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Exploring SES Effects in Mathematics, Reading and Science Achievements in a Global Context

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Abstract

Socioeconomic status (SES) plays a key factor for students' academic achievement. Although extensive research has examined this relationship in the U.S., other countries have received less attention. Moreover, different studies have measured SES and academic achievements differently, making their findings hard to compare, especially across subjects. This study aims to address these two issues by providing a unified examination of SES effects using data from a large-scale international assessment. Based on the representative sample of 15-year-olds from six countries in the 2022 PISA data: Australia, Brazil, Finland, Mexico, Singapore, and the United States, both student- and school-level SES were analyzed across three subject domains—mathematics, reading, and science. Results indicate that school-level SES effects are substantially greater than student-level effects, and both effects remain consistent across subject areas. Country-specific analyses reveal that school-level SES effects are generally stronger in more affluent nations, such as Australia and Singapore, whereas student-level SES effects are relatively small and comparable in lower-income countries, such as Mexico and Brazil.

Introduction

Socioeconomic status (SES) has long been recognized as a key factor for students' academic achievement. The general negative impact of low SES on educational outcomes has been extensively established across time periods and educational systems, as comprehensively reviewed by Chmielewski (2019). Similarly, Liu et al. (2022) conducted a review examining the relationship between SES and academic achievement among primary and secondary school students. Their findings revealed a consistent positive correlation of approximately 0.25 between SES and academic performance, the magnitude also observed in earlier research (Harwell et al., 2017; White, 1982). The causes of the SES achievement relationship have also been explored. For instance, differences in early numeracy exposure have been identified as a potential contributor to the SES and mathematics performance relationship (Duncan et al., 2015; Zhao & Gibson, 2023).

While the general relationship between SES and academic achievements has been established, what is unclear is how this relationship holds across different subjects and across different educational systems. As previous studies have measured SES and academic achievements differently, their findings are not directly comparable across subjects. Moreover, due to the difference in availability of national test data, while the SES effect has been widely studied in countries like the U.S.A., it has received less attention in other countries, such as Mexico and Brazil in the current study. This study aims to bridge these gaps by providing a unified examination of SES effects across subjects and in a global context.

More specifically, this study uses the most recent data available from the Program of International Student Assessment (PISA). Six countries representing different types of educational systems are studied to address the following two research questions:

1. Whether there is a consistent SES effect across different subject areas, i.e., mathematics, reading and science.
2. Whether student-level or school-level SES plays a more important role in student achievement.

These three subjects were studied due to their importance in student learning, which PISA refers as core "literacies" (OECD, 2023). Meanwhile, while most studies on SES effects have focused on student SES effects, the school-level effect can be quite different (Marchant & Finch, 2016).

Empirical Literature Review

This study evaluates the SES effect in the following six countries: Australia, Brazil, Finland, Mexico, Singapore, and U.S.A. These countries have been selected to represent a mixture of educational systems ranging from more controlled with a national curriculum (e.g., Singapore) to more decentralized with high local control of education (e.g., U.S.A.), from large (e.g., U.S.A.) to small (e.g., Singapore) and from developing countries (Mexico and Brazil) to developed countries (Australia, Finland, Singapore, and U.S.A.). These countries also occupy different positions on the achievement scale: Singapore and Finland typically rank near the top, Australia and the United States fall in the middle range, and Brazil and Mexico appear toward the lower end. While other countries may have been selected and findings based on them may be different, the focus of this study is not only to show the SES effects for different countries, but also to use them to discover the general patterns of SES effects on different subject areas.

The following section is organized around the above two research questions. Previous studies on the relationship between SES and academic achievement in the six countries under study will be synthesized to provide a broad picture of the SES effects in different subjects and at different levels. This picture will help contextualize and illuminate the findings for these countries as revealed later in this study.

SES Effect at Student-level Across Subjects

As expected, the SES effect is prevalent at the student level in the countries studied. In Singapore, despite sustained policy efforts aimed at ensuring equal access to quality education, data from PISA indicate that achievement gaps linked to SES remain evident across mathematics, reading, and science (OECD, 2023a). Overall, students from high-SES households scored approximately one standard deviation higher in mathematics than those from low-SES families, a difference equivalent to more than two years of schooling (Yang et al., 2022). This gap between advantaged and disadvantaged students reached one full standard deviation for reading.

In the U.S., student-level SES effects on academic achievement are broad and enduring. In general, it was found that SES accounts for as high as 15% of performance variance, as indicated by the PISA scores (Volante et al., 2019). On mathematics, Bai (2020) and Matheny et al. (2023) revealed that the gap between students from the highest and lowest income families could reach 1.2 standard deviations, equivalent to three to four years of learning. On reading, by the time U.S. children enter kindergarten, those from higher-income families already have 60% larger vocabularies, and by age fifteen, this early advantage translates into a full standard deviation advantage in reading (UNICEF Innocenti Research Centre, 2019). On science, SES also remained a strong predictor of science achievement (OECD, 2023a).

In Australia, SES has also been shown to be a significant factor for students' achievement in mathematics (Rothman, 2003;) and science (McConney & Perry, 2010). An analysis of PISA 2003 results demonstrated an advantage for students with higher SES in mathematical literacy (Thomson et al., 2004) as well. In Mexico, PISA data show that students in the top SES quartile outperformed those in lowest by about half a standard deviation in mathematics, which is equivalent to two years of learning (OECD, 2023b). In Finland, the SES achievement gaps have been found to be widening. Since 2012, the gap between students in the top and bottom SES quartiles has gradually increased to be approximately half a standard deviation in reading, which is equivalent to roughly one and a half years of schooling (OECD, 2023b).

SES Effect at School-level

One distinct school-level SES effect in these countries is regional differences, which is especially true in Brazil. Guilherme et al.(2024) noted that as early as in 1953, Lambert argued that there was a remarkable contrast in Brazil with a dynamic South and a feeble North-Northeast. They further suggested that these Brazilian unequal social structures can be described as "Two Brazils." Consequently, school level differences have been identified in Brazilian schools. School level variables like school quality and school structure were found to be key factors affecting achievement scores (Gomes et al., 2019). In Australia, studies conducted using national datasets like NAPLAN also revealed large regional disparities of student achievement in reading, writing, and numeracy (Ford, 2013). In Mexico, Santibáñez (2016) and Reimers (2024) show that indigenous and rural students consistently perform below national averages, probably due to shortages, weak infrastructure, and language barriers in those regions. Additionally, schools serving low-income communities performed worse than those with more resources in Mexico (Ortiz et al., 2024).

Factors Related to SES Effects

A substantial body of research has been devoted to understanding the effects of SES on academic achievement. Prior studies in these countries generally converge on two central themes: disparities in learning opportunities and disparities in learning support. With respect to learning opportunities, one explanation for the persistent SES effect is that SES disparities are associated with unequal access to enrichment opportunities and learning environments that promote student confidence and engagement (Talib & Fitzgerald, 2015; Talib, 2019). Using PISA data, Marteleto and Andrade (2014) demonstrated that family cultural capital significantly influences Brazilian adolescents' achievement in science, reading, and mathematics. In the domain of science, students from higher-SES households typically have greater access to well-equipped laboratories, advanced coursework, and extracurricular STEM opportunities, whereas students from lower-SES backgrounds are more likely to attend schools with fewer qualified science teachers and limited resources for hands-on experimentation (Thomas & Lonobile, 2021).

Similarly, Lay et al.(2015) found that students from higher-SES families in Singapore were more likely to participate in science fairs, research projects, and inquiry-based programs, all of which contribute to deeper conceptual understanding and sustained interest in science. In the domain of reading, Mah (2020) reported that access to home literacy resources—including books, digital reading tools, and active parental engagement—played a critical role in shaping Singaporean students' reading proficiency.

With respect to learning support, classroom- and school-level support represents a critical factor contributing to SES-related disparities in academic achievement. Using data from the Third International Mathematics and Science Study (TIMSS), Lamb and Fullarton (2002) demonstrated that classroom and school compositional differences are closely associated with Australian students' mathematics achievement. Similarly, Hanushek et al. (2020) argued that SES influences course placement, access to advanced mathematics courses, and exposure to high-quality teachers. These cumulative disadvantages limit low-SES students' opportunities to engage in higher-order problem-solving and abstract reasoning tasks, thereby contributing to persistent achievement gaps.

Finland provides a positive example of how the negative effects of SES can be mitigated. In PISA 2022, Finland maintained its position among the highest-performing OECD countries. OECD (2023a) identifies several structural features that promote educational equity in Finland, such as universal access to early childhood education, free school meals, in-school health and psychological services, and targeted special education. Similarly, the Finnish National Agency for Education (2022) reports that comprehensive student welfare services—including counseling and individualized learning support—play a crucial role in mitigating the effects of economic disadvantage.

Method

Data

PISA is one of the most ambitious international educational projects ever undertaken in the global setting. It provides comprehensive international data in three core learning areas: mathematics, science, and reading. PISA focuses on the skills that 15-year-old students will need in the future and seeks to assess what they can do with what they have learned (OECD, 2023a). The PISA assessment provides baseline profile of the knowledge and skills of students along with contextual indicators that show how such skills relate to important demographic, social, economic, and educational variables. To gather contextual information, PISA surveys students, parents, and schools by background questionnaires. Student assessment along with these questionnaires provides an excellent combination of information necessary to study various factors that are related to student achievement, such as SES in the current study.

This study used the 2022 PISA data, the latest PISA data available to study the SES effect in the global context. Six countries were selected from the 41 countries that participated in that cycle. To reiterate, these countries were Australia, Brazil, Finland, Mexico, Singapore, and U.S.A. These countries were selected to represent different levels of student achievement and social economics status levels. As shown in the descriptive statistics in Tables 1 and 2, Singapore and Finland were at the top achieving levels. They also had the highest SES levels. Australia and U.S.A were at the medium level for both student scores and SES. Brazil and Mexico, two developing countries, were at the lower levels of student scores and SES.

Models

A two-level HLM model (Bryk & Raudenbush, 1992) was fitted to examine the SES effect at both the student and school levels. HLM modeling was chosen to account for the nested structure inherent in the PISA data in that multiple students were nested within each school.

More specifically, at level 1, test score was predicted by student-level variables. At level 2, the intercept from the level 1 model (school mean) was predicted by school-level variables. The two-level HLM model can be expressed as:

$$\text{Level 1: } PV_{ij} = \beta_{0j} + \sum \beta_k X_{ij} + r_{ij}$$

$$\text{Level 2: } \beta_{0j} = \gamma_{00} + \sum \gamma_{0g} W_j + u_{0j}$$

$$\text{Overall: } PV_{ij} = \gamma_{00} + \sum \gamma_{0g} W_{ij} + \sum \beta_{1k} X_{ij} + u_{0j} + r_{ij}$$

where i is student, j is school, X is the predictor at the student level, W is the predictor at the school level. Y_{ij} is an achievement test score for student *i* from school *j*, γ_{00} is the grand mean for the entire sample, β_{0j} is the mean of school *j*, r_{ij} is the error term for student *i* in school *j* which captures within-school differences, and μ_{0j} is the error term for school *j* which captures between-school differences.

All independent variables were centered around their respective group means in level 1 models but around the grand mean in level 2 models. Model estimates were obtained by using Proc mixed in the SAS software package. Regression coefficients were used to measure the effect of variables. Normalized sampling weights were used to preserve the representativeness of the sample while controlling for the sample size (Gonzalez, 2012).

Four Models. To address the two research questions, the above HLM model was run in four ways, resulting in four models as specified below. Model 1 was a null model with no predictor. Its purpose was to estimate country's means and the clustering effect of schools. Model 2 used school-level predictors only. Its goal was to evaluate school SES effect. Model 3 used student-level predictors only to estimate student SES effect. Model 4 was the most realistic model that used both school and student predictors. Its goal was to evaluate school and student-level effects while controlling one for the other.The same models were applied separately to mathematics, reading, and science, allowing for a comparison of the SES effect across these subjects. The comparisons across subjects and countries were based on the regression coefficients of the SES variables in the models, which assess the extent to which achievement scores change in response to the change in SES. Furthermore, the effects of school SES and student SES were explicitly modeled in Models 2–4, thereby facilitating a direct comparison of these two effects in relation to Research Question 2.

Variables

Independent Variable. The most important independent variable apparently is the SES of students. How to measure SES across different countries can be challenging. PISA measures SES as a broad indicator of social, economic, and cultural resources that are available to students (Avvisati, 2020). The ESCS index—Economic, Social, and Cultural Status index—is based on three components: parental education, parental occupation and home possessions. The ESCS variable is scaled to have a mean of 0 and SD of 1 for all countries. One control variable at the student level is gender. At the school level, the most important variable is school level SES, which is the average of student level SES at each school. In addition, school size was used as a controlling factor at the school level.

Dependent Variable. Dependent variables were measures of student academic achievement. Due to the BIB (balanced incomplete block) design, plausible values rather than point estimates like total score are used as proficiency estimates for PISA. These values took into account the fact each student only took a small portion of all the items in the whole test. For each student, 10 plausible values were used for math, reading and science. These plausible values were used as the dependent variable in this study. For each model, 10 runs were conducted, each based on plausible value. Results from each run were combined and reported as findings for each model.

Results

To provide a comprehensive and cumulative knowledge of the SES effects on academic achievements in the six chosen countries, descriptive statistics on sample size, SES, country means on math, reading, and science were presented first. Following that, findings from the four models were presented sequentially.

Descriptives

Table 1 gives the sample size of each country. Overall, sample size was large for all countries, which is not surprising, given that PISA aims to represent the 15-year-olds at the national level. The weighted N was computed using the student sampling weights, making each value represent the target student population of each country.

Table 1

Sample and Population Size

Country	N	%	Weighted N
Australia	13,437	25.9%	265,196
Brazil	10,798	20.8%	2,262,972
Finland	10,239	19.7%	58,955
Mexico	6,288	12.1%	1,393,727
Singapore	6,606	12.7%	41,958
United States	4,552	8.8%	3,661,328

Table 2 gives the descriptive statistics for the SES measure. The mean and SD of this measure were 0 and 1 for all countries combined. Australia, Finland and Singapore were above the mean, U.S.A was about average, and Brazil and Mexico were about one standard deviation below the mean.

Table 2

SES Level of Countries

	N	Mean	Std. Deviation
Australia	12,971	.39	.85
Brazil	10,334	-.98	1.13
Finland	9,931	.19	.86
Mexico	6,270	-.93	1.16
Singapore	6,559	.29	.83
United States	4,342	.04	.99
Total	**50,407**	**-.13**	**1.13**

Model 1

Model 1 results are given in Table 3. Note that this was the null model without predictors. The only interesting parameter was the intercept, which was the country's mean. The overall mean for all countries was set at 500 with the standard deviation at 100.

Table 3

Model 1 Results

Subject	Country	Mean	SE	ICC
Mathematics	Australia	483.31	2.00	.24
	Brazil	374.99	2.22	.41
	Finland	482.61	2.01	.09
	Mexico	388.65	2.65	.30
	Singapore	569.63	4.61	.31
	United States	463.36	4.03	.25
Reading	Australia	495.61	2.08	.18
	Brazil	404.88	2.78	.38
	Finland	487.82	2.53	.10
	Mexico	406.84	3.43	.35
	Singapore	538.41	4.65	.27
	United States	502.23	4.29	.19
Science	Australia	504.22	2.16	.19
	Brazil	397.67	2.68	.40
	Finland	508.57	2.60	.10
	Mexico	402.94	2.95	.33
	Singapore	557.06	4.35	.29
	United States	498.00	4.48	.23

To better compare countries and subjects, the above means were illustrated in Figure 1. The six countries may be classified into three groups: Singapore was the highest for all three subjects; Australia, Finland, and U.S.A were around the mean; Brazil and Mexico were about one standard deviation below the mean. Within each country, the average score was quite similar for the three subjects. Note that these mean estimates were very close to the official numbers (OECD, 2023).

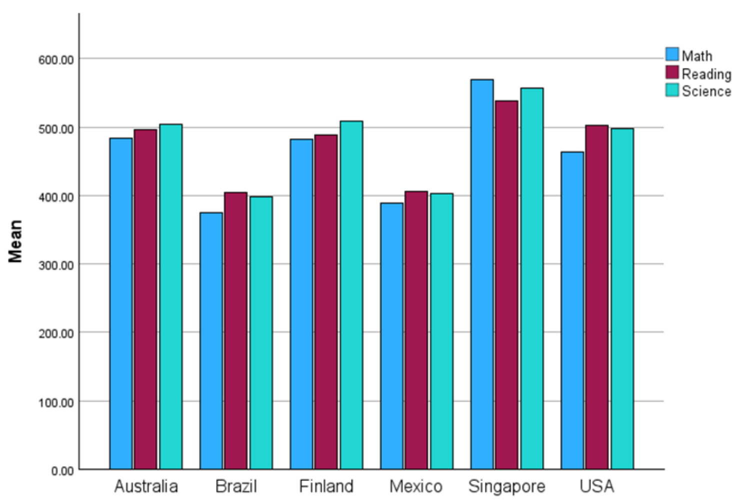

Figure 1. Mean Score for Countries

ICCs in Table 3 were higher than .1 for almost all cases, indicating significant school clustering effect for all countries, which justified the use of HLM models. ICCs were especially high for Brazil, indicating a stronger cluster effect for schools there. Interesting, ICC has a -.55 correlation with the average country score in this sample, indicating that higher achieving countries seemed to have smaller school cluster effects.

Model 2: Student Effects (Research Question 1)

Model 2 used school-level predictors only. It aimed to evaluate the SES effect at school level, while controlling school size. Model results were given in Table 4 and illustrated in Figure 2. Numbers under School SES and School Size in this table and hereafter were regression coefficients.

Table 4

Model 2 Results

Subject	Country	School SES	School Size
Mathematics	Australia	79.51	.71
	Brazil	57.71	.44
	Finland	62.97	4.50
	Mexico	37.62	.50
	Singapore	114.77	-.28
	United States	67.62	.12
Reading	Australia	77.77	.28
	Brazil	67.12	.81
	Finland	52.57	5.41
	Mexico	49.65	.66
	Singapore	108.94	.08
	United States	67.67	.27
Science	Australia	78.77	.61
	Brazil	67.37	.79
	Finland	74.55	6.19
	Mexico	43.57	.66
	Singapore	107.08	-.07
	United States	72.17	.34

To better understand the school effect, the above regression coefficients were illustrated in Figure 2. Several patterns can be identified from the figure. First, school SES effect was large. One standard deviation of SES change resulted in over 40 points for all countries and all subjects. In Singapore, it was over 100 points, or one standard deviation for all three subjects. Second, while the highest achieving country in this sample (i.e., Singapore) had the largest school SES effect, Mexico, the lowest achieving country, has the smallest. Finally, while this effect was mostly even across subjects for some countries (e.g., Australia, Singapore and U.S.A), it was not for others. For instance, it was considerably larger for science for Finland. Mexico also showed a differential effect in that the reading SES effect was the largest.

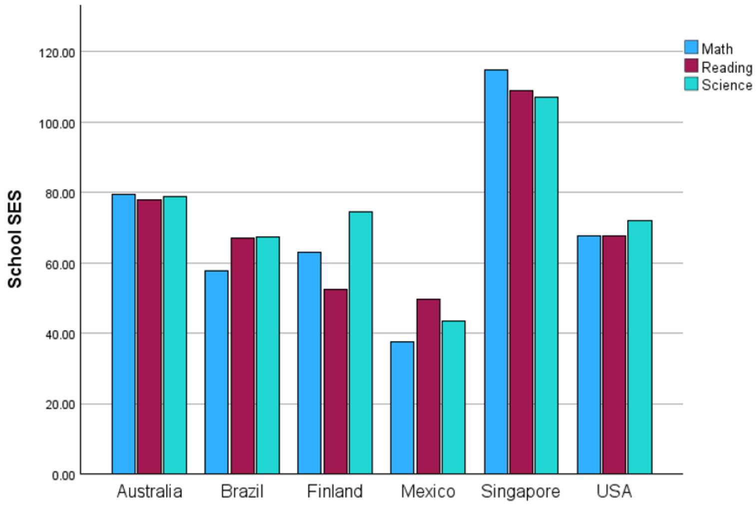

Figure 2. School Level SES Effect

School size effect was generally small for all countries. Finland was an exception. Its effect was almost 10 times larger than that of other countries.

Model 3: School Effect (Research Question 2)

Model 3 used student-level predictors only. It aimed to evaluate the SES effect at the student level, while controlling gender. Model results were given in Table 5 and illustrated in Figure 3.

Table 5

Model 3 Results

Subject	Country	Student SES	Gender
Mathematics	Australia	27.77	12.61
	Brazil	7.96	13.40
	Finland	34.20	-3.14
	Mexico	6.39	14.04
	Singapore	30.80	15.47
	United States	24.61	13.07
Reading	Australia	27.26	-20.72
	Brazil	8.62	-10.99
	Finland	35.61	-42.39
	Mexico	11.67	-6.32
	Singapore	31.89	-15.36
	United States	24.98	-22.53
Science	Australia	30.24	3.48
	Brazil	9.70	11.56
	Finland	38.31	-19.16
	Mexico	8.21	14.97
	Singapore	30.68	10.86
	United States	26.93	6.69

As illustrated in Figure 3, student SES effect was considerably smaller than school SES effect. Actually, the student effect was about half the size of the school effect. Interestingly, this effect was especially smaller for Brazil and Mexico, two countries with lowest SES and test scores. Finland, on the other hand, had the highest student SES effect on all subjects.

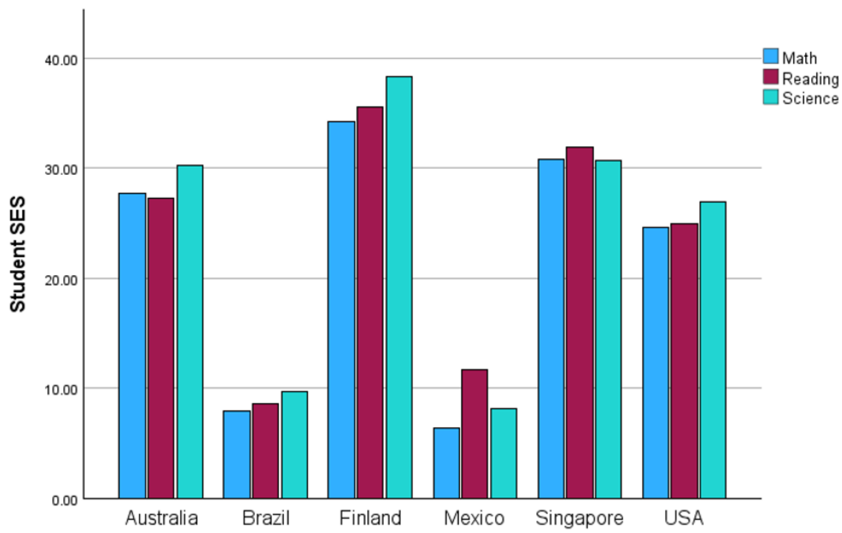

Figure 3. Student SES Effect

Figure 4 gives gender effect. Overall, boys did better at math and science while girls did much better at reading. In Finland, girls did better on all subjects.

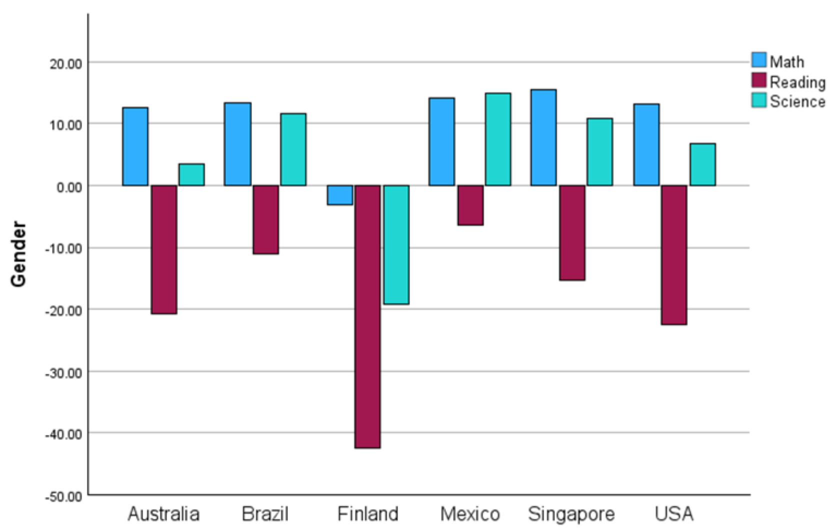

Figure 4. Gender Effect

Model 4: Conditional Student and School Effects (Research Questions 1 and 2)

Model 4 used both student-level and school-level predictors. This is probably the most realistic and important model for decision making by policymakers and parents. Its student SES effect reflects the student effect after controlling school SES effect. This is equivalent to evaluating how student SES is related to academic performance, if the school SES is the same. This is more realistic as students going to the same school would have the same school SES level. School effect in this model reflects the school effect for students with the same SES level, which is equivalent to evaluating how school SES may affect students who have same SES but have chosen different schools. Model results were given in Table 6 and illustrated in Figures 5–8.

Overall, the effects of both school SES and student SES decreased after controlling for one another, as shown in Table 6. Figures 5–8 present more details on these changes. As illustrated in Figure 5, the pattern observed in Model 2 for school SES effect still holds. School SES effect was still quite consistent across subjects. Singapore still showed oversized school SES effects while Mexico had the smallest.

Table 6

Model 4 Results

Subject	**Country**	**School SES***	**Student SES***
Mathematics	Australia	79.96	28.15
	Brazil	58.04	8.38
	Finland	66.37	30.78
	Mexico	37.60	6.40
	Singapore	116.26	30.80
	United States	67.85	24.66
Reading	Australia	76.39	27.57
	Brazil	66.92	8.96
	Finland	54.94	33.14
	Mexico	49.73	11.71
	Singapore	106.85	31.89
	United States	67.56	25.16
Science	Australia	78.69	30.67
	Brazil	67.68	10.20
	Finland	77.71	34.37
	Mexico	43.60	8.21
	Singapore	108.26	30.68
	United States	72.32	27.10

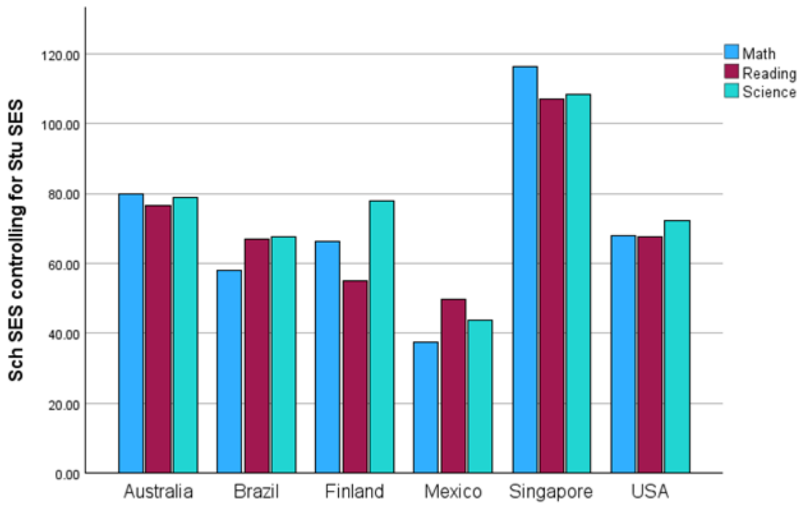

Figure 5. School SES effect after controlling for student SES

Figure 6 illustrates the difference between Model 4 and Model 2 estimates. Overall, school effect decrease was limited after controlling for student SES. Reduction was more prominent for Finland. However, school SES effect for reading surprisingly increased after controlling for student SES for Australia and Singapore.

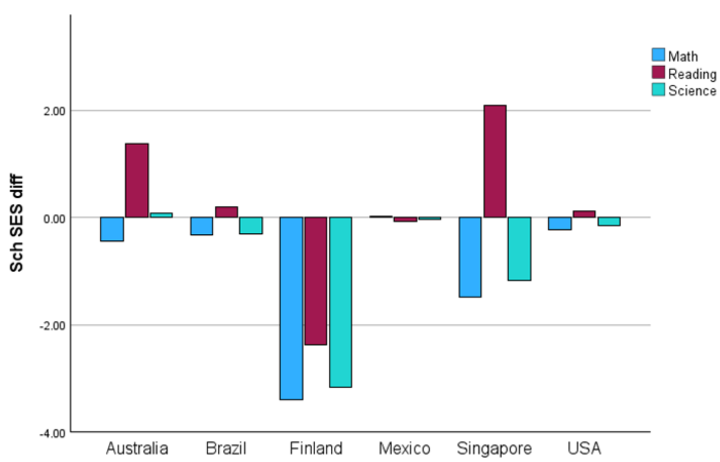

Figure 6. Change of school effect after controlling student SES

As illustrated in Figure 7, the general pattern observed in Model 3 for student SES effect still holds. Mexico and Brazil kept having small student SES effects, even after controlling School SES. One notable change is that Finland's performance aligned more closely with other developed countries once school SES was controlled.

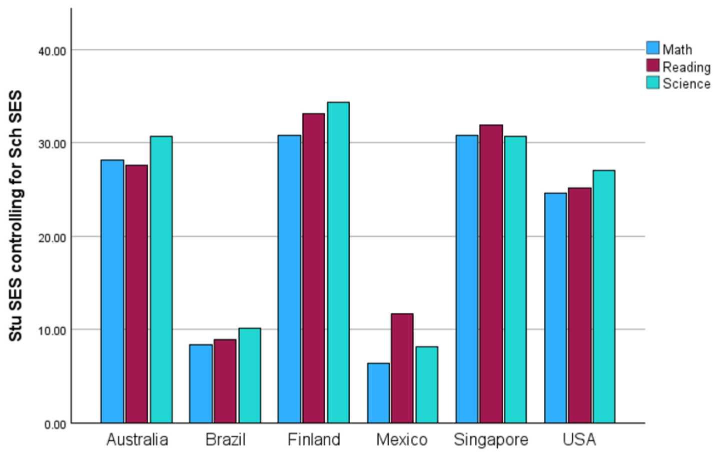

Figure 7. Student SES effect after controlling for school SES

Figure 8 illustrates the change of student SES effect from Model 2 to Model 4. In most cases, student SES effect increased slightly. Finland, on the other hand, showed the most reduction of student SES effect after school SES was controlled.

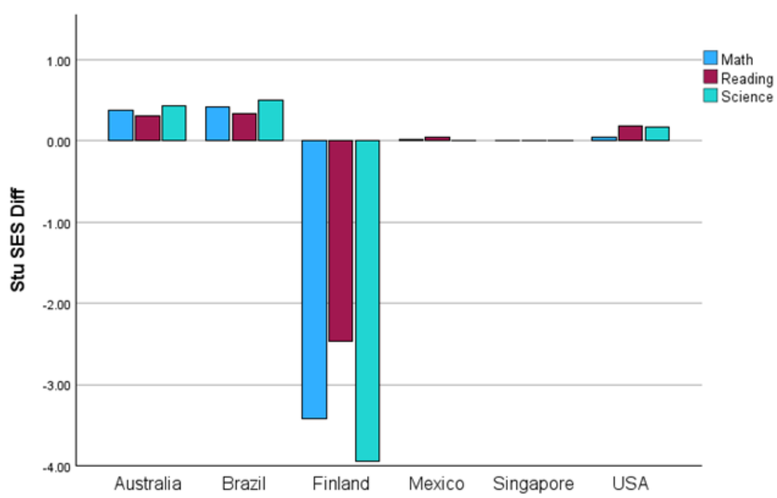

Figure 8. Change of student effect after controlling school SES

To summarize the findings from the four models, this study reaffirms the negative impact of student SES on academic achievement. Moreover, the effect of school-level SES appears to be substantially larger than that of student-level SES. These SES effects were mainly consistent across the three subjects while each country also showed some uniqueness.

Discussion

While the relationship between SES and academic achievement has been extensively researched and documented, this study aimed to provide a broader, global perspective on this important issue. The availability of international assessments such as PISA made such a cross-nation, cross-subject analysis possible. The findings from this study clearly illustrate this global view. On the other hand, a secondary data analysis like the current one by nature has its limitations.

First, the results may be influenced by the selection of countries in that choosing a different set of countries could have resulted in different patterns of SES effects. Another major limitation is while the main goal of this research was set to uncover the possible underlying patterns of SES effects across disciplines and countries, its findings shed little light on the underlying causes of the observed patterns. In other words, it does not provide new insights into what factors may have contributed to the large school- and student-level SES effects.

On Student SES Effects Across Subjects (Research Question 1)

The impact of SES on academic achievement does not appear to vary by subject. In other words, for each country, the effects of both student- and school-level SES are generally consistent across mathematics, reading, and science, as indicated by results from Models 2, 3 and 4. Although many previous studies have focused on how SES influences resources for specific subjects (e.g., Zhao & Gibson, 2023; Haoning Mah, 2021, the findings from this study suggest that school and student resource availability may similarly affect multiple subjects. When disparities among SES effects do occur, they are most often observed in reading, while the effects on mathematics and science tend to be more comparable.

Among the six countries examined in this study, the findings for Finland are the most challenging to interpret. This study revealed that its SES effects are surprisingly similar to those observed in other developed countries, such as Australia and the United States, as shown by the findings from Models 2–4. This contrasts with earlier research suggesting that its SES effects should be less pronounced (The Finnish National Agency for Education, 2022). One possible explanation is that rising socioeconomic inequality in Finnish society may be gradually undermining the foundations of its historically equitable education system (OECD, 2023b; Metsämuuronen & Lehikko, 2022). Other notable observations for Finnish students include a substantial effect of school size and consistently higher achievement of girls over boys.

On Student and School SES Effects (Research Question 2)

This study found significant effects associated with school-level SES, a finding that raises concern. Moreover, school-level SES effects tend to be larger in more affluent countries, such as Australia and Singapore. Although questions such as why Singapore's school-level SES effect is so pronounced—exceeding one standard deviation—cannot be addressed through a cross-sectional international comparative study like this one, they merit further investigation. On the other end, while students in Mexico and Brazil exhibit similar SES levels, their school-level SES effects differ markedly. Mexico demonstrates a much smaller school-level SES effect than Brazil.

In comparison, student-level SES effects tend to be smaller than school-level SES effects. While this should not diminish the importance of student SES—its effects remain substantial (approximately one-third of a standard deviation in Australia and Singapore)—it does highlight the strong influence of school-level SES on student achievement. Unlike school-level SES effects, student-level SES effects are similar in Mexico and Brazil, and in both countries, they are relatively small.

Future research could take several directions. One clear direction is to examine other countries, as this study suggests that there is uniqueness in the relationship between SES and academic achievement in each country. Another direction is to investigate SES effects at another, preferably earlier stage of student learning. PISA assesses 15-year-olds, approximately 8th graders or high school freshmen, but other international assessments, such as the Trends in International Mathematics and Science Study (TIMSS) and the Progress in International Reading Literacy Study

(PIRLS), assess 4th-grade students. These assessments offer an earlier window to study this important relationship.

Conclusions and Implications

In conclusion, this study found that school-level SES effects are significantly greater than student-level effects, with both effects remaining consistent across subject areas. Country-specific analyses suggest that school-level SES effects tend to be stronger in more affluent nations, such as Australia and Singapore, while student-level SES effects are relatively smaller in lower-income countries, such as Mexico and Brazil. Although these findings are not causal, they have important implications for stakeholders, including policymakers and parents. Overall, policies aimed at reducing school SES disparities—such as improving school resources and teacher quality—could help mitigate the achievement gaps associated with SES. For parents, fostering a supportive learning environment and advocating for increased school resources related to SES may also contribute to improved student outcomes.

Finally, this study underscores the importance of carefully examining the SES effects within each educational system, as the findings also demonstrate that these effects can vary substantially across contexts.

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