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The Socio-Economic Gradient in Teenagers' Reading Skills: How Does England Compare with Other Countries?*

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Abstract

A number of studies have explored the link between family background and children's achievement in a cross-national context. A common finding is that there is a stronger association in England than in other parts of the developed world. Rather less attention has been paid, however, to England's comparative position at different points of the achievement distribution. Is the test score gap particularly big between the most able children from advantaged and disadvantaged homes, or are differences particularly pronounced between low achievers? This issue is investigated using the Programme for International Student Assessment (PISA) 2009 data set. The association between family background and high achievement is found to be stronger in England than in most other developed countries, and there is little evidence that this has changed over time. However, socio-economic differences at the bottom of the achievement distribution are no more pronounced in England than elsewhere. I discuss the implications of these findings for social mobility and educational policy in the UK.

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Keywords: PISA, educational inequality, social mobility.

JEL classification numbers: I20, I21, I28.

Policy points

- The link between family background and educational achievement is thought to be an important determinant of social mobility.
- The association between family background and high educational achievement is stronger in England than in most other developed countries.
- Socio-economic inequalities in educational achievement may have declined in England over the last decade.

I. Introduction

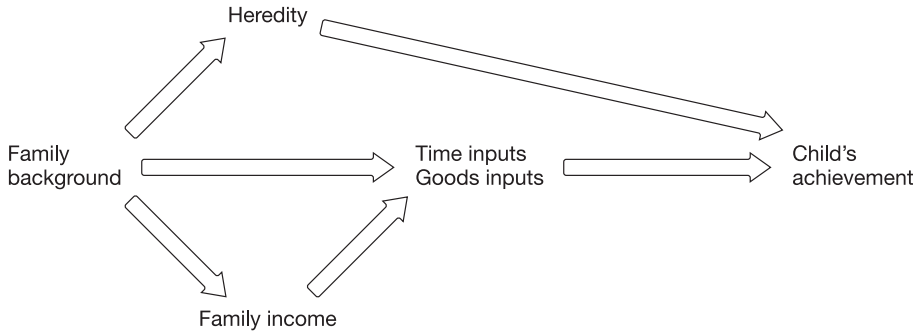
Social mobility has emerged as one of the key academic and political topics in England over the past decade. Groundbreaking studies by leading economists have suggested that intergenerational income mobility decreased between children born in 1958 and 1970[1] and that the association between fathers' and sons' incomes is stronger here than elsewhere.[2] Prominent policymakers from across the political divide have thus noted how England is becoming a 'closed-shop' society (Alan Milburn), that 'social mobility has ground to a halt' (Conservative Party, 2008) and that even bright children from poor backgrounds are unable to succeed (Deputy Prime Minister Nick Clegg). Although sociologists have cast doubt on some of these claims,[3] there seems to be broad disciplinary agreement that education is one of the key drivers of intergenerational persistence (the criticisms of Saunders (2010) withstanding). The link between family background and children's academic achievement is therefore central to concerns over England's lack of social mobility and has become a major field of study in its own right. This paper thus investigates the strength of the association between socio-economic position (measured by parental occupation) and children's reading skills at age 15, with specific attention paid to whether this intergenerational link is stronger in England than elsewhere.

I draw upon Haveman and Wolfe's (1995) framework of intergenerational transmission to explain why it is important to consider this topic from a cross-national perspective. This can be found in Figure 1. Children's achievement is assumed to have two proximate determinants: home investments (time and goods inputs) and heredity. The former, determined partly by family income, reflect the environments in which children grow up. The latter (heredity) illustrates that at least part of the association between socio-economic background and children's outcomes is

[1]Blanden et al., 2004.
[2]Blanden, 2009.
[3]Erikson and Goldthorpe, 2010.

FIGURE 1

Haveman and Wolfe framework of children's achievement



Source: Adapted from Haveman and Wolfe (1995, figure 1).

due to genetic inheritance: bright parents tend to hold high socio-economic positions and produce offspring of above-average intelligence (who will thus do well in later achievement tests).[4] The implication is that estimates of the association between family background and children's achievement reflect both 'genetic' and 'environmental' factors. Therefore, without a comparative context, such simple associations tell us little about the extent to which disadvantaged children's lower test scores are attributable to the poor environments in which they have been brought up.[5]

Beller (2009) and Blanden (2009) note that one way around this problem is to compare estimates of such associations across a set of similar nations. The intuition is that, if one assumes that the influence of genetic inheritance is roughly the same in each country, then any cross-national difference in the strength of association between family background and children's outcomes will be due to 'environmental' factors. In other words, countries where this relationship is strong are the ones in which disadvantaged children do not receive the inputs they need to succeed.

It is therefore concerning that at the end of the twentieth century, England did not perform well in this respect. Using TIMSS data from the 1990s,[6] Schütz, Ursprung and Wößmann (2008) found that the association between family background and children's achievement was stronger in England (on

[4]As Blanden (2009) notes, it is therefore difficult to imagine a world where there is no link between generations. Beller (2009) goes a step further, stating that the absence (or near absence) of an association between family background and children's outcomes is neither plausible nor (perhaps) desirable.

[5]Most frameworks of intergenerational persistence do not explicitly consider the possibility of gene by environment (G×E) interactions. The presence of such interactions would suggest that such simple partitioning of environment and genetics is not sensible. See Perry (2002), Turkheimer et al. (2003) and McGrath et al. (2007) for evidence of G×E interactions. Manski (2010) also discusses this issue. If G×E interactions do play an important role in the development of children's cognitive skill, then this could also be responsible for the differences observed across countries.

[6]TIMSS is the Trends in International Mathematics and Science Study.

average) than in most other countries. Wößmann (2008), using data from roughly the same period, found a similar result. Yet there has been much investment in disadvantaged children over the last 10–15 years. Educational expenditure has risen in England from 4.5 per cent of GDP in 1997 to near 6 per cent in 2010,[7] while child poverty has declined by more than in any other developed country.[8] This begs the question, 'Do such findings (which remain widely cited) still hold?'. I consider this issue throughout the course of this paper by investigating (a) how inequality in educational achievement in England currently compares with that in other developed countries and (b) whether the achievement gap between rich and poor has narrowed over the last decade.

The second limitation of the existing literature is that socio-economic differences are only considered in terms of *average* test scores. In contrast, this paper explicitly considers the size of the socio-economic gradient at different points of the achievement distribution. A particular concern is whether the *most able* children from disadvantaged homes are able to keep up academically with their more advantaged peers.[9] This has important implications for those concerned with widening access to higher education (particularly to 'elite' institutions) and the top professions. In particular, socio-economic differences towards the top of the achievement distribution need to be sufficiently narrow to make such pathways a viable option for disadvantaged groups. If this is not accomplished, then England is unlikely to foster the 'top-end' social mobility that many see as a desirable goal.

In this paper, these issues are discussed in reference to five specific comparator countries (Australia, Canada, Finland, Germany and the US), while also being put in the broader context of 22 OECD nations. Policymakers have shown much interest in such cross-national comparisons, with the five aforementioned countries receiving particular attention.[10] Some key information (for example, inequality, intergenerational income mobility and average PISA achievement scores) can be found in Table 1. With regards to socio-economic inequalities, some countries (for example, Australia and Canada) stand out as being quite socially mobile despite

[7]Crawford, Emmerson and Tetlow, 2009.

[8]For further details, see http://www.oecd.org/dataoecd/61/32/47701096.pdf and http://www.oecd.org/dataoecd/52/43/41929552.pdf (table C02.2.A).

[9]A similar topic has indeed caught the imagination of British academics and policymakers before; Feinstein (2003) specifically focused on how the development of advantaged and disadvantaged children differed amongst those who performed particularly well on an early test, and his is arguably the piece of research that has had the greatest impact on social policy in England over the past decade. Jerrim and Vignoles (2011) argue, however, that the methodology applied in Feinstein (2003) is problematic and that estimates are likely to suffer from the statistical problem of regression to the mean.

[10]Comparisons between England and Finland are not as common as with the other countries listed. This country has been included as it has been described as one of the 'PISA winners' (Dobbins and Martens, 2012), with high average test scores and low educational inequality.

TABLE 1

Summary of country characteristics

	Source[a]	*Australia*	*Canada*	*England*	*Finland*	*Germany*	*US*
Poverty, inequality and social mobility							
Intergenerational income elasticity[b]	Blanden (2009)	0.25	0.23	0.37	0.20	0.24	0.41
Income inequality (Gini coefficient)	OECD (KT)	0.301	0.317	0.335	0.269	0.298	0.381
Percentage of children living in poverty	OECD (KT)	14.0	15.1	12.5	5.4	8.3	21.6
Educational achievement							
PISA reading rank in 2009	PISA 2009	9th	6th	25th	3rd	20th	17th
Mean PISA reading test score in 2009	PISA 2009	515	524	494	536	497	500
Standard deviation of PISA reading test score	PISA 2009	99	90	95	86	95	97
Youth labour market							
Unemployment rate (%, 2010)	OECD (EO)	5.3	8.1	7.9	8.5	7.2	9.8
Youth unemployment rate (%, 2010)	OECD (EO)	11.5	14.8	19.1	20.3	9.7	18.4
Educational expenditure							
Percentage of GDP spent on (non-tertiary) education	OECD (EAG)	3.6	3.6	4.2	3.8	3.0	4.1

[a]Figures are taken from various sources. OECD (KT) stands for OECD key tables, (EO) for *Employment Outlook* and (EAG) for *Education at a Glance*. PISA 2009 is the most recent wave of the Programme for International Student Assessment.

[b]Countries with a high figure for the intergenerational income elasticity are the least socially mobile.

having reasonably high levels of income inequality.[11] Others are both unequal and immobile (for example, the US) or are generally high achieving with (comparatively) little income/educational inequality (for example, Finland). Such diversity makes this a particularly interesting group with which to compare.

In the following section, I describe the Programme for International Student Assessment (PISA) data on which this paper is based. The most recent wave (2009) is used to study how socio-economic differences in PISA test scores vary across countries, both on average and across the achievement distribution. I also investigate whether there has been a reduction in socio-economic inequalities in educational attainment in England since the first PISA wave in 2000, and whether this has been concentrated amongst the most or least able pupils. Results suggest the following:

- The difference between advantaged and disadvantaged children's PISA 2009 reading test scores in England is similar (*on average*) to that in most other developed countries (including Australia, Germany and, to some extent, the US). This is in contrast to previous studies from the 1990s, which suggested that there was a particularly large socio-economic gap in English pupils' academic achievement.
- Yet the association between family background and *high* achievement seems to be stronger in England than elsewhere.
- There is some evidence that the socio-economic achievement gradient has been reduced in England over the last decade, although not amongst the most able pupils from advantaged and disadvantaged homes.

The paper now proceeds as follows. Section II describes the PISA data and my empirical methodology. This is followed in Section III by estimates of (a) socio-economic differences in average test scores, (b) how this gap varies at different points of the PISA test distribution and (c) whether there have been changes over time. Conclusions and policy recommendations are contained in Section IV.

II. Data and methodology

Data are drawn from the Programme for International Student Assessment (PISA), a study of 15-year-olds' achievement conducted across the OECD nations every three years. In each country, a minimum of 150 schools are selected with probability proportional to size, with 35 pupils then randomly

[11]See Björklund and Jäntti (2009) and Ermisch, Jäntti and Smeeding (2012) for further discussion.

selected from within. Average response rates of both schools and pupils are high (around 90 per cent in most countries).[12]

TABLE 2

Summary statistics of variables used in the analysis

	Australia	*Canada*	*England*	*Finland*	*Germany*	*US*
PISA reading test score (2009)						
P5	342	368	335	384	333	337
P10	384	406	370	419	366	371
P25	450	464	429	480	434	433
P50	522	529	499	543	505	501
P75	584	589	559	598	567	570
P90	638	636	615	643	613	626
P95	668	663	645	668	638	656
Mean	515	524	494	536	497	500
Standard deviation	99	90	95	86	95	97
HISEI distribution						
P5	25	28	25	29	28	25
P10	30	30	30	30	30	30
P20	40	37	34	38	34	34
P25	43	42	38	40	38	40
P40	51	51	44	51	43	51
P50	53	53	50	53	49	52
P60	56	59	52	56	51	56
P75	69	69	59	68	56	66
P80	69	69	66	69	67	69
P90	70	71	69	71	70	70
P95	77	77	74	77	74	77
Mean	52	53	51	52	50	53
Standard deviation	16	16	16	16	16	16
Gender						
Boys (%)	48.9	50.3	49.1	50.1	51.1	51.3
Immigrant status						
Immigrants (%)	42.2	35.5	20.6	7.7	23.7	27.2
N	*14,251*	*23,207*	*9,548*	*5,810*	*4,979*	*5,233*

Note: P5 refers to the 5th percentile of the distribution, P10 to the 10th percentile, etc.
Source: PISA 2009.

[12]A set of sampling weights are provided by the survey organisers that attempt to correct for non-response and scale the sample up to the size of the national population. These weights are applied throughout the analysis.

As part of the PISA study, participants sit a two-hour test that measures their cognitive ability in three areas (reading, maths and science).[13] In 2000 and 2009, the focus was children's reading skill, and hence this is the attribute that I study in this paper.[14] All questions included in the test were designed with cross-national comparability in mind. Children's answers were summarised by the survey organisers using an 'item-response model', producing five 'plausible values'. These are five different estimates of children's 'true' reading ability at age 15. The intuition is that children's true skill cannot be observed (it is a latent trait) and must therefore be estimated from the answers that they provide to the test. This is done via the item-response model, with the five plausible values equally likely to reflect children's true proficiency in a particular subject. The first of these plausible values is used throughout the analysis.[15] This variable has a mean of roughly 500 points across all OECD children who took the test and a standard deviation of 100. To aid interpretation, the survey organisers state that 40 PISA test points is equivalent to roughly one additional year of schooling.[16] Table 2 illustrates the distribution of this variable across the key countries considered.

There are several ways one may use the PISA data to divide children into those from 'advantaged' and those from 'disadvantaged' homes. One common way of doing so is on the basis of parental education, playing directly into a growing literature on intergenerational educational mobility and cross-national studies in this area.[17] Measurement of parental education in cross-national studies is, however, problematic. First, education systems and qualifications differ dramatically across countries, with cross-national comparability a major concern.[18] Second, information on parental education is often based upon children's reports.[19] Jerrim and Micklewright (2012) discuss how this can lead to measurement error, and show how this is more problematic for some of the PISA measures of socio-economic status (parental education and books in the home) than it is for others (parental occupation). Finally, the wording of questions used to capture information on parental education changed between the 2000 and 2009 PISA survey

[13]Micklewright, Schnepf and Skinner (2010) show that the correlation between scores on the PISA test and achievement on national exams in England is high ($r \approx 0.8$). These national exams are an important determinant of children's future employability and the availability of certain educational pathways (for example, which university they are able to attend).

[14]In 2003 and 2006, reading was a so-called 'minor domain', with children asked fewer questions on this topic.

[15]I experimented using the other plausible values, and by running five separate models and averaging the estimated coefficients and standard errors. Results are very similar to those presented.

[16]OECD, 2010b, p. 157. The organisers state that six years of additional schooling is equivalent to 242 PISA test points. This roughly converts into 40 test points for one school year.

[17]For example, Hertz et al. (2007) and Chevalier, Denny and McMahon (2009).

[18]Steedman and McIntosh, 2001.

[19]Schulz, 2005; Kreuter et al., 2010.

waves, making it inappropriate to use for measuring change over time.[20] Thus, despite the conceptual attraction of parental education as a measure of social stratification, the above concerns mean that alternatives must be considered.

The main measure of family background used in this paper is the HISEI[21] index of occupational status (a widely-used measure in the sociological literature), which assigns each occupation a score between 16 and 90 based upon the 'inputs' (educational level required) and 'outputs' (the salary commanded) for that particular job.[22] The creators – Ganzeboom, De Graaf and Treiman (1992) – explicitly designed this index to improve the measurement of socio-economic status (SES) in cross-national research, and have thus validated it across a range of developed countries, making it particularly attractive for this piece of work.

The HISEI index is included in PISA as a predefined variable, which has been created by the survey organisers based upon children's reports of their mother's and father's occupation (whichever is the higher). The distribution of this variable across countries can be found in Table 2. The index is divided (within each country) into five quintile groups, with the top quintile defined as 'advantaged' and the bottom quintile as 'disadvantaged'. To give readers unfamiliar with this measure some feel for the data, the bottom quintile in England includes occupations such as roofer, labourer, waiter/ waitress and chambermaid, while the top quintile contains judges, doctors, architects and professional engineers (amongst others). The motivation for using this 'quintile' definition is that it has been widely used in the existing literature on socio-economic gradients[23] and, as noted by Feinstein and Bynner (2004), is widely understood in policy circles.[24] Moreover, it ensures that results will not be driven by a different proportion of children being defined as 'advantaged' and 'disadvantaged' in the different countries. There are, of course, also limitations to this choice. For instance, one could argue that it results in some information loss, or that different occupations are being used to define advantaged and disadvantaged groups in different

[20]In fact, my investigation into national adaptions of the PISA questionnaire suggests that there have been some changes to the parental education questions throughout this period (at least in some countries). One example is the wording used to capture post-secondary-school qualifications in Australia, which altered between 2003 and 2006.

[21]Highest international social and economic index.

[22]Appendix A, available online, presents an additional set of estimates using an alternative measure of family background (http://www.ifs.org.uk/docs/fsjun12_jerrim_appendices.pdf).

[23]For example, Chowdry et al. (2010) and Crawford, Goodman and Joyce (2010).

[24]This method does, of course, lead to some information loss. For instance, it might also be interesting to compare outcomes for the least advantaged and the average child, versus the average child and the most advantaged. This would, however, produce a very large number of estimates. Hence, going into such finer details is not practical when using a (cross-national) quantile regression approach.

countries.[25] My experimentations with the data suggest, however, that the broad pattern of results still holds when using various alternatives (for example, the HISEI index values as a simple linear term).[26]

Measurement error in the HISEI data might be another concern. Schulz (2005) has, however, investigated this issue using PISA field trial data, where a subsample of parents were asked about their occupation in a piloted 'parental questionnaire'. He found a strong correlation ($r \approx 0.8$) between parental and child reports of the HISEI index in 14 out of the 15 countries considered. Jerrim and Micklewright (2012) also found evidence that children's reports of parental occupation in PISA are generally consistent with those drawn from their parents. Moreover, I have used a subsample of the PISA 2006 data to test the sensitivity of my results to who reports the information on family background. Estimates do indeed seem robust to whether the sampled children or their parents report the information on family background and, although this does not completely rule out the possibility of measurement error, the signs are nevertheless encouraging.[27]

In the next section, the aforementioned variables enter as covariates in ordinary least squares (OLS) and quantile regression models of children's reading achievement. The intuition behind these techniques is shown in Figure 2, which presents hypothetical test score distributions for low SES and high SES children.[28] M^L and M^H represent the mean test scores for these two groups. OLS regression that includes a dummy variable for socio-economic status (low versus high) captures the difference between these two points (conditional upon any other factors that have been included in the model). Quantile regression can be thought of in a similar way. The points Q^L and Q^H in Figure 2 represent the 90^{th} percentile of the low SES distribution and the 90^{th} percentile of the high SES distribution. A quantile regression analysis at the 90^{th} percentile will capture the difference between these two points (again, conditional upon any other factors that have been included in the model). An analogous interpretation holds when estimates are made at other points of the test distribution (for example, a quantile regression estimate at the 10^{th} percentile). For a more technical description of quantile regression, I direct the reader to Koenker and Bassett (1978).

The specification of the model estimated follows that used in the existing literature on international comparisons of socio-economic achievement

[25]In other words, different quintile groups will incorporate different types of occupations in different countries. Thus, if one particular country has many parents in low-skilled jobs, this could lead to it having greater measured disparities.

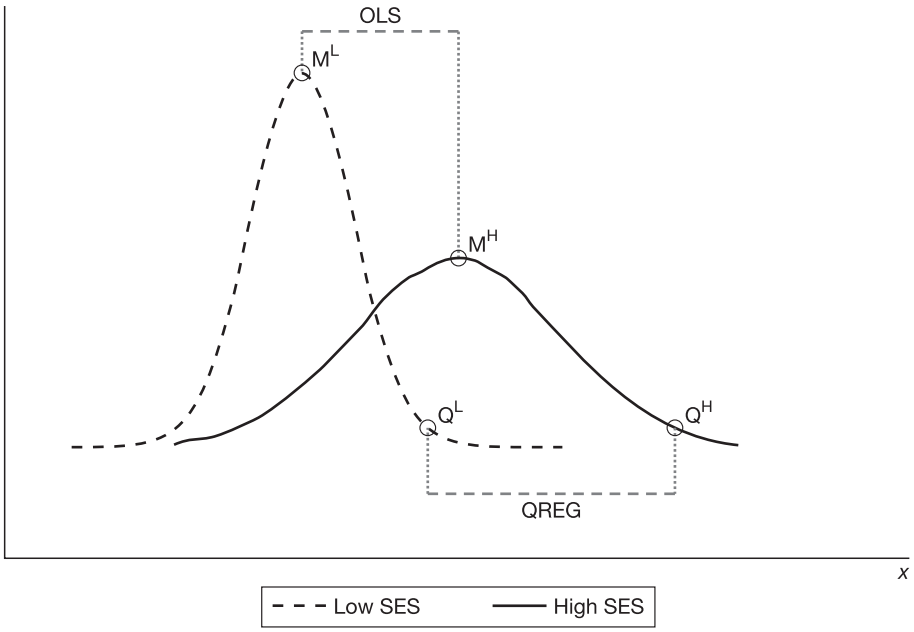
[26]Results are available upon request.

[27]Further details are available upon request.

[28]In this example, I have set the shapes of the high and low SES test score distributions to be different, for illustration purposes.

FIGURE 2

Hypothetical distribution of test scores 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 the means 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 included in the model). Q^H and Q^L, on the other hand, refer to the 90th percentiles of the high and low SES distributions. Quantile regression will capture the difference between these two quantities (conditional on the other terms included in the model). In this example, I have set the shapes of the high and low SES test score distributions to be different – the standard deviation of the high SES distribution is greater than that of the low SES distribution. Under this scenario, the quantile regression estimate will be greater than the OLS estimate. This can be seen from the diagram, as the dashed 'QREG' line is longer than the dashed 'OLS' line ($M^H - M^L < Q^H - Q^L$). For further information, see my discussion in this section.

gradients.[29] Socio-economic status (quintiles of the HISEI index) is the covariate of interest, with controls included for gender and whether the child was a first- or second-generation immigrant.[30] As argued by Wößmann (2008), other characteristics (for example, type of school attended) are intentionally not controlled, so that the SES parameter captures all the channels by which family background influences children's test performance at age 15 (through both nature and nurture). The estimated coefficients will

[29]For example, Schütz, Ursprung and Wößmann (2008), Wößmann (2008) and Jerrim and Micklewright (2011).

[30]Children had to answer three questions regarding whether they, their mother or their father were born outside the country in which they are taking the test. I define a child as an 'immigrant' if they answer yes to any of these three questions.

thus capture the *cumulative* impact of family background on children's test performance, including their experiences during the first years of life (which Cunha et al. (2006), amongst others, have stressed are extremely important). The final form of the model is[31]

$$(1) \qquad A_{ijk} = \alpha + \beta_1 SES_i + \beta_2 Sex_i + \beta_3 I_i + \beta_4 SES_i I_i + \varepsilon_{ij} \quad \forall k \,,$$

where: A_{ijk} is the child's score on the PISA reading test for child i from school j in country k; Sex_i is a binary indicator of the child's gender (0 = female, 1 = male); I_i indicates whether the child is a first- or second-generation immigrant (0 = native, 1 = immigrant); SES_i is a set of four dummy variables reflecting quintiles of the HISEI distribution (reference: bottom quintile); and ε_{ij} is an error term, where there is clustering of children within schools. In OLS estimation, this is taken into account by making the appropriate adjustment to the estimated standard errors. It is not possible to do the same in a quantile regression approach; thus, I bootstrap by cluster (schools) using 50 replications when calculating the standard errors in the quantile regression models.[32]

All estimates refer to socio-economic gaps at *national* deciles of the test distribution. This approach therefore abstracts from absolute differences in test performance across countries, and instead focuses upon SES gaps at the same *relative* point of the *national* achievement scale. One implication of this is that these percentiles will refer to different levels of skill. My exploration of the data suggests, however, that results are robust to this choice (i.e. substantive findings still hold if absolute skill thresholds are used instead). Summary statistics for all variables used in the analysis can be found for a selection of countries in Table 2.

One final issue is the comparability of the PISA data across the four survey waves (this is important for my analysis of change over time). Even though PISA has been explicitly designed with this in mind, there have been some difficulties in this respect for England. First, the response rate in 2000 and 2003 did not quite meet the strict requirements of the OECD (it fell 3 per cent short). A recent report by the survey organisers states that the bias induced by this was 'likely [to be] negligible',[33] although some have questioned this claim.[34] Second, data for 'England' in the PISA 2009 study include pupils from both England and Wales. On the other hand, Wales only

[31]'Missing' categories (dummy variables) are also included to ensure children are not dropped from the analysis when pieces of information are unavailable. In England, 5 per cent of children are missing parental occupation data, compared with 6 per cent in Australia, 6 per cent in Canada, 1 per cent in Finland, 11 per cent in Germany and 5 per cent in the US.

[32]I have not, however, made any adjustment for the stratification in the PISA data, which may introduce some upward bias into my estimated standard errors.

[33]OECD, 2010a, p. 30, footnote 3.

[34]For example, Micklewright, Schnepf and Skinner (2010).

took part in the 2003 wave onwards (and not in 2000). Third, the test was sat by children in the 2000 and 2003 waves in March/April, while in 2006 and 2009 it was notably earlier in the school year (November/December). Finally, and possibly related to each of the factors above, the distribution of test scores in England has changed dramatically over this nine-year period. This can be seen in Table 3, where I present the distribution of test scores for England compared with the OECD average. I discuss this issue at length in Jerrim (2011b).

I have tested the robustness of my results to the above difficulties in various ways. First, I have investigated the sensitivity of my results to different sample selections (for example, to the inclusion or exclusion of children from Wales in the 2003, 2006 and 2009 data sets). Similarly, I have tested whether my substantive results still hold when I explore socio-economic differences at specific points thresholds which have kept the same meaning over time (say 400 points), rather than at certain percentiles, to try to take the different distributions of test scores into account. Finally, the fact that response rates met the OECD threshold in the 2006 and 2009 waves, while the target population and test month were also consistent, makes comparison between these years a useful check for the consistency of results (and will hence be explicitly discussed in my analysis of change over time in the following section).[35]

TABLE 3

Distribution of PISA reading test scores in England and the OECD average

	England				OECD average			
	2000	*2003*	*2006*	*2009*	*2000*	*2003*	*2006*	*2009*
P5	352	346	315	335	335	329	320	335
P10	391	379	357	370	374	370	363	372
P25	457	445	431	429	440	436	432	435
P50	527	510	501	499	509	504	502	503
P75	596	573	567	559	570	566	564	565
P90	651	625	620	615	620	615	615	614
P95	685	655	655	645	648	643	645	642
Mean	524	506	495	494	502	498	495	498
Standard deviation	101	95	102	95	96	96	98	94

Notes: P5 refers to the 5th percentile of the distribution, P10 to the 10th percentile, etc. Figures refer to the number of points at various percentiles of the PISA test distribution. 'OECD average' refers to averaging the relevant figures across the OECD countries in the international PISA database.
Source: Author's calculations from the PISA data sets.

[35]The 2006 to 2009 comparison therefore overcomes most of the concerns about the comparability of the data over time, although an obvious limitation is that it only allows one to examine change between cohorts born just three years apart.

III. Results

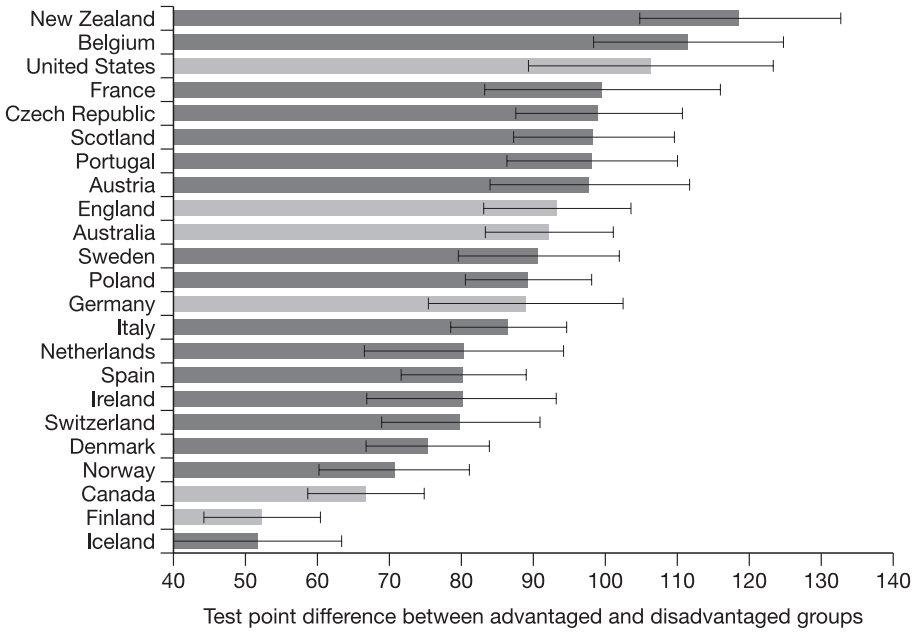
This section attempts to summarise the main findings from the OLS and quantile regression models in a simple and accessible way. A full set of parameter estimates for England, Australia, Canada, Finland, Germany and the US are provided in Appendix B.[36]

1. The socio-economic gap in *average* test scores

Figure 3 illustrates the size of the socio-economic gap in average PISA reading test scores (based upon OLS estimates). The length of each bar represents the difference in PISA test points achieved by 'advantaged' and 'disadvantaged' groups (i.e. the top and bottom HISEI quintiles). The thin black line running through the centre is the estimated 95 per cent confidence interval.

FIGURE 3

Estimated socio-economic gap in mean PISA reading test scores across 23 countries, 2009



Notes: Figures along the horizontal axis refer to the difference in PISA points scored by 'advantaged' and 'disadvantaged' children (i.e. the top and bottom HISEI quintiles) on average. The thin black lines show the 95 per cent confidence interval of each estimate. The countries that I focus my discussion on are highlighted in light grey.
Source: PISA 2009.

[36]Available online at http://www.ifs.org.uk/docs/fsjun12_jerrim_appendices.pdf.

England sits around the middle of the international ranking, with the socio-economic gap standing at roughly 95 PISA test points. In other words, by the final year of compulsory schooling, the reading skills of English children from disadvantaged backgrounds are (on average) two-and-a-half years behind those from the most affluent homes. Although this difference may seem large, it is not atypical to that seen in other countries (estimates for both Australia and Germany are of a similar magnitude). In contrast, the US stands out as a country where socio-economic differences in educational achievement are particularly big (more than 100 PISA test points). This is perhaps what one might expect for a country with high levels of inequality and low levels of intergenerational income mobility (recall Table 1). One cannot conclude, however, that the US is significantly different from England (nor Australia or Germany) at the 5 per cent level.

At the other extreme are Canada and Finland. These two countries sit amongst a set of (mainly northern European) countries where the association between family background and the average level of children's achievement is particularly weak. For instance, the OLS estimates suggest that the socio-economic test score gap in Finland is (on average) about 50 PISA test points (little more than one year of schooling), which is roughly half the size of that in England, Germany or the US. This is consistent with research suggesting that these two countries (Canada and Finland) are amongst the most socially mobile.[37]

2. The size of the socio-economic gap across the achievement distribution

Figure 3 has established (a) that there are large socio-economic differences in average PISA test scores and (b) that there is variation in the size of this gap across developed countries. Quantile regression estimates now illustrate how the gap varies across the achievement distribution. Results can be found in Figure 4. Running along the horizontal axis are deciles of the PISA test distribution, with the magnitude of socio-economic test score gap on the vertical axis. This figure is supplemented by Table 4, which ranks each country by the size of the socio-economic gap at each PISA test decile (those with weak associations are found towards the top of the table). Countries shaded in grey and accompanied by one or two stars illustrate where the association is significantly weaker/stronger than in England at either the 5 or 10 per cent level. Solid filled markers on Figure 4 indicate estimates that are significantly different from that for England.

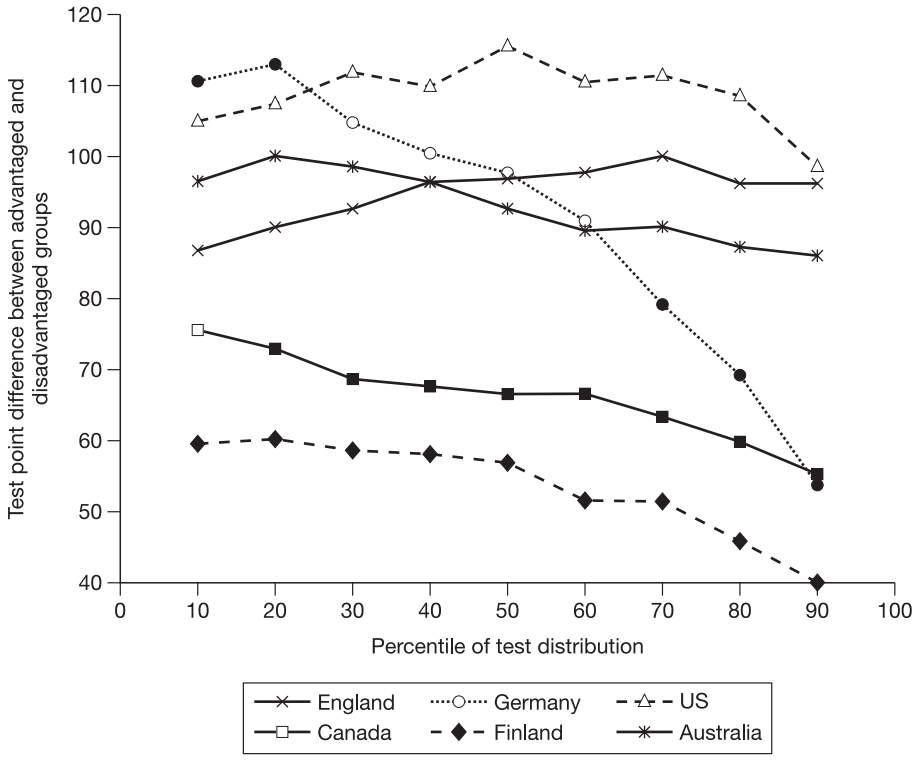
In the US, the association between family background and achievement is particularly strong at all points of the PISA test distribution, while in Finland (a country with high income mobility and low inequality) the relationship is always comparatively weak. The situation in other countries is more

[37]See Blanden (2009) and Table 1.

complex, with the socio-economic gradient only standing out as atypically large or small (compared with other countries) at certain test deciles. Of particular interest for this paper, the link between family background and high achievement is stronger in England than in most other countries. For instance, Table 4 reveals that socio-economic test score differences at the 80th percentile are greater here than in 18 out of the other 22 OECD countries considered (and significantly so on 11 occasions). The same is not true, however, at the bottom of the PISA reading test distribution, where England is actually ranked above the median, having smaller socio-economic test score differences.

FIGURE 4

Estimated socio-economic achievement gap at various points of the PISA reading test distribution, 2009



Notes: Running along the horizontal axis are the percentiles of the national PISA reading test distribution. Figures on the vertical axis refer to the estimated difference in test scores between children from the most advantaged (top national HISEI quintile) and children from the least advantaged (bottom national HISEI quintile) backgrounds. Markers that have a solid fill illustrate where the estimate is significantly different from that for England at (at least) the 10 per cent level. At no point are estimates for England and Australia significantly different at the 5 per cent level.
Source: Author's calculations based upon PISA 2009.

TABLE 4

Association between family background and children's reading ability at different points of the PISA test distribution: England's comparative position, 2009

Q10	*Q20*	*Q30*	*Q40*	*Q50*	*OLS*	*Q60*	*Q70*	*Q80*	*Q90*
IS*	IS*	IS*	IS*	IS*	IS*	FI*	FI*	FI*	FI*
FI*	FI*	FI*	FI*	FI*	FI*	IS*	IS*	IS*	IS*
NL	NO*	CA*	CA*	NO*	CA*	CA*	CA*	CA*	DE*
NO	CA*	NO*	NO*	CA*	NO*	NO*	DK*	ES*	CA*
CA	DK	DK	ES	ES*	DK*	ES*	NO*	DK*	DK*
CH	NL	CH	DK	DK*	CH	IE*	ES*	DE*	ES*
DK	CH	PL	CH	IE*	IE	DK*	IE*	NO*	IE*
GB(E)	IE	NL	IE	CH	ES	CH**	DE*	NL*	AT*
IT	PL	IE	PL	SE	NL	IT	CH*	IE*	CH*
IE	GB(E)	GB(E)	IT	IT	IT	PL	NL	CH*	NL*
SE	IT	ES	SE	AU	DE	AU	IT	IT**	IT*
PL	GB(S)	IT	AU	NL	PL	NL	PL	FR	NO*
GB(S)	ES	GB(S)	NL	PL	SE	SE	FR	PL	SE**
AU	SE	SE	GB(E)	GB(E)	AU	DE	AU	BE	PT**
ES	AU	AU	GB(S)	DE	GB(E)	PT	BE	AT	PL**
AT	CZ	CZ	FR	GB(S)	AT	FR	PT	AU	BE
CZ	PT	DE	CZ	PT	PT	GB(E)	SE	PT	AU
US	AT	PT	DE	FR	GB(S)	GB(S)	AT	SE	FR
DE**	US	FR	PT	CZ	CZ	CZ	GB(E)	GB(E)	CZ
PT*	DE**	US	US	AT	FR	AT	CZ	CZ	GB(E)
FR*	FR*	AT**	AT**	US	US	BE	GB(S)	GB(S)	US
NZ*	BE*	BE*	BE*	BE*	BE*	US	NZ	NZ	NZ
BE*	NZ*	NZ*	NZ*	NZ*	NZ*	NZ**	US	US	GB(S)

Notes: Q10 is the quantile regression at the 10th percentile, Q20 at the 20th percentile, etc. Data are sorted in each column by the strength of association between family background and children's reading test score. The further down the table a country sits, the stronger the association (i.e. the greater the difference in test scores between the most and least advantaged quintiles of the population). England is highlighted in rectangles. Countries near the top of the table that are highlighted in dark grey (accompanied by a single star) illustrate where the association between family background and test scores is significantly weaker than in England 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 with a double star indicates a significant difference compared with England at the 10 per cent level. Country abbreviations refer to official two-letter country codes. GB(E) refers to England and GB(S) to Scotland. Further details can be found at http://www.unc.edu/~rowlett/units/codes/country.htm.
Source: Author's calculations from the PISA 2009 data set.

It is also insightful to compare England with some of the specific countries of interest. Consider, first of all, the similarities and differences with Canada. Towards the bottom part of the test distribution (for example, the 10th percentile), the socio-economic achievement gaps in these two countries are similar (standing at around 85 PISA test points in England and 75 in Canada). The same does not apply, however, at the top: Figure 4 reveals that there is a difference between advantaged and disadvantaged groups of almost 100 points at the 80th percentile in England, compared with

around 60 in Canada. Table 4 shows that this is a statistically significant difference at the 5 per cent level. It is thus clear that the socio-economic test score gradient is significantly weaker in Canada than in England *on average* (as shown in Figure 3) because Canada has a weaker link between family background and *high* test performance. Indeed, when it comes to socio-economic differences at the top of the achievement distribution, England actually has much more in common with the US.

Another interesting country to compare England with is Germany. Recall from Figure 3 that the socio-economic achievement gap is very similar in these two countries (on average). Figure 4 reveals, however, a clear contrast in what is lying behind this broad result. At the bottom end of the test distribution (P10 and P20), the socio-economic gradient is significantly *steeper* in Germany than in England at the 10 per cent level, standing just short of 110 PISA test points (almost three years of schooling) in the former compared with less than 90 in the latter. But when looking at the top of the test score distribution (P80 and P90), the opposite holds true. The socio-economic gradient amongst high achievers in Germany is around 60–70 PISA test points, compared with almost 100 in England, which Table 4 highlights as a statistically significant difference at the 5 per cent level. Hence there is clearly more variation in socio-economic inequalities across England and Germany than simple OLS estimates suggest. Indeed, Figure 4 highlights the rather distinct problems that these two countries face, which are likely to require quite different policy responses.

Before turning to the issue of change over time, it is worth considering why the association between family background and high achievement is stronger in England than in most other countries. Anecdotally, much of the investment made in disadvantaged children in England is designed to help this group reach a basic level of skill (i.e. to push up the lower tail). Indeed, academics, policymakers and the media frequently discuss England's 'long tail of low achievement' and the need to increase the proportion of disadvantaged children (for example, those receiving free school meals) reaching a certain floor target (for example, five GCSEs at grades A*–C). Although this is clearly important, much less attention seems to be paid to helping disadvantaged children who are already doing reasonably well to push on and reach the top grades. This is consistent with the findings presented above.

Another possibility is that the link between family background and high achievement is a reflection of the different schools young people attend. Able children from disadvantaged homes in England often do not have access to the best schools, while many from affluent backgrounds receive intensive private tuition. In contrast, disadvantaged children who are doing well in school at age 10 in Germany have access to high-quality *Gymnasien*, which can potentially provide the educational resources these children need

to keep up academically with their more affluent peers.[38] It is possible that this is one of the reasons there is a weaker relationship between family background and high achievement in Germany than in England. At face value, this may provide some motivation for policymakers in England to consider a return to a selective (grammar) school system. However, it is interesting to note that socio-economic differences at the top end of the achievement distribution still stand out as atypically large in England if one also includes a school-level fixed effect.[39] This would seem to suggest that it is not schools (or a school-level factor) that are driving this result. Such interpretations should, however, be treated with caution. There are many possible explanations for the patterns observed, with identification of causal relationships that explain these cross-national differences being beyond the scope of this paper.

3. Has the socio-economic achievement gradient declined in England since PISA 2000?

To complete this section, I consider whether socio-economic inequalities in educational achievement have changed since the first PISA study in 2000. For brevity, discussion focuses upon the results for England. I begin by investigating whether the socio-economic achievement gradient has declined on average over this period. Results can be found in Table 5, with the 'change' column illustrating the extent to which the socio-economic test score gap has increased or decreased between 2000 and 2009.

The table suggests that the socio-economic achievement gap has been reduced in England, and that there is some evidence of a trend emerging (although one should bear in mind that there are only four time points upon which to base this). Specifically, the difference in PISA test scores (on average) between advantaged and disadvantaged groups was 108 points in 2000, dropping to around 98 points in 2003 and 2006, and then to 93 in 2009. This decline of 15 test points (or 0.15 of an international standard deviation) is of reasonable magnitude and sits on the boundary of statistical significance at the 10 per cent threshold ($t = 1.62$, $p = 0.10$). To put this into context, the reading ability of low SES children has moved (on average) approximately one school term closer to that of their high SES peers.[40] This

[38]However, doing well in school at age 10 will, to a great extent, be determined by parental inputs during the early years (see Cunha et al. (2006)), which is why disadvantaged children tend to be under-represented within such schools.

[39]Estimates are available upon request.

[40]The PISA survey organisers state that 40 PISA test points equals roughly one year of additional schooling. As there are three school terms in England per year, 15 PISA points is approximately equal to one school term.

TABLE 5

Comparing the association between family background and children's test performance (on average) across the four PISA waves

	Estimated socio-economic gradient in children's test scores				Change, 2000–2009		
	2000	*2003*	*2006*	*2009*	*Difference*	*SE*	*t-stat*
Australia	108	88	84	92	–16	8.6	–1.88
Canada	77	70	79	67	–10	5.4	–1.89
England	108	98	98	93	–15	9.1	–1.62
Finland	55	53	49	52	–3	6.8	–0.48
Germany	121	91	86	89	–32	16.8	–1.91
US	102	–	–	106	4	12.5	0.31
OECD	88	83	86	87	–1	10.0	–

Notes: Figures refer to the number of PISA test points between children from the most advantaged (top national HISEI quintile) and least advantaged (bottom national HISEI quintile) backgrounds. The 'difference' column refers to the change in the socio-economic gap between 2000 and 2009; a negative figure refers to a decline in the socio-economic test score gap between advantaged and disadvantaged groups. The 't-stat' column illustrates results from the test of the hypothesis that the change between the PISA 2000 and 2009 cohorts is zero. Data for the US are not included in 2003 and 2006 as there was a problem with the reading test data for this country in these years (when reading was a minor domain).
Source: Author's calculation from the PISA data sets.

finding is consistent with other recent research,[41] which found socio-economic differences in national exam performance to have declined in England over roughly the same period. It is also interesting to note that there has been a significant decline in some of the other countries of interest (Australia and Germany), but not in others (Finland and the US).[42]

Next, I consider whether this reduction in socio-economic inequalities in England has been concentrated amongst high or low achievers. The quantile regression results for England from PISA 2000 (square markers) are compared with those from PISA 2003 (circles), 2006 (diamonds) and 2009 (triangles) in Figure 5. Notice that the data points are a large distance apart on the left-hand side of the graph, but are quite close together on the right. For instance, the estimated socio-economic gap at the 20th percentile for the PISA 2000 cohort was roughly 115 PISA test points, but only 90 in PISA 2009. This decline (of 25 PISA test points or 0.25 of an international standard deviation) is both large (equivalent to two terms' worth of schooling) and statistically significant at the 5 per cent level (t = 2.4). The PISA 2003 and 2006 results are consistent with this view, and suggest the decline is not simply due to random fluctuations in the data. In particular, I find a decline in the socio-economic gap of roughly 15 test points at the 20th percentile between the PISA 2006 and 2009 cohorts, which is, in itself, on

[41]For example, Sullivan, Heath and Rothon (2011).

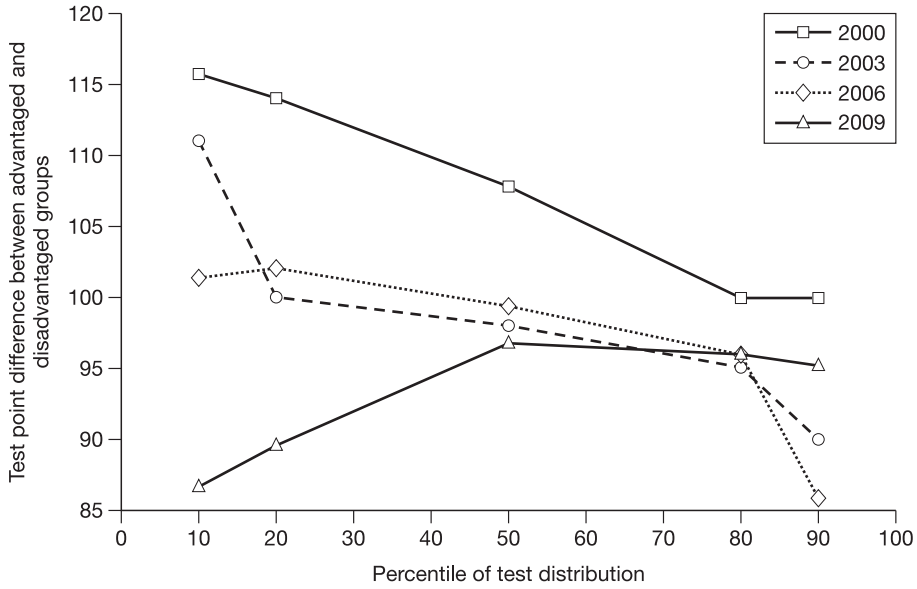
[42]One may note that the declines in Australia and Germany are driven by a particularly large gap in the 2000 study that has not been replicated in any of the more recent waves. There is, in other words, less evidence of a genuine trend.

the boundary of being a statistically significant change at the 10 per cent level (t = 1.64). On the other hand, the association between family background and the 80th achievement percentile was roughly 101 test points in PISA 2000, and has dropped by just 3 test points as of 2009 (a small and statistically insignificant decline).[43]

Why has the socio-economic achievement gap narrowed in the lower tail of the achievement distribution but not at the top? Although it is difficult to directly attribute this change to government policy, a number of initiatives were introduced over this period to improve disadvantaged children's basic skills. One example is the 'literacy hour', which was specifically designed to help those with low-level reading skills. This was rolled out nationally during the time in question, with an evaluation finding the scheme to be

FIGURE 5

Comparison of quantile regression estimates for England from the four PISA waves



Notes: Running along the horizontal axis are the percentiles of the national PISA reading test distribution. Figures on the vertical axis refer to the estimated difference in test scores between children from the most advantaged (top national HISEI quintile) and children from the least advantaged (bottom national HISEI quintile) backgrounds.
Source: Author's calculations based upon the PISA data sets.

[43]I have also investigated whether the socio-economic gap in children's PISA maths test scores has narrowed over the same period. Interestingly, evidence of a reduction is not so clear (at any point on the achievement distribution). This is consistent with the less obvious policy focus on maths during this period (compared with the interventions in literacy, such as the literacy hour). Careful interpretation of this result is required, however, as maths has been the focus of PISA only once (in 2003), with children asked relatively few questions on this topic in subsequent years.

TABLE 6

PISA reading test scores achieved by children in the bottom and top SES quintiles across the four waves

	P10		Mean		P90	
	Bottom Q	*Top Q*	*Bottom Q*	*Top Q*	*Bottom Q*	*Top Q*
2000	362	471	480	588	597	692
2003	350	443	462	560	576	660
2006	329	428	451	549	567	653
2009	342	425	449	542	561	652
Change, 2000–2009	–20	–46	–31	–46	–35	–40

Notes: P10 refers to the 10th percentile of the achievement distribution, P90 to the 90th percentile. Bottom Q refers to the bottom SES quintile, top Q to the top SES quintile.
Source: Author's calculations based upon the PISA data sets.

highly effective.[44] Initiatives targeting more able children in England (for example, the Gifted and Talented scheme) have, on the other hand, been criticised in the media for not reaching those from lower socio-economic groups.[45] This is consistent with my finding that the association between family background and PISA test scores weakened between 2000 and 2009, but only towards the bottom end of the achievement distribution.[46]

On the other hand, some policymakers have claimed that academic standards have fallen in England over this period (based, in part, upon England's fall in the PISA rankings). Although there are difficulties with such interpretations,[47] one cannot rule out the possibility that it is this that has led to the reduction observed in the socio-economic achievement gap. I illustrate this point in Table 6, which provides the 10th percentile, 90th percentile and mean PISA reading scores achieved by children from the top and bottom HISEI quintiles. Figures are provided for each of the four PISA waves.

Notice how the average PISA test score achieved by the low SES group has fallen between 2000 and 2009 but by less than that for the high SES group (31 points compared with 46 points). Thus the narrowing of the socio-

[44]Machin and McNally, 2008.

[45]See http://www.telegraph.co.uk/education/educationnews/7720608/Poorest-schoolchildren-missing-out-on-help.html, for example.

[46]To test the robustness of the results presented in this subsection, I have estimated similar models using the HISEI index of occupational status as a continuous measure of family background. My substantive inferences remain largely intact. In particular, I still find evidence of a decline in the family background effect for England between the two cohorts, and that this is being driven by a reduction in socio-economic inequalities amongst the lowest achievers. Moreover, I continue to find that England stands out in this respect compared with most other developed nations. I also find that the aforementioned conclusions hold true when exploring socio-economic differences at absolute skill thresholds (for example, a certain number of PISA test points in the two surveys) rather than at certain percentiles (see appendix 2 of Jerrim (2011a) for details).

[47]I discuss this issue at length in Jerrim (2011b).

economic achievement gap would seem to be driven by the greater decline in achievement amongst children from the most advantaged backgrounds. Moreover, whereas the apparent decline in performance for the top SES quintile seems to have occurred quite evenly across the achievement distribution (P10 and P90 have both fallen by roughly 40–45 test points), the decline suffered by the most disadvantaged group is most apparent at the top end (P10 has decreased by 20 points compared with 35 points at P90).

Which of these interpretations is correct? Has the socio-economic achievement gap been reduced because of government initiatives raising basic skills or due to children from affluent backgrounds suffering a particularly marked fall in their achievement? Unfortunately, limitations with the PISA data for England make this a difficult question to answer. Policymakers must thus exercise caution and await further investigation, based upon a broader body of evidence, before reaching a firm conclusion on this matter.

IV. Summary, discussion and conclusions

The relationship between socio-economic status and children's cognitive achievement has become a key academic and political topic in England over the past decade. Worryingly, data from the 1990s suggested that this association was stronger (on average) in England than elsewhere. I have contributed to the existing literature by considering how this relationship varies across the achievement distribution and how it has changed over time. Results suggest that children's reading skills are heavily linked to their socio-economic background, but not by more (on average) in this country than in most other OECD countries. England does, however, stand out in international comparisons when one considers the link between family background and *high* achievement. Moreover, my estimates suggest that the family background effect may have weakened in this country over the last decade, although mainly in the bottom part of the achievement distribution. This finding is consistent with the large investment made by government in education, children and families in England since 2000, along with the emphasis on improving disadvantaged children's basic literacy skills. However, I am unable to rule out the possibility that the decline in the socio-economic achievement gap is the consequence of a decline in affluent children's literacy standards over this period.

There are, of course, limitations to this work and there is a need for further research. Perhaps the most pressing issue is that the causal mechanisms behind such cross-national differences need to be better understood. Although some explanations have been offered, trying to isolate the specific reason(s) why the association between family background and high achievement is particularly strong in England has not been directly

tackled in this particular study. Nevertheless, this paper has important implications for public policy, particularly regarding access to elite higher education institutions and the top professions. The fact that the literacy skills of the most able pupils from disadvantaged homes lag those of their more advantaged peers by over two years of schooling suggests that such pathways are not currently viable options for them. To widen participation in such areas, it is therefore vital to improve the academic achievement of the most able children from disadvantaged homes.

The key question for policymakers is, of course, 'How do we reach this goal?'. As noted by Chowdry et al. (2010), schemes to raise academically able pupils' aspirations during secondary school may be important if these have a causal influence on their later attainment. Alternatively, a targeted 'gifted and talented' scheme could be introduced, where high-potential children from poor backgrounds are identified at the start of compulsory education and receive sustained investment throughout their time at school. Much valuable research has suggested that it is most efficient to invest early, but also that inputs are complementary (i.e. that later investment is most effective when it builds on earlier investment).[48] Disadvantaged children who have reached school age doing relatively well should thus be in a particularly strong position to benefit from a period of such sustained investment.[49] Schemes of this nature could be piloted in the most deprived parts of the country and undergo a thorough evaluation before being rolled out on a national scale. Despite the fiscal limitations that governments are acting under, such investment may be needed in order to reduce England's comparatively strong association between family background and high achievement, and thus to make pathways to elite higher education institutions and the top professions a viable option for more children from disadvantaged homes.

References

Beller, E. (2009), 'Bringing intergenerational social mobility research into the twenty-first century: why mothers matter', *American Sociological Review*, vol. 74, pp. 507–28.

Björklund, A. and Jäntti, M. (2009), 'Intergenerational income mobility and the role of family background', in W. Salverda, B. Nolan and T. Smeeding (eds), *The Oxford Handbook of Economic Inequality*, Oxford: Oxford University Press.

Blanden, J. (2009), 'How much can we learn from international comparisons of intergenerational mobility?', Centre for the Economics of Education (CEE), Discussion Paper no. 0111.

[48]For example, Cunha et al. (2006).

[49]This is not to say that disadvantaged children who are falling behind others should be neglected. Indeed, there are many other social and economic reasons why investment may be needed in this particular group.

—, Goodman, A., Gregg, P. and Machin, S. (2004), 'Changes in intergenerational mobility in Britain', in M. Corak (ed.), *Generational Income Mobility in North America and Europe*, Cambridge: Cambridge University Press.

Chevalier, A., Denny, K. and McMahon, D. (2009), 'Intergenerational mobility and education equality', in P. Dolton, R. Asplund and E. Barth (eds), *Education and Inequality across Europe*, Cheltenham: Edward Elgar.

Chowdry, H., Crawford, C., Dearden, L., Goodman, A. and Vignoles, A. (2010), 'Widening participation in higher education: analysis using linked administrative data', Institute of Education, Department of Quantitative Social Science (DoQSS), Working Paper no. 10-08.

Conservative Party (2008), *Through the Glass Ceiling*, Conservative Policy Report.

Crawford, C., Goodman, A. and Joyce, R. (2010), 'Explaining the socio-economic gradient in child outcomes: the intergenerational transmission of cognitive skills', Institute for Fiscal Studies (IFS), Working Paper no. 10/16.

Crawford, R., Emmerson, C. and Tetlow, G. (2009), 'A survey of public spending in the UK', Institute for Fiscal Studies (IFS), Briefing Note no. 43.

Cunha, F., Heckman, J., Lochner, L. and Masterov, D. (2006), 'Interpreting the evidence on lifecycle skill formation', in E. Hanushek and F. Welch (eds), *Handbook of the Economics of Education*, North-Holland.

Dobbins, M. and Martens, K. (2012), 'Towards an education approach à la *finlandaise*? French education policy after PISA', *Journal of Education Policy*, vol. 27, pp. 23–43.

Erikson, R. and Goldthorpe, J. (2010), 'Has social mobility in Britain decreased? Reconciling divergent findings on income and class mobility', *British Journal of Sociology*, vol. 61, pp. 211–30.

Ermisch, J., Jäntti, M. and Smeeding, T. (eds) (2012), *From Parents to Children: The Intergenerational Transmission of Advantage*, New York: Russell Sage Foundation.

Feinstein, L. (2003), 'Inequality in the early cognitive development of British children in the 1970 cohort', *Economica*, vol. 70, pp. 73–97.

— and Bynner, J. (2004), 'The importance of cognitive development in middle childhood for adult socio-economic status, mental health, and problem behaviour', *Child Development*, vol. 75, pp. 1329–39.

Ganzeboom, H., De Graaf, P. and Treiman, D. (1992), 'A standard international socio-economic index of occupational status', *Social Science Research*, vol. 21, pp. 1–56.

Haveman, R. and Wolfe, B. (1995), 'The determinants of children's attainments: a review of methods and findings', *Journal of Economic Literature*, vol. 33, pp. 1829–78.

Hertz, T., Jayasundera, T., Piraino, P., Selcuk, S., Smith, N. and Verashchagina, A. (2007), 'The inheritance of educational inequality: international comparisons and fifty-year trends', *B.E. Journal of Economic Analysis and Policy*, vol. 7, issue 2 (Advances), article 10.

Jerrim, J. (2011a), 'The literacy achievement of disadvantaged children in England: are they stuck to the floor or unable to reach the ceiling?', Institute of Education, Department of Quantitative Social Science (DoQSS), mimeo.

— (2011b), 'England's plummeting PISA test scores between 2000 and 2009: is the performance of our secondary school pupils really in relative decline?', Institute of Education, Department of Quantitative Social Science (DoQSS), Working Paper no. 11/09.

— and Micklewright, J. (2011), 'Children's cognitive ability and parents' education: distinguishing the impact of mothers and fathers', in T. Smeeding, R. Erikson and M. Jäntti (eds), *Persistence, Privilege, and Parenting: The Comparative Study of Intergenerational Mobility*, New York: Russell Sage Foundation.

— and — (2012), 'The socio-economic gradient in children's cognitive skills: how robust are comparisons across countries to who reports the socio-economic characteristics?',

Institute of Education, Department of Quantitative Social Science (DoQSS), Working Paper, forthcoming.
— and Vignoles, A. (2011), 'Social mobility: regression to the mean and the cognitive development of high ability children from disadvantaged homes', Institute of Education, Department of Quantitative Social Science (DoQSS), Working Paper no. 11/01.
Koenker, R. and Bassett Jr, G. (1978), 'Regression quantiles', *Econometrica*, vol. 46, pp. 33–50.
Kreuter, F., Eckman, S., Maaz, K. and Watermann, R. (2010), 'Children's reports of parents' education level: does it matter whom you ask and what you ask about?', *Survey Research Methods*, vol. 4, no. 3, pp 127–38.
Machin, S. and McNally, S. (2008), 'The literacy hour', *Journal of Public Economics*, vol. 92, pp. 1441–62.
Manski, C. (2010), 'Genes, eyeglasses, and social policy', Institute for Policy Research, Working Paper no. 10-09.
McGrath, L., Pennington, B., Willcutt, E., Boada, R., Shriberg, L. and Smith, S. (2007), 'Gene × environment interactions in speech sound disorder predict language and pre-literacy outcomes', *Development and Psychopathology*, vol. 19, pp. 1047–72.
Micklewright, J., Schnepf, S. and Skinner, C. (2010), 'Non-response biases in surveys of school children: the case of the English PISA samples', Institute of Education, Department of Quantitative Social Science (DoQSS), Working Paper no. 10-04.
OECD (2005), *PISA 2003 Technical Report*, Paris: Organisation for Economic Cooperation and Development.
— (2009), *PISA 2009 Results – Overcoming Social Background: Equity in Learning Opportunities and Outcomes*, Paris: Organisation for Economic Cooperation and Development.
— (2010a), *Learning Trends: Changes in Student Performance since 2000*, Paris: Organisation for Economic Cooperation and Development.
— (2010b), *PISA 2009 Results – What Students Know and Can Do*, Paris: Organisation for Economic Cooperation and Development.
Perry, B. (2002), 'Childhood experience and the expression of genetic potential: what childhood neglect tells us about nature and nurture', *Brain and Mind*, vol. 3, pp. 79–100.
Saunders, P. (2010), *Social Mobility Myths*, London: Civitas.
Schulz, W. (2005), 'Measuring the socio-economic background of students and its effect on achievement in PISA 2000 and PISA 2003', paper presented at the Annual Meetings of the American Educational Research Association (AERA), San Francisco.
Schütz, G., Ursprung, H. and Wößmann, L. (2008), 'Education policy and equality of opportunity', *Kyklos*, vol. 61, pp. 279–308.
Steedman, H. and McIntosh, S. (2001), 'Measuring low skills in Europe: how useful is the ISCED framework?', *Oxford Economic Papers*, vol. 53, pp. 564–81.
Sullivan, A., Heath, A. and Rothon, C. (2011), 'Equalisation or inflation? Social class and gender differentials in England and Wales', *Oxford Review of Education*, vol. 37, pp. 215–40.
Turkheimer, E., Haley, A., Waldron, M., D'Onofrio, B. and Gottesman, I. (2003), 'Socioeconomic status modifies heritability of IQ in young children', *Psychological Science*, vol. 14, pp. 623–8.
Wößmann, L. (2008), 'How equal are educational opportunities? Family background and student achievement in Europe and the United States', *Zeitschrift für Betriebswirtschaft*, vol. 78, pp. 45–70.