Exploring the relation between socio-economic status and reading achievement in PISA 2009 through an intercepts-and-slopes-as-outcomes paradigm

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ABSTRACT

In some countries more than others, factors like parental socio-economic status (SES) can cause inequalities in educational achievement. Here we show how the mechanisms leading to such inequalities can be scrutinized by involving background variables which impact the relation between SES and achievement. We use the intercepts-and-slopes-as-outcomes paradigm which recognizes that the outcomes of schooling systems are not only characterized by average achievement (the intercept) but also by the achievement–SES regression slope. We show how certain background variables moderate the relationship between SES and achievement. As an illustration, we examine the relationship between reading achievement and SES, and how this is moderated by school funding and curriculum. This is done for several countries that participated in the PISA 2009 cycle.

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1. Introduction

Advancing equality of opportunity is widely seen as a significant function of public goods such as higher education. Fair access to education and training, and flexibility in the way it can be accessed can help to unlock the opportunities that will allow the widest pool of talent to enter and progress within society. Equity in educational achievement is a crucial determinant of the extent of equality of opportunity and intergenerational mobility achievement by societies (Schutz, Ursprung, & Woßmann, 2008). Since Coleman's landmark study on Equality of Educational Opportunity, socioeconomic status has been seen as a strong predictor of student achievement. Coleman asserted that the influence of student background was greater than anything that goes on within schools. Subsequent research in the sociology of education offers conclusive evidence of a positive relationship between family socio-economic status (SES) and the academic achievement of students (Sirin, 2005; White, 1982). Though the factor of race or ethnicity is closely associated with that of poverty as a predictor of achievement, Harkreader and Weathersby (1998) found its influence much less than economic factors. The relationship between family SES and academic achievement is referred to in the literature as a socioeconomic gradient because it is gradual and increases across the range of SES (Adler et al., 1994; Willms, 2002), or as a socio-economic gap because it implies a gap in academic achievement

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between students of high and low SES families. Scholars have shown that a socio-economic gap in the early school years has lasting consequences. Particularly, as low SES children get older their situation tends to worsen. In the longer term, they are less likely to enter the labour market successfully or pursue post-secondary education (Alexander, Entwisle, & Olson, 2007; Cabrera & La Nasa, 2001; Kerckhoff, Raudenbush, & Glennie, 2001; Raudenbush & Kasim, 1998). That educational and labour opportunities are unequally distributed among individuals of varying SES poses concerns and challenges in societies that value equal opportunity irrespective of socio-economic background. Therefore numerous studies have been undertaken to explain and understand the processes that configure socio-economic gradients.

The issue of socio-economic status and its relationship to student achievement is more complex than Coleman's (1966) report first intimated. Chall (1996) analyzed a combination of National Assessment of Educational Progress (NAEP) reading results, Scholastic Aptitude Tests scores over time, and a synthesis of research on reading beginning from 1910 to 1996. She also concluded that there are large differences between higher and lower socio-economic status children but that the differences were smaller among younger children and increased in the higher grades. Other researchers have examined the underlying family processes that mediate the relationship between SES and educational outcomes (Chao & Willms, 2002; Guo & Harris, 2000; Hanson, McLanahan, & Thomson, 1997; Lareau, 2002; Yeung, Linver, & Brooks-Gunn, 2002); the extent to which socio-economic gaps in academic achievement are consistent across subject areas (Ma, 2000); the school practices that can effectively reduce achievement inequalities across SES groups (Cohen, 1982; Rutter & Maughan, 2002; Scheerens, 1992); the impact of the school organizational model (Coleman & Hoffer, 1987; Coleman, Hoffer, & Kilgore, 1981, 1982); the role of tracking (Ansalone, 2010; Loveless, 1999; Oaks, 1985; Schofield, 2010; Van de Werfhorst & Mijs, 2010). In this study we focus on two important facets of educational organization, school type and tracking, that are known to moderate the relationship between SES and achievement and are malleable characteristics of the educational system from a policy perspective at the system level.

We first outline the theory and past research on the role of the school sector in academic achievement. The influence of school type on students' results has been a major topic in the educational field for quite a long time. Much research has been conducted on the relative effects of school type on academic achievement. Such studies were influenced by the relative merits of public and private sectors in education, and had implications for the allocation of government resources, that is, if the private sector can educate children more effectively (and for less money), then it is difficult to justify the exclusive hold that public schools have on public funding for education (Lubienski, 2001, 2003). Public schools are viewed as input-oriented organizations, accountable to bureaucracies, not to consumers, so they lack structural incentives to innovate, improve, or respond to demands for quality from the groups that they serve (Chubb & Moe, 1990; Coleman, 1997). Private schools on the other hand are considered to be free of much of the bureaucracy and regulation that inhibit performance in the public sector, but they are not shielded from competition as public schools are. They must demonstrate greater effectiveness in terms of their outputs in order to attract families willing to pay tuition. So, while private schools tend to draw more advantaged families that can afford the added costs, if such schools can be shown to achieve superior results with the same types of students who attend public schools, then there is a stronger argument for policies that promote the private sector. This would not only be a more efficient and effective use of public resources in educating the public, but there is a serious equity concern about trapping poorer families in the underperforming public sector. However not all researchers agree about academic advantages that private schools ought to convey based on the above reasoning. In their opinion public schools are better resourced than independent private schools on average and public school teachers and administrators are required to receive a certain level of training. If such factors are linked to higher student achievement, then we might expect that public schools could perform relatively well. Over the last decades researchers have collected actual evidence to put such theoretical arguments about school type to the test. Goldhaber (1996) examined a subsample from the NELS data of over 3000 students each in mathematics and reading. After controlling for the fact that the private school students come from more affluent and educated families, he found no achievement advantage in private schools. On the other hand a report by James Coleman and Hoffer (1987), Coleman et al. (1981, 1982) found a notable private school effect, inherent advantages for schools in the private sector that resulted in greater academic achievement even after controlling for differences in student populations. In the UK studies about public/private schools do show that the school type does make a difference on students' achievement (Archer, 1984). The admissions system strongly favors privately educated applicants, particularly in accessing top universities. According to the Independent Schools Council, the independent sector educates around 6.5% of the total number of school children in the UK, however it accounts for over 48% of the entrants to the UK's 30 most selective universities. Furthermore in the UK the most socio-economically advantaged 20% of the young people are up to six times more likely to enter higher education than the most socio-economically disadvantaged 20%. These differences are even more skewed in the most selective disciplines (Brennan & Osborne, 2008, p.180). In the USA a government report on mathematics results from the 2003 National Assessment of Educational Progress (NAEP) highlighted this finding: "Public-school students scored lower on average than non-public-school students at both grades 4 and 8". This finding was not considered new as private school students in the United States have typically scored higher than public school students on standardized tests, confirming the perception among the US public and policymakers that private schools are inherently more effective than public schools.

However, the real question for researchers and policymakers is whether differences in test scores between the private schools and public schools is primarily due to differences in the student populations served by these different sectors. According to Lubienski and Lubienski (2005), there are reasons to expect that private schools would have higher achievement than public schools, even after accounting for differences in their student population. Private schools are free of

much of the bureaucracy that plagues schools in the public sector, and are able to focus on a core academic curriculum. Furthermore, in private schools, parents are positioned to select a school based on academic quality, and to choose another if their school fails to meet expectations. Additionally, private school parents, through the act of choosing, demonstrate a commitment to their children's education, a characteristic that goes beyond typical SES measures and is associated with higher student achievement. In view of such factors, it seems reasonable to expect that private schools have many incentives to excel.

Next we outline the theory and past research on the role of tracking students in different curriculums in academic achievement. Tracking or student grouping has also been a much investigated issue in educational circles. Advocates of tracking believe that tracking benefits students' academic performance and detractors on the other hand believe that tracking would increase the achievement gap between tracked students. A number of studies can be found on the impact of tracking on student performance (Ansalone, 2010; Loveless, 1999; Oaks, 1985; Schofield, 2010; Van de Werfhorst & Mijs, 2010). The key issues of tracking is whether this widely adopted educational practice has an impact on students achievement, which in turn may lead to widened inequality among students tracked into different ability groups or curriculum types. The arguments about tracking often rest on a perceived trade-off between equity and efficiency. Some discussions of tracking are mainly concerned with placements between different types of schools and others with placements into different tracks within schools but the arguments are basically the same. The main argument behind tracking is that homogeneous classrooms permit a focused curriculum and appropriately paced instruction that leads to the maximum learning by all students. The arguments against tracking largely revolve around the concerns that the lower groups will be systematically disadvantaged by slower learning environments that leave them far behind the skills of those in the upper groups. Furthermore, a number of studies on school influences argue that because school practices like tracking are not neutral in their treatment of students of varying socio-economic backgrounds, they tend to produce a widening gap between students in higher and lower tracks. For example, researchers have suggested that the disproportionate assignment of low SES students to lower school tracks (Kerckhoff, 1993; Pallas, Entwisle, Alexander, & Stiuka, 1994) lead to increasing inequalities between high SES and low SES students over time. Close investigation of trends in high school student results in the USA indicates that curriculum differentiation has had a negative effect on the education of many young adults, particularly working-class and African-American students (Mirel & Angus, 1994). Research on tracking in the US and UK has consistently shown that tracking was positive to the students who were assigned to high ability tracks and was negative to the students assigned to low ability tracks (Gamoran, 1992). Reviewers of empirical studies of tracking or ability grouping have pointed out that one possible mechanism for tracking to be positive to students' performance is for ability grouping to be accompanied with curriculum differentiation (Kulik & Kulik, 1992; Schofield, 2010; Slavin, 1990). Tracking without providing students with different levels of difficulty or providing them with different programs or instruction would not produce significant impact on student's performance. The data used in this study is about curriculum based tracking and thus enables the possibility to test this theory.

Hence the literature reviewed suggests that socio-economic background is a key factor in inequality in educational achievement, not only to start with, but results in further barriers over time at later stages of education. Tracking is one manner in which this occurs as there tends to be a disproportionate assignment of low SES students to lower school tracks in many countries leading to increasing inequalities between high SES and low SES students over time. With respect to the impact of school type on academic inequalities, the private schools perform better than public schools in most countries where performance results have been published. Some researchers are of the view that the difference in the background characteristics of students can explain much of the performance difference between the two school sectors while there are others who feel that even after taking into account the background characteristics of the enrolled student populations, there are reasons to expect that private schools would have higher achievement than public schools.

The present study examines the academic achievement gap between high SES and low SES students across different countries. Focusing on reading academic performance, we seek to establish how the achievement gap associated with SES is moderated by the type of school and curriculum orientation. We investigate the relationship between these background variables and educational achievement using the intercepts-and-slopes-as-outcomes model of Bryk and Raudenbush (2002). This approach recognizes that the outcomes of schooling systems are not only characterized by average achievement (the intercept) but also by the achievement–SES regression slope. Thus we can gain insights regarding equity, not only on intercepts (average achievement of schools) but also on slopes (the differences within schools).

In our analyses, we use a step-wise approach for modeling the data to get insights into occurring patterns. We start with the ANOVA model and gradually build up the analyses to the more detailed intercepts-and-slopes-as-outcomes model. This allows us to obtain a broad picture of what can be distilled from these analyses regarding equity. We use school type and study orientation as moderating variables on the relation between SES and achievement but the method can be applied to other variables also. We use the PISA 2009 dataset for our analyses. The PISA (Program for International Student Assessment) educational survey of the OECD aims to evaluate students' skills and aptitude for lifelong learning in the areas of reading literacy, mathematics, science and problem solving. The target population of PISA consists of 15 year-old students just before the school leaving age. The first PISA cycle started in the year 2000 and is repeated every three years with one of the three mentioned domains being the focus in each cycle. Besides collecting responses on cognitive tests, PISA also collects data on background characteristics of the students and information about the schools through the so-called context questionnaires. PISA 2009 has explored the impact of SES and Mean SES on student achievement using multi-level models in the

International Report but by only using intercepts-as-outcomes and without incorporating the moderating variables we selected for our study. This study aims to shed new light on equity related outcomes using the PISA dataset.

1.1. School type

In many countries that participate in the PISA project public, private and semi-private schools exist alongside each other. Because of the struggle between the state and churches on the ownership and financing of schooling, these three types of schools have emerged in most of the European countries. The schools can be categorized based on two main aspects: the first one is that who has the right to decide the school's organization and the curriculum and the second one is how the schools are funded. In relation to the first aspect, the schools are categorized into two types: the public school and the private schools. If the public agencies takes the decisions on the school organization and take the responsibility to raise the funds, then it is called public education (Coleman & Hoffer, 1987). However, if the churches, other religious institutions or commercial organizations established the school, they are called private schools. Within the private sector, the private schools can be sorted as either government-dependent or government-independent schools based on where they get funding from. The private-independent schools raise their funding mainly by means of pupil fees, donations, sponsoring, and parental fund-raising (Corten & Dronkers, 2006).

1.2. Study orientation

PISA also provides information on the orientation of the study program that students are enrolled in. In past decades, the European Union has made distinctions between educational path ways of higher education. In general, they distinguished between the vocational education and the academic or general education. The curriculum of the two kinds of education is not the same because they prepare pupils for different types of occupations. For the vocational education, most of the students enter the labour market directly after their graduation.

1.3. Research questions

We investigate the relations between the socio-economic status and reading performance in private and public schools. We also study the effect of the orientation of the study program a student is enrolled in. Using the PISA 2009 data, we addressed the following research questions:

1. Is the relation between reading achievement and socio-economic status different in public and private schools?
2. Is the relation between reading achievement and socio-economic status different in general and vocational schools?

2. Method

2.1. Sample

In this study, the sample comprised of students in 8 countries who participated in PISA 2009. The 8 countries selected are: Austria, Belgium, Finland, Indonesia, Ireland, Japan, the Netherlands and Chinese Taipei. This set of countries was chosen for two reasons. The first reason was that these countries represent a wide variety of educational systems across the globe. The second reason was that these countries had sufficient number of both private and public schools in their dataset and likewise also curriculum differentiation in terms of general and vocational tracks. The sampling process for selecting students within these countries can be found in the technical report of PISA 2009 (see PISA, OECD website). For our analyses the entire sampled dataset for each country was used.

2.2. Measures

2.2.1. Socio-economic status (independent variable)

The socio-economic variable in PISA is called the ESCS. It is a composite index derived from a principal component analysis of three sub-indices; the possessions at home (HOMEPOS), the highest educational level of the parents (PARED) and the highest occupational status of the parents (HISEI). We also use Mean ESCS as a variable in the analyses. Mean ESCS is the average ESCS of all students in a school. The values of ESCS in the data range from about −5 to 3.5. Please note that in this article the term "ESCS" is replaced by the term "SES", even though it refers to the ESCS variable in the PISA dataset.

2.2.2. School type (independent variable)

The PISA school questionnaire contains a question about the school type. In the PISA database this variable is denoted as SCHLTYPE. There are three types of schools in the data: public schools = 1, private government dependent = 2 and private independent = 3. For our analyses, we combine the two different kinds of private schools under one heading of private

schools. One of the reasons for doing this is that in many countries there is only one kind of private school, either private independent or private government funded and that combining them for our analyses allows us to make a comparison between countries besides making a clear distinction between private and public types. Thus in the regression of achievement on School type, public schools is coded as 1 and private schools is coded as 0.

2.2.3. Study orientation (independent variable)

The PISA student questionnaire contains a question about the study program orientation. In the PISA database this variable is called ISCEDO and indicates whether the programs curricular content is general, pre-vocational or vocational. For our analyses, we combine pre-vocational and vocational orientation under one heading of vocational orientation. One of the reasons for doing this is that in many countries there is only one kind of orientation, pre-vocational or vocational and combining them for our analyses allows us to make a comparison between countries besides making a clear distinction between vocational and general types. Thus in the regression of achievement on program orientation, Vocational is coded as 1 and General is coded as 0.

2.2.4. Reading literacy (dependent variable)

Reading Literacy was a latent scale that was measured by 131 items distributed over 13 booklets. An Item Response Theory (IRT) model (Lord & Novick, 1968) was used to estimate the students' proficiency scores on a common scale. Plausible values were used to account for the measurement error. Plausible values were first developed for the analyses of NAEP (National Assessment of Educational Progress) data, based on Rubin's work on multiple imputation (1978).

Plausible values are student proficiency estimates. Mathematically, we can describe the process as follows: Given an item response pattern $\mathbf{x}$, and ability θ, let $f(\mathbf{x}|\theta)$ be the probability of the response pattern under the IRT model. We assume that θ has a normal distribution $g(\theta|Y) \sim N(YB, \sigma^2)$ where θ is regressed on all covariates measured through the regression model $E(\theta) = YB$. (In our terminology, we often call $f(\mathbf{x}|\theta)$ the item response model, and $g(\theta|Y)$ the population model). It can be shown that the posterior distribution, $h(\theta|\mathbf{x},\mathbf{Y})$, is given by

$$h(\theta|x, Y) \propto f(x|\theta)g(\theta|Y). \tag{1}$$

That is, if a student's item response pattern is $\mathbf{x}$, then the student's posterior (θ) distribution is given by $h(\theta|\mathbf{x},\mathbf{Y})$. Plausible values for a student with item response pattern $\mathbf{x}$ are random draws from the probability distribution with density $h(\theta|\mathbf{x},\mathbf{Y})$. Therefore, plausible values provide not only information about a student's "proficiency estimate", but also the uncertainty associated with this estimate. All the regression analyses were done 5 times with different plausible values for reading literacy for each regression. The results for the effect size of the regression coefficients presented in this study are the average of the results obtained from the five runs. The standard errors and the significance tests were also adjusted for the variation between the five sets of results.

2.3. Data analysis

Our regression models contain two levels: student level and school level. All regression analyses were done separately for each country. The regression model used for the analyses was a 2-level random intercepts model (Bryk & Raudenbush, 2002). In our analyses, we used four steps. First, an ANOVA model without predictors is built to evaluate within and between groups variance components. Second, the effects of school level predictor Mean SES is included in the model. In the third model, the effects of student level predictor SES (group centered) is added. In the fourth model, both the effects of level 1 and level 2 predictors are added, that is, Mean SES, School type, Study orientation and group-centered SES..

2.3.1. The one-way ANOVA model

To assess the effects of the predictor variables, the ANOVA model is used as a baseline. In the ANOVA model, only the outcome variable, reading achievement, is included. In this model, we define Y_{ij} as the reading performance for student i in school j, γ_{00} is the grand mean of reading performance across the population of schools, r_{ij} is the student level error and u_{0j} is the school level effect. So, the level 1 model is

$$Y_{ij} = \beta_{0j} + r_{ij}, \tag{2}$$

where β_{0j} is school j's mean reading achievement. Further we assume $r_{ij} \sim (0, \sigma^2)$ and refer to σ^2 as level 1 variance.

At level 2 (school level), each school's mean reading achievement is represented as a function of the grand mean plus a random error, that is,

$$\beta_{0j} = \gamma_{00} + u_{0j}, \tag{3}$$

where we assume $u_{0j} \sim (0, \tau_{00}^2)$, and refer to τ_{00}^2 as the level 2 variance.

With this model, the within school variance σ^2 and the between school variance τ_{00} of the reading achievement can be estimated.

2.3.2. Means-as-outcomes regression

The school average reading performance can be predicted by group characteristics. This model is motivated by the question whether school differences in achievement can be explained by school mean SES differences. Individual reading achievement scores are viewed as varying around their school means. The level 1 model remains the same as

$$Y_{ij} = \beta_{0j} + r_{ij}.$$

The level 2 model now includes the mean SES of the students in a school.

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{mean\_SES})_j + u_{0j}, \tag{4}$$

where γ_{00} is the intercept, γ_{01} is the effect of mean SES on the school average reading achievement, β_{0j}, u_{0j} the deviation of school j's mean from the grand mean and we assume $u_{0j} \sim (0, \tau_{00}^2)$.

With this model, we can estimate the proportion of variance of school performance explained by mean SES. Furthermore, we can test if the reading performance still varies significantly across schools if the mean SES is controlled for.

2.3.3. The random-coefficient model

Next we focus on the within school effects of SES rather than between school effects as described above. The within school effects are represented by the within school regression of achievement on individual SES, also called the within school slope of SES. Regarding the regression of reading achievement on SES for every school, it was investigated whether there is a distinction in the different schools in the slopes and the intercepts. If so, how much do the regression effects vary from school to school? And what is the correlation between the intercepts and the slopes? So we use the random-coefficient regression model to investigate this.

In the Random coefficient model, the group (classroom) centered predictor SES is added to level 1:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - \bar{X}_{.j}) + r_{ij}. \tag{5}$$

As in the model above, we assume $r_{ij} \sim (0, \sigma^2)$, however, σ^2 is the residual variance at the student level after controlling for the effect of student SES.

The level 2 model is

$$\beta_{0j} = \gamma_{00} + u_{0j} \tag{6}$$

$$\beta_{1j} = \gamma_{10} + u_{1j} \tag{7}$$

with variance-covariance matrix for the random effects:

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \tau_{00} & \tau_{01} \\ \tau_{10} & \tau_{11} \end{bmatrix} \right)$$

where γ_{00} is the average intercept across the population of schools, γ_{0j} is the unique increment to the intercept associated with school j, γ_{10} is the average SES–reading achievement regression slope across the schools, u_{1j} is the unique increment to the slope associated with school j, τ_{00} is the residual variance in the intercept, τ_{11} is the residual variance in the slopes, $\tau_{01} = \tau_{10}$ is the covariance between intercepts and slopes.

Using this model, we can test the hypothesis whether there are differences in SES slopes among the schools. We can also analyze the public schools and the private schools separately with this model. Suppose we want to explore the different relationship between SES and reading achievement in private and public schools. This is exemplified in Fig. 1. The hypothetical figure shows that the overall slope of SES and reading achievement is steeper in private schools than in public schools. It can also be seen that in the private schools with increasing average school reading performance, the relationship between SES and reading achievement becomes stronger and that it is the other way around in public schools. This indicates that there is a positive correlation between intercepts and slopes in private schools and a negative correlation between intercepts and slopes in public schools.

2.3.4. The intercepts-and-slopes-as-outcomes model

In order to explore whether School type and Program orientation have different reading achievement as well as whether the strength of association between SES and reading achievement are the same, the intercepts-and-slopes-as-outcomes model is also used. The school level model is elaborated with new predictors school type, study orientation and mean SES. The school level model is also elaborated with new predictors school type and study orientation. This leads to the model

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - \bar{X}_{.j}) + r_{ij}$$

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{mean\_SES})_j + \gamma_{02}(\text{SCHTYPE})_j + \gamma_{03}(\text{Orientation}) + u_{0j} \tag{8}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{mean\_SES})_j + \gamma_{12}(\text{SCHTYPE})_j + \gamma_{13}(\text{Orientation}) + u_{1j} \tag{9}$$
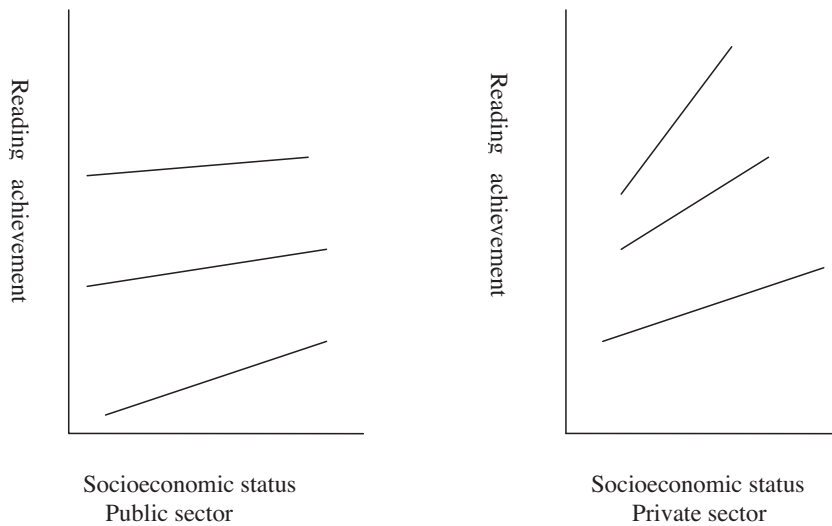
Fig. 1. Hypothetical regression of reading achievement as a function of SES within private and public sectors.

$$\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \tau_{00} & \tau_{01} \\ \tau_{10} & \tau_{11} \end{bmatrix} \right).$$

3. Results

Tables 1 and 2 present descriptive statistics about the schooling systems, the enrollment of students in them and the distribution of SES across the school types and study orientation types.

Table 3 shows the One-Way ANOVA results. The proportion of variance explained by the school difference is given by the so called intra-class correlation index p, which is displayed in the last column. For Austria, Belgium, Japan and the Netherlands, there is more variation in the reading achievement is at school level, while in Finland, Indonesia, Ireland and Taipei there is more variance within schools.

The school differences explain most of the variance in the Netherlands, where 62% of the variance in reading achievement is between schools. In contrast, in Finland only 8% of the variance can be explained by the school differences.

Table 4 presents the results of the means-as-outcomes regression. In the means-as-outcomes model, the student reading achievement scores are viewed as varying around their school means. By comparing the τ_{00} estimates across the ANOVA and the means-as-outcomes model, we can develop an index of the proportion of reduction in the between school variance τ_{00} that is explained by the Mean SES. We refer to it as V in Table 4. The estimated ρ is now a conditional intra-class correlation that measures the degree of the dependence among observations within schools that are of the same Mean SES.

For Belgium, Mean SES plays the most important role as it explains 73% of the between school variance in reading achievement. For Finland and Indonesia, only 13% and 33% of the true between school variance in reading is accounted for by Mean SES. In all of the countries the intra-class correlation is reduced after accounting for the effect of Mean SES of the schools.

Table 1
Percentages of students by school sector and orientation of the study across countries in the dataset.

Country	Public Schools		Private Schools		General Programs		Vocational Programs	
	Number of schools	%	Number of schools	%	Number of students	%	Number of students	%
Austria	234	85.7	39	14.3	1917	29.1	4666	70.9
Belgium	89	34.6	168	65.4	4556	53.6	3945	46.4
Finland	191	94.1	12	5.9	5804	99.9	6	0.1
Indonesia	85	47.2	95	52.8	4387	85.4	749	14.6
Ireland	57	44.5	71	45.5	3871	98.4	63	1.6
Japan	135	73.4	49	26.6	4580	75.2	1508	24.8
Netherlands	69	39.9	104	60.1	3527	74.1	1232	25.9
Taipei	97	64.7	53	35.3	3539	60.7	2292	39.3

Table 2

The SES means by school sectors and study orientation across countries and the standard deviation of SES within school sectors and study orientation programs.

Country	School sector	Number of schools	Mean	S.D.	Study orientation	Number of students	Mean	S.D.
Austria	Public	234	0.03	0.81	General	1917	0.43	0.94
	Private	39	0.45	0.79	Vocational	4666	0.05	0.72
Belgium	Public	89	−0.01	0.89	General	4556	0.52	0.88
	Private	168	0.31	0.92	Vocational	3945	−0.15	0.81
Finland	Public	191	0.40	0.77	N.A.	N.A.	N.A.	N.A.
	Private	12	0.61	0.78	N.A.	N.A.	N.A.	N.A.
Indonesia	Public	85	−1.46	1.10	General	4387	−1.50	1.10
	Private	95	−1.61	1.08	Vocational	749	−1.68	0.92
Ireland	Public	57	−0.12	0.81	N.A.	N.A.	N.A.	N.A.
	Private	71	0.16	0.85	N.A.	N.A.	N.A.	N.A.
Japan	Public	135	−0.06	0.73	General	4580	−0.09	0.70
	Private	49	0.15	0.69	Vocational	1508	0.22	0.67
Netherlands	Public	69	0.35	0.83	General	3527	0.45	0.81
	Private	104	0.28	0.85	Vocational	1232	−0.11	0.79
Taipei	Public	97	−0.27	0.83	General	3539	−0.17	0.83
	Private	53	−0.35	0.81	Vocational	2292	−0.50	0.76

Table 3

Between and within school variance with the ANOVA model.

Country	γ_{00}	σ^2	τ_{00}	p
Austria	453.8	4421.2	5813.4	0.56
Belgium	496.7	4781.4	6617.5	0.58
Finland	530.2	6915.2	646.9	0.08
Indonesia	398.9	2253.2	2088.7	0.48
Ireland	494.1	6841.0	2260.5	0.24
Japan	517.3	5033.8	5122.3	0.51
The Netherlands	514.9	2842.2	4740.4	0.62
Taipei	495.8	4795.4	2671.4	0.35

γ_{00} is the grand mean of reading achievement; σ^2 is the within school variance; τ_{00} is the between school variance; ρ is the intra-class correlation.

Table 4

Results from means-as-outcomes regression.

Country	γ_{00}	γ_{01}	S.E.	σ^2	τ_{00}	V	ρ
Austria	**456**	**104.6**	2.2	**4428**	**2503**	0.57	0.36
Belgium	**480**	**125.0**	1.7	**4783**	**1765**	0.73	0.26
Finland	**518**	**29.6**	3.6	**6915**	**562**	0.13	0.07
Indonesia	**456**	**36.8**	1.2	**2253**	**1393**	0.33	0.38
Ireland	**492**	**73.4**	3.2	**6870**	**1136**	0.50	0.14
Japan	**523**	**151.0**	2.9	**5034**	**2017**	0.61	0.28
The Netherlands	**481**	**113.0**	2.3	**2843**	**2151**	0.55	0.43
Taipei	**528**	**100.2**	2.5	**4831**	**1019**	0.62	0.17

The significant effects (at 5%) are highlighted in bold; γ_{01} is the effect of mean SES; σ^2 is the within school variance; τ_{00} is the between school variance; V is the proportion of between school variance explained by the school Mean SES; ρ is the conditional intra-class correlation.

Table 5 presents the random coefficient model (see Eq. (5)). It can be seen from Table 5 that in all the countries, the average of the SES-achievement slopes is positive. That indicates that, on average, the students SES is positively related to reading achievement within the schools. From the results, we can also see the size of the within school effects of SES on achievement and the level 1 variance in reading achievement explained by SES. The slopes γ_{10} indicate the effect size and the variance comparison quantifies the difference. Overall, the within school SES does not account for much of the variation in any of the countries. The SES in Finland explained 8.1% and for Ireland explained 7.3% of reading achievement variation within the schools, which are the largest values from all the countries in our analyses. The within school variance explained by SES is computed by taking the difference in the residual student level variance between the Random-coefficient model and the ANOVA model. For Indonesia, Japan and the Netherlands the within school slopes of reading achievement on SES are quite flat and the SES accounts for little within school variation in reading achievement.

Table 5
The fixed and random effects in the random coefficient model.

Country	γ_{00}	S.E.	γ_{10}	S.E.	τ_{00}	S.E.	τ_{11}	S.E.	τ_{01}	σ^2
Austria	**454.2**	1.4	**10.9**	1.4	**5801.1**	526.2	**109.8**	40.1	**−0.14**	**4290.4**
Belgium	**497.0**	1.2	**13.1**	1.1	**6447.2**	571.1	**109.2**	32.3	**0.18**	**4564.8**
Finland	**530.8**	1.7	**29.9**	1.5	**654.4**	90.4	76.1	46.2	N.A.	**6354.4**
Indonesia	**398.0**	0.8	**2.9**	0.8	**2082.6**	223.4	7.2	25.1	N.A.	**2241.8**
Ireland	**495.8**	1.8	**28.1**	1.8	**2127.2**	294.0	28.3	49.1	N.A.	**6341.1**
Japan	**518.2**	1.6	**4.5**	1.5	**5060.6**	541.2	60.1	45.2	N.A.	**4917.3**
The Netherlands	**515.2**	1.1	**6.7**	1.1	**4717.6**	497.5	8.0	21.2	N.A.	**2772.2**
Taipei	**496.0**	1.4	**15.5**	1.5	**2668.6**	321.3	**108.1**	41.3	**−0.15**	**4571.2**

The significant effects (at 5%) are highlighted in bold. For countries with N.A., there was insufficient variation in the slopes to determine a correlation; γ_{00} is the average of school means on reading achievement across the population of schools; γ_{10} is the average SES–reading achievement regression slope across the school; τ_{00} is the unconditional variance in the student level intercepts; τ_{11} is the unconditional variance in the student level slopes; τ_{01} is the correlation (standardized covariance) between intercepts and slopes.

Table 5 also provides the estimates of the variances of the random effects and test of the hypothesis that these variances of the random effects are null. For all the countries that we tested, highly significant differences exist among the different school means as all τ_{00} differ significantly from zero. For Austria, Belgium and Taipei, we reject the null hypothesis, in this case that $\tau_{11} = 0$, and infer that the relationship between SES and reading achievement within schools does indeed vary significantly across the population of schools. The model also produces the correlation between the intercepts and the slopes. For Austria and Taipei there is a negative relationship between the intercepts and slopes; in other words, in schools with higher reading achievement for mean SES, the within school slopes for SES tend to be less steep. For Belgium the correlation is positive such that for schools with higher reading achievement for mean SES the within school slopes for SES tend to be more steep. Thus in Austria and Taipei the choice of school makes less impact on the results of students with high SES while at the other end of the spectrum, in Belgium, the choice of school has the largest impact on achievements of students with high SES. In rest of the countries there is not enough variation in the slopes to estimate a correlation (Figs. 2 and 3).

Next we study the outcomes of the random coefficient model separately for the public and private school types that are given in Table 6.

Note that the intercept, which is a manifestation of the average reading level, is higher in public schools for Indonesia, Japan, the Netherlands and Taipei. This is contrary to the popular perception that private schools convey an academic advantage. As far as differences in the within school SES slopes are concerned, they are generally larger for the public schools and in the case of Taipei there is a large difference of about 5 times in the average within school SES slopes between public and private schools, with public schools having larger SES slopes (Figs. 4 and 5).
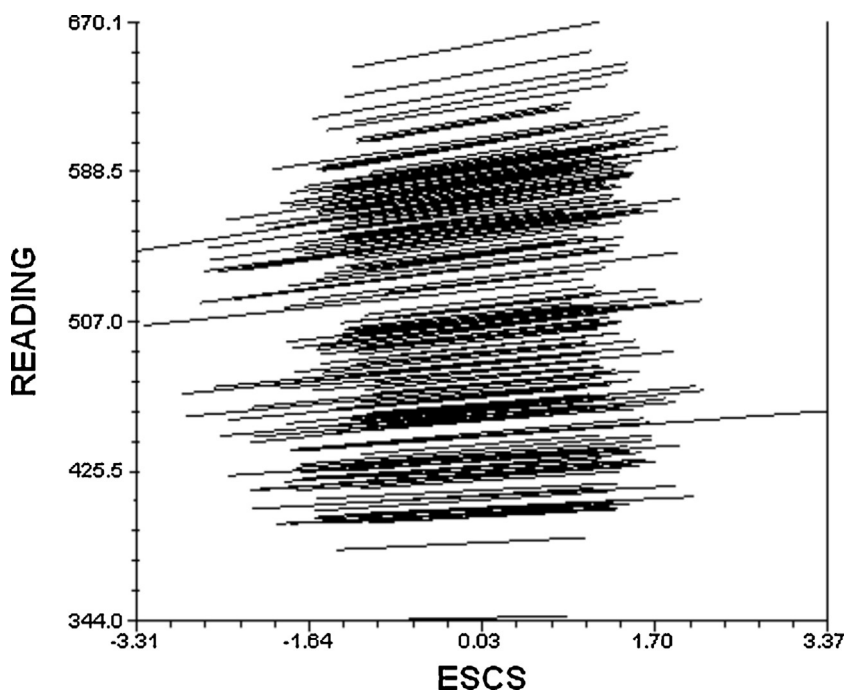

Fig. 2. Within school regression of reading achievement on SES for the Netherlands.
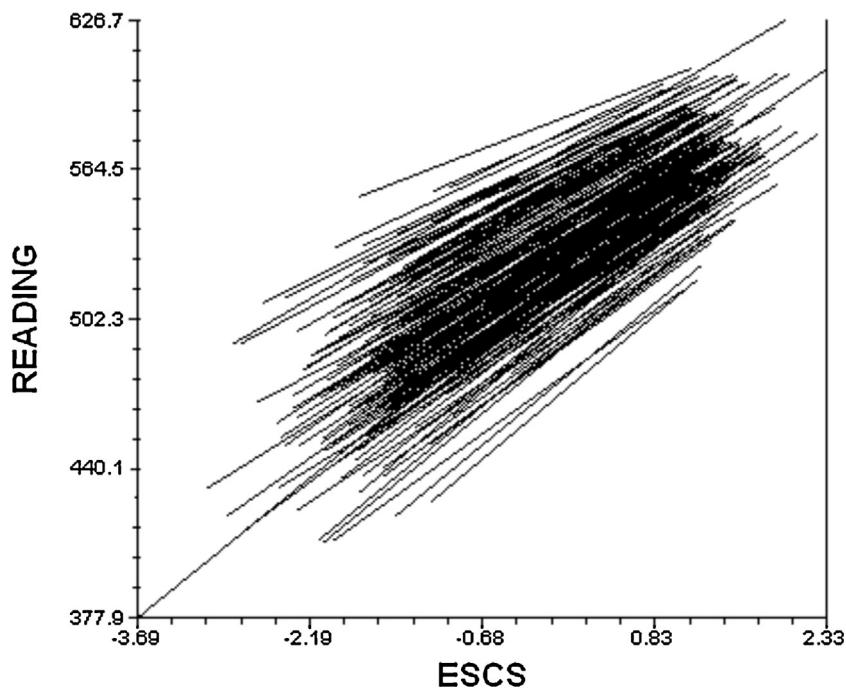
Fig. 3. Within school regression of reading achievement on SES for Finland.

Besides analyzing public and private sector schools separately, we also study schools with different orientations. We analyze two kinds of schools, with a 'general' orientation and with a 'vocational' orientation. The results are shown in Table 7.

Note that the intercept, which is an indication of the average reading level, is higher in schools with a general orientation, except for Indonesia and Japan where the differences are insignificant. The differences are especially large for Belgium and The Netherlands.

So far we have analyzed the differences in the scores of school types and program orientations using the actual scores that did not take into account the socio-economic differences in their respective student populations. In Table 8, we present the average scores for public and private schools and for classrooms with a general and vocational program orientation before and after taking into account the differences in the socio-economic backgrounds of their respective student populations.

From the results in Table 8 above it can be seen that for all the countries the average scores differences between different school types and program orientations change significantly after taking into account the socio-economic status of their student populations. For Austria, Belgium and Ireland there was a large difference in the scores of private schools above those of public schools but after taking into account the SES differences, the achievement differences almost disappear and in Austria the public schools even score fractionally higher. In Indonesia and the Netherlands the public schools had higher averages but after accounting for SES differences the public and private school scores become almost equal. In Taipei the public schools performed better than private schools before accounting for SES. After accounting for SES the average scores of both public and private schools increase by approximately the same margin. In Japan public schools had performed slightly better and after taking SES differences into account the gap between public over private schools only increased.

Table 6
The fixed effects from the Random coefficient model in public and private schools.

Country	Public schools				Private schools			
	γ_{00}	γ_{10}	S.E.	τ_{01}	γ_{00}	γ_{10}	S.E.	τ_{01}
Austria	**448.4**	**12.0**	1.5	**−0.21**	**483.4**	6.3	4.2	N.A.
Belgium	**463.8**	**17.0**	2.1	**0.30**	**512.8**	**10.9**	1.3	**0.10**
Finland	**530.8**	**30.4**	1.6	N.A.	**532.6**	**29.4**	7.2	N.A.
Indonesia	**409.8**	**3.1**	1.1	N.A.	**388.4**	**3.0**	1.2	N.A.
Ireland	**475.4**	**31.0**	3.1	N.A.	**508.2**	**25.6**	2.2	N.A.
Japan	**520.2**	**3.41**	1.7	N.A.	**513.8**	**8.4**	3.3	**0.18**
The Netherlands	**518.8**	2.9	1.7	N.A.	**510.8**	**8.2**	1.4	N.A.
Taipei	**511.2**	**20.8**	1.8	**−0.22**	**472.4**	**3.9**	1.9	**−0.10**

The significant effects (at 5%) are highlighted in bold. For countries with N.A., there was insufficient variation in the slopes to determine a correlation; τ_{01} is the correlation (standardized covariance) between intercepts and slopes; γ_{00} is the average of school means on reading achievement across the population of schools; γ_{10} is the average SES–reading achievement regression slope across the schools.
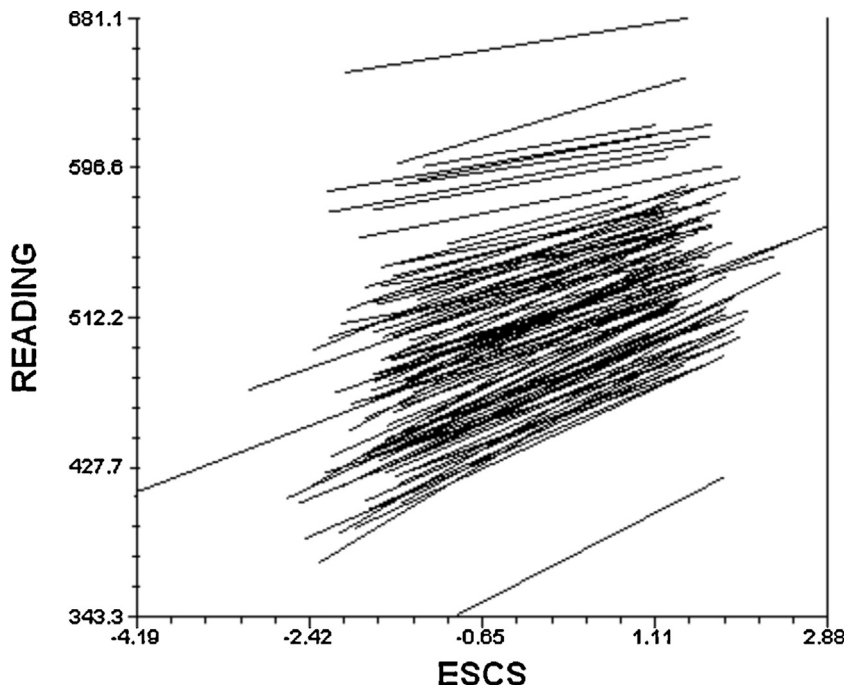
Fig. 4. Within school regression of reading achievement on SES for Public schools in Taipei.

The change between student scores in vocational and general programs was even greater than the change observed between private and public schools after taking SES differences into account. The average scores of vocational schools in many countries improved tremendously after taking the SES differences into account. In Austria, Belgium, Netherlands and Taipei the average score differences between general and vocational tracks were huge. After taking SES differences into account the gap decreased significantly in all the four countries. In Austria and Taipei it virtually disappeared while in Belgium and The Netherlands it decreased by over one half. In Indonesia and Japan the actual scores were similar for general
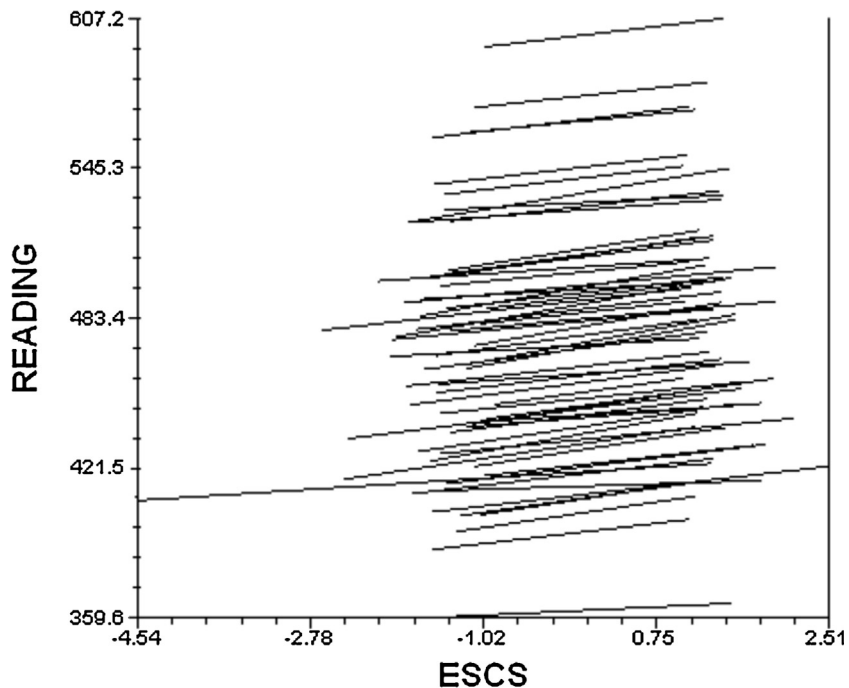

Fig. 5. Within school regression of reading achievement on SES for Private schools in Taipei.

Table 7
The fixed effect from the Random coefficient model for students in programs with a 'General' or 'Vocational' orientation.

Country	General orientation				Vocational orientation			
	γ_{00}	γ_{10}	S.E.	τ_{01}	γ_{00}	γ_{10}	S.E.	τ_{01}
Austria	**463**	**9.3**	2.1	**0.16**	**448**	**11.0**	1.7	**0.08**
Belgium	**533**	**12.6**	1.3	**0.22**	**446**	**7.4**	1.5	N.A.
Indonesia	**401**	**2.8**	0.9	N.A.	**402**	3.2	2.0	N.A.
Japan	**515**	**3.8**	1.8	**0.07**	**526**	**8.9**	3.2	N.A.
Netherlands	**531**	**7.0**	1.2	N.A.	**431**	1.9	2.0	N.A.
Taipei	**512**	**17.9**	1.8	**−0.20**	**471**	**7.1**	1.9	N.A.

The significant effects (at 5%) are highlighted in bold. Results for Finland and Ireland are excluded for vocational orientation because of insufficient sample size. For countries with N.A., there was insufficient variation in the slopes to determine a correlation; τ_{01} is the correlation (standardized covariance) between intercepts and slopes; γ_{00} is the average of school means on reading achievement across the population of schools; γ_{10} is the average SES–reading achievement regression slope across the schools.

Table 8
Mean student scores for public and private school types and also separately for schools with General and Vocational program orientation.

Country	Public schools		Private schools		General programs		Vocational programs	
	Original score	After accounting	Original score	After accounting	Original score	After accounting	Original score	After accounting
Austria	468	465	500	457	519	474	454	461
Belgium	475	478	526	488	559	499	448	466
Finland	530	520	534	517	N.A.	N.A	N.A.	N.A.
Indonesia	412	465	391	460	402	457	404	466
Ireland	477	490	509	499	N.A.	N.A	N.A.	N.A.
Japan	524	535	514	495	519	533	528	509
Netherlands	521	482	511	483	547	498	429	437
Taipei	511	540	478	513	514	534	472	523

Results for Finland and Ireland are excluded for vocational orientation because of insufficient sample size.

Table 9
Fixed effects of results from intercepts-and-slopes-as-outcomes model.

Country	γ_{01}	S.E.	γ_{02}	S.E.	γ_{03}	S.E.	γ_{11}	S.E.	γ_{12}	S.E.	γ_{13}	S.E.	τ_{01}
Austria	**108.6**	6.3	19.3	9.7	−2.0	6.8	1.8	3.2	5.9	4.8	−0.6	3.3	**−0.12**
Belgium	**89.3**	4.9	**−19.1**	5.3	**−57.0**	2.4	4.5	2.4	**8.3**	2.5	−4.1	2.1	**0.20**
Finland	**29.1**	6.5	4.4	8.8	–	–	−2.9	5.6	−0.1	7.7	–	–	N.A.
Indonesia	**35.9**	4.0	**18.2**	5.6	**17.0**	8.1	1.6	1.3	0.2	1.6	2.0	7.9	N.A.
Ireland	**74.0**	7.2	−10.9	6.6	–	–	−9.0	4.6	3.1	3.8	–	–	N.A.
Japan	**165.3**	8.7	**39.8**	7.1	−9.2	15.5	2.3	4.6	−5.6	3.7	2.0	7.9	N.A.
The Netherlands	**90.8**	7.7	−3.2	7.1	**−45.0**	3.0	0.1	2.3	−3.9	2.2	−2.5	2.6	N.A.
Taipei	**89.5**	5.9	**19.5**	4.9	**−23.0**	3.8	−2.3	3.6	**14.3**	3.0	−4.5	3.2	**−0.17**

The significant effects (at 5%) are highlighted in bold. Results for Finland and Ireland are excluded for study orientation because of insufficient sample size. For countries with N.A., there was insufficient variation in the slopes to determine a correlation. γ_{01} is the coefficient of Mean SES in the intercept; γ_{02} is the coefficient of school type in the intercept (private schools = 0, public schools = 1); γ_{03} is the coefficient of program orientation in the intercept (general = 0, vocational = 1); γ_{11} is the coefficient of the Mean SES in the slope; γ_{12} is the coefficient of school type in the slope (private schools = 0, public schools = 1); γ_{13} is the coefficient of program orientation in the slope (general = 0, vocational = 1).

and vocational students. After accounting for SES, the differences in Indonesia remained the same while in Japan the students in general programs performed better than those in the vocational programs.

Table 9 presents the results from the intercepts and slopes as outcomes model (see Eqs. (6) and (7)). We see from the table that all γ_{01} are significant. It yields that Mean SES is positively related to school mean reading achievement except after controlling for school type and study orientation. For Indonesia, Belgium and Taipei there was an independent effect of both orientation and school type on school average scores after controlling for the school Mean SES. For Belgium, after accounting for Mean SES, public schools are disadvantageous and if they have a vocational orientation it conveys a further disadvantage. For Indonesia after accounting for Mean SES, public schools are advantageous and if they have a vocational orientation it conveys a further advantage. Likewise for Taipei, public schools are advantageous and if they have a general orientation it conveys a further advantage. These results are new in the context of PISA outcomes. With regard to the within school SES slopes, there is a positive effect of public schools on the within school slopes in Belgium and Taipei. The differences in within school slopes for other countries are not impacted by any of the three background variables we employed in our analysis.

4. Conclusions

In this study we applied the intercepts-and-slopes-as-outcomes method to examine the effects on educational achievement of socio-economic status of individuals and characteristics of schooling systems they are enrolled in. Previous literature suggested that such aspects can constitute initial and continuing barriers to educational achievement and we studied this in the context of the PISA dataset of students at the school leaving age. We investigated how different variables or educational settings like the type of school and the study orientation moderated the relationship between SES and achievement. PISA 2009 explored the impact of SES on student achievement using multi-level models but using only intercepts as outcomes and without incorporating the moderating variables we selected for this study. This study shed new light on equity related outcomes in the context of PISA outcomes also.

We started the analysis with the ANOVA and Means-as-Outcomes regression models. Results indicated that a sizeable portion of the total variance in student performance was at the school level or, in other words, there were sizeable differences in performance between schools (or intra class correlation) in all countries except Finland. This between school variance decreased sizably for all the countries (except Finland) after accounting for the Mean SES of the schools. This indicated that the difference in the average socio-economic characteristics of the school's students was a very important predictor of inequity across schools.

Next we proceeded with the Random-effects model where we introduced a within school SES slope and a random intercept for the schools. The percentage of within school variance explained by individuals SES was much less than the percentage of between school variance explained by school Mean SES. The within school effects of SES on student performance were noticeable only for Finland and Ireland both of which had a low intra class correlation. One of the aims of this research was to study the correlation between the intercepts and slopes to see if the schools with a higher intercept also had higher slopes or vice versa. However there was noticeable variation in SES slopes across schools in only a few countries. For the remaining countries there was hardly any variation in SES slopes across schools, that is, the relationship between SES and performance was quite similar across schools in these countries and correlations could not be computed for these countries. Countries where there was a positive correlation between intercepts and slopes could be said to have lesser equity while countries with a negative correlation could be said to have more equity.

Our analysis led us to the recognition of socioeconomic status as a strong predictor of student achievement. This had been observed in past studies also. However using hierarchal models allowed us to separate the effects of socio-economic status within schools and between schools. We observed that in nearly all the countries there was a tendency of segregation of students in schools on the basis of SES and that explained a high proportion of between school performance differences. The within school differences of SES on performance were overshadowed by the between school differences in SES. Next we studied the how the type of school and study orientation moderated the between school differences resulting from the socio-economic characteristics of the schools.

Analyzing the private and publicly financed schools separately, we observed that in Austria, Belgium and Ireland there was a large difference in the mean scores of private schools over the public schools. However after taking the SES differences into account, the achievement differences between private and public schools virtually disappear and in Austria the public schools scored even score fractionally higher. In the remaining countries the public schools had performed better or equal to the private schools and that remained so even after taking SES differences of the student populations into account. Some earlier researchers had suggested that the advantage of private schools over public schools was largely due to the higher socio-economic characteristics of the student populations that are likely to be found in the private schools. Others had suggested that there were reasons to expect that private schools would have higher achievement than public schools, even after accounting for differences in their student population as private schools enjoy structural incentives over public schools such as parental selection, minimal bureaucracy and transfer possibilities in case the school fails to meet parental expectations. The notable findings of this study regarding the remarkable performance of public schools vis-à-vis private schools are significant, not just statistically, but in terms of their policy implications. In about half of the countries we analyzed, the public schools already performed better than private schools even before accounting for SES differences (and it remained so even after accounting for the SES differences). In the remaining countries where public schools had initially fared poorer, after accounting for the SES differences, the performance of the public schools became equal to or even better than that of the private schools. Thus the opinion that the higher scores of the private schools can be attributed to the higher SES students that private schools attract was confirmed in all the countries where private schools had performed better. While in other countries even the higher SES intake of the private schools did not convey an academic advantage over public schools. In light of these results, the arguments about the inherent private schools advantage cited earlier can be dispelled.

Next we analyzed the differences between students tracked in different curriculums, namely with a general or vocational orientation. The key issue of tracking was whether this widely adopted educational practice would have impact on student's achievement, which in turn may lead to widened inequality among students tracked into different ability groups or types of programs. In this study we analyzed tracking vis-à-vis curriculum differentiation in the form of general or vocational study programs. While the advocates of tracking believe that tracking benefits students' academic performance, the detractors believe that tracking increases the achievement gap between tracked students. The main argument in favor of tracking was that homogeneous classrooms permit a focused curriculum and appropriately paced instruction that leads to the maximum learning by all students. The arguments against tracking were largely based on concerns that the lower groups will be systematically disadvantaged by slower learning environments that leave far behind the skills of those in the upper groups.

Overall in the dataset that we analyzed, an average student in a general program performed better than his/her peers in the vocational programs and in countries like The Netherlands, Belgium, Austria and Taipei the differences were huge. However the average scores of vocational schools in these countries improved significantly after taking the SES differences into account. In the remaining countries, Indonesia and Japan, for which we had valid data, there were minor differences across general and vocational tracks and they didn't change much after accounting for SES. These findings lend support to one of the outcomes in previous literature that there tends to be a disproportionate assignment of low SES students to lower school tracks. However the main argument often cited in favor of tracking, that homogeneous classrooms lead to the maximum learning by all students did not hold in majority of the countries as there were large differences in average scores in general and vocational programs. The main argument against tracking that curriculum differentiation benefits initially higher achieving students at the cost of initially lower achieving students also did not hold across all the countries as in Austria and Taipei the differences became very narrow after accounting for SES alone. On the other hand in The Netherlands and Belgium substantial achievement differences still remained between the two tracks even after accounting for SES, suggesting that curriculum differentiation has not narrowed the gap between higher and lower tracks and supporting the argument that the slower learning environments of the (lower) vocational track were contributing to lower achievement. Though the results from some of these countries support the conclusion that ability grouping with curriculum differentiation undermines the achievement of initially lower achieving students, research on this question has yet to completely solve difficult methodological issues, like how controlling variables can impact estimates of these effects. So these conclusions should be treated as tentative and reflecting the current state of knowledge, however open to revision as methodological advances allow more precise estimates of effects. What can be said with more certainty is that tracking is causing a disproportionate segregation of lower SES students in vocational streams and this contributes significantly to the visible achievement gap between high and low tracks.

We also analyzed SES and both the moderating variables together in the intercepts-and-slopes-as-outcomes model. It transpired that school Mean SES was strongly related to school mean reading achievement in almost all the countries even after controlling for school type and study orientation. This was an important result that the average SES level of a school that a student attends is still the most important predictor of academic achievement after accounting for both the type of schools students attended and the curriculum they followed. For students in Indonesia, Belgium and Taipei there was an independent effect of both study orientation and school type on the intercepts after controlling for the school mean SES. The within school SES slopes were only affected by the school type variable in Belgium and Taipei. The average within school slopes were not significantly different across vocational of general programs in any of the countries.

Coleman had asserted that the influence of student background was greater than anything that goes on within schools. Others had argued that the issue of economic status and its relationship to student achievement was more complex and it increased with student age because of school related factors and other policies like curriculum differentiation. Certain school factors like school climate and classroom discipline predictably affect student achievement and the size of their impact may vary for higher or lower SES students, but these factors are intrinsic to school level control and are not malleable variables at the system level. What is malleable from a system level policy perspective is that whether curriculum differentiation should be implemented or not and also which organizational model of schools is more effective and should be copied; should governments keeping pouring resources into the public school model or should a shift be made towards the private school model. The intercepts-and-slopes-as-outcomes study enabled us to contextualize the impact of SES and these moderating variables on achievement at both the student and school level across different countries. The overall results of our study are in conformity with Coleman's assertion that student background was the single most important factor in determining academic performance. The differences in average performances across different school organizational types were explained by differences in their students' socio-economic backgrounds. For curriculum orientation types, in some countries the differences virtually disappeared after accounting for SES, while in other countries differences still remained across curriculums types even after accounting for student background, indicating that there was a negative independent effect of curriculum differentiation on the lower tracks in such countries. However due to the non-availability of longitudinal data on student academic performance since they first underwent tracking (and also the possible impact of other controlling variables) the exact dynamics or progression of this effect over the years could not be analyzed. On the other hand, differences in school organizational models, between private and public school types, could be fully explained by the student background composition of schools. Thus, the presumed superiority of private-style organizational models, the private-school advantage was not supported by these results on reading achievement in any of the different countries we analyzed. The data suggest significant reasons to be suspicious of claims of general failure in the public schools, and raise substantial questions regarding a basic premise of the current generation of school reforms based on mechanisms such as choice and competition drawn from the private sector. In conclusion, this study presented a wide variety of analysis and discussed them in light of the previous literature to examine the relationship between SES and achievement and how it is moderated by different facets of educational organization using data from a number of countries. The results of this study expand on both the conceptual and empirical base available as research on this topic moves forward.

Acknowledgements

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