cent level. Similarly, those at the bottom of the table are where the association is significantly stronger at the 5 per cent level. A cell shaded in light grey indicates a significant difference compared with the UK at the 10 per cent level. No correction for multiple hypothesis testing has been applied. Country abbreviations refer to official two-letter country codes. Further details can be found at http://www.unc.edu/~rowlett/units/codes/country.htm. Table can be cross-referenced with Appendix Figure 3.1 (panel b).