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School characteristics mediating the relationship between school socioeconomic status and mathematics achievement

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Abstract: While numerous studies have reported the effect of school socioeconomic status (SES) on achievement, the factors that can cause this relationship are not well established. This study is, therefore, an attempt to understand school SES and students' mathematics achievement relationship by assuming that this relationship occurs through a correlation between school SES and school characteristics. Identifying these school characteristics is crucial to reduce the relation between SES and achievement for educational equity. Focusing on the 8th-grade mathematics data from Trends in International Mathematics and Science Study (TIMSS) 2015, this study aimed to identify school characteristics (quality of mathematics teaching at school, discipline at school, sense of school belonging, and school academic emphasis) that can mediate the relationship between school SES and students' mathematics achievement. The results of multilevel regression analyses showed that controlling school characteristics reduced the relationship between school SES and students' mathematics achievement in most of the educational systems. However, the results of multilevel multiple mediation analysis showed that the relationship between school SES and students' mathematics achievement were mediated through discipline at school, school academic emphasis, or sense of school belonging in some educational systems. In addition, the results indicated that the quality of mathematics teaching at school was not a mediator in this relationship. These results suggest the need for eliminating the effect of school SES on some school characteristics to improve equity in education.

1. INTRODUCTION

Equity in mathematics education means providing individualized support to students as much as they need (National Council of Teachers of Mathematics, 2000). This support addresses the barriers that students face to achieve their potential in mathematics. Socioeconomic status (SES) is one of these barriers because researchers point out that both student SES and school SES determine student achievement in many countries (Perry & McConney, 2010; Sirin, 2005). Besides, Chmielewski's study (2019) reveals that SES related performance differences have

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been increasing consistently over the past 50 years in many countries. Researchers also state that the effect of school SES is more significant on students' mathematics achievement than the effect of student SES (Borman & Dowling, 2010; Sirin, 2005). Therefore, it seems crucial to eliminate the relationship between school SES and achievement for educational equity.

Student SES is defined as the social and economic background of students' parents. Accordingly, school SES is defined as the socioeconomic status of parents of students in a school. Student SES can be indicated by various ways such as parents' income, parents' education level, or home educational resources. Students with higher SES are likely to have an education in academically more advantaged schools (having qualified teaching and school resources). Likewise, students with lower SES probably will be educated in academically more disadvantaged schools (Berkowitz et al., 2017; Liu et al., 2015; Rumberger & Palardy, 2005; Sirin, 2005). The mentioned distribution of students to schools in a planned or an unplanned manner causes differences in achievement among schools as well as the individual performance of students. For example, a student attending a school with a higher SES is more likely to be successful compared to a student having a similar family structure but attending a lower SES school (Gustafsson et al., 2016; Liu et al., 2015; Mullis et al., 2016).

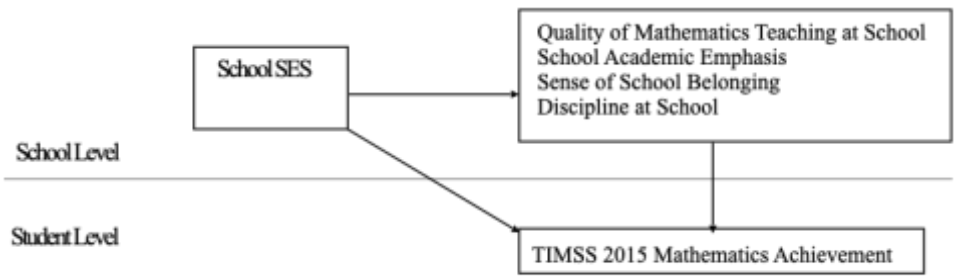
Besides, research shows that students who attend schools having qualified teaching, safe and supportive school climate, a high sense of school belonging, and giving high academic emphasis will have a higher probability to be successful in mathematics (Gustafsson et al., 2016; Nilsen et al., 2016; Olmez, 2020; Thrupp et al., 2002). There is little research and there are no comprehensive theories that address the relationships between school SES, school characteristics, and academic performance. However, about the theoretical nature of these relationships, some authors argue that a school's SES affects its characteristics (e.g., social climate), which in turn affects students' academic achievement (Berkowitz et al., 2017). That is, students' mathematics achievement is assumed to be influenced by school SES indirectly through school characteristics. This indirect relationship is named mediation and, in this mediation, the school characteristics are called mediators. Consistent with this argument the results of the previous studies outlined below suggest that school characteristics may have a potential mediational role between school SES and student mathematics achievement. For example, school SES may be related to mathematics achievement indirectly through the mediating role of school characteristics such as quality of teaching and school climate (Berkowitz et al., 2015; Gustafsson et al., 2016; Hansen & Strietholt, 2018; Liu et al., 2015; Nilsen et al., 2016; Schmidt et al., 2015). The educational practices that contribute to student achievement in a school are named as "quality of teaching at school" (Brophy & Good, 1986). The quality of mathematics teaching might be better in high SES schools (i.e., schools with high SES students) because these schools are more likely to have well-qualified mathematics teachers. Since the quality of mathematics teaching at school is associated with students' mathematics achievement, school SES may indirectly be related to mathematics achievement. On the other hand, low SES schools may not provide a safe and supportive learning environment because of disadvantages resulting from having low SES such as social problems, violence, and emotional and behavioral difficulties (Berkowitz et al., 2017; Liu et al., 2015). Without a safe and supportive learning environment in school, learning cannot become students' focus. The degree of physical and emotional safety and order of disciplinary situations provided for students by a school are conceptualized as "discipline at school" (Wang & Degol, 2016). Therefore, school SES has the potential to affect students' mathematics achievement via discipline at school (Liu et al., 2015). Similarly, research has shown that students' sense of belonging to school (Munk, 2007) may be another meaningful mediator between school SES and mathematics achievement. "A sense of school belonging" is conceptualized as that a student has the feeling of being an essential part of school/classroom life and activities and is accepted and valued by teachers and peers (Goodenow, 1993). Also, academic emphasis in school is

another school characteristics that may be related to SES (Wu et al., 2013) and achievement (Hoy, 2012; Olmez, 2020; Yavuz et al., 2017). "The school academic emphasis" is conceptualized as priority and importance given on learning and achievement by a school (Hoy et al., 2006). The work of Boonen et al. (2014) demonstrates that the school academic emphasis may have the potential to mediate the relationship between SES and mathematics achievement.

Despite numerous studies reported the relationship between school SES and student achievement, few studies investigated the underlying mechanism of this relationship (Berkowitz et al., 2017; Liu et al., 2015; Schmidt et al., 2015). In these studies, the joint effects of multiple mediators were not considered. In addition, examining these joint mediation effects in different cultures may shed light on understanding possible different school SES mechanism that is related to cultural difference. Viewing the gaps in previous studies, we investigated the multiple school characteristics mediating the relation between school SES and students' mathematics achievement. The existence of school-SES indirect effects in addition to its direct effect (the effect with no mediator) on student mathematics achievement creates a situation causing inequity in mathematics achievement (Berkowitz et al., 2017; Gustafsson et al., 2016; Nilsen et al., 2016). In such a situation, managing the educational environment at school in the way that this mediating role is eliminated can contribute to establishing equity in achievement. For example, if low SES schools were able to alter their climate to enhance student achievement, this might eliminate the negative effects of the low SES.

Thus, the purpose of this study is to investigate the mediational role of school characteristics between school SES and student mathematics achievement in order to understand the school SES mechanism better. Previous studies indicate weaker school SES effects in secondary schools than primary schools (e.g., Driessen, 2002). This finding may imply that the school SES effect diminishes over time. However, most of the recent studies have focused on the secondary level and found that school SES is a stronger predictor of student outcomes in secondary schools (e.g., Liu et al., 2015). To contribute to the generalizability of the recent findings at the secondary level, in this study, we investigated the school SES mechanism using Trends in International Mathematics and Science Study (TIMSS) 2015 eighth-grade data. Previus studies that use TIMSS data report the effect of school SES on student mathematics achievement (e.g., Akyuz, 2014). Similarly, TIMSS reports that if low SES students attend schools which are composed of students from affluent homes, they are more likely to achieve a higher level compared to low SES students who attend schools composed of students from less affluent or disadvantaged homes (Mullis et al., 2011; Mullis et al., 2016). Accordingly, we formulated the following hypotheses: 1) School SES is positively related to students' mathematics achievement and 2) School SES is positively and indirectly related to students' mathematics achievement through the mediation of school characteristics (quality of mathematics teaching at school, discipline at school, school academic emphasis, and sense of school belonging). The proposed model demonstrates these relations (Figure 1).

Figure 1. *The Proposed Model.*



2. METHOD

2.1. Data and Participants

This study uses students' and school principals' data obtained through TIMSS 2015 administered by the International Association for the Evaluation of Educational Achievement (IEA). The sample includes 37 countries after removing Saudi Arabia due to single-sex schools in order to control student gender in the analysis. Therefore, data of 248.667 8th-grade students and 7135 schools in all remaining countries are used in the study (see Appendix 1). TIMSS uses a stratified two-cluster sampling design in each country with schools and classes randomly selected (Martin et al., 2016).

2.2. Variables

2.2.1. *TIMSS 2015 mathematics achievement*

This study used five plausible values of mathematics achievement scores in TIMSS 2015 data as the dependent variable. Plausible values are multiple imputed scores based on estimates regarding student ability distribution (Mullis et al., 2016; Wu, 2004). The scales created by TIMSS from student and school principal's responses were used in this study and explained below (Martin et al., 2016).

2.2.2. *School SES*

TIMSS surveys school principals' views to determine student percentage of economically advantaged and disadvantaged backgrounds in their schools. TIMSS uses these responses to describe schools as "affluent," "neither affluent nor disadvantaged," and "disadvantaged" based on students' economic backgrounds.

2.2.3. *School characteristics*

2.2.3.1. School Academic Emphasis. TIMSS asks school principals to indicate how they characterize their schools' emphasis on academic achievement by rating some items from very low to very high scale. Examples of these items are "parental expectations for student achievement," "teachers' degree of achievement in implementing the school's curriculum," "teachers' expectation for student achievement," "teachers' collaborative work to improve student achievement," "students' desire to do well in school", and "students' ability to reach school's academic goals." Then TIMSS combines these responses to describe school's academic emphasis as "medium", "high", and "very high".

2.2.3.2. Discipline at School. Similarly, an index score in the TIMSS 2015 database, based on principals' responses to the question "To what degree each of the following is a problem among 8th-grade students in your school?" was used in this study. Some of the issues scored by principals included "arriving late at school," "absenteeism," "intimidation and verbal abuse among students," "profanity," "cheating," thieving", and "vandalism." TIMSS uses these responses to describe schools' discipline problems as "hardly any", "minor", and "moderate to severe".

2.2.3.3. Sense of School Belonging. The extent of student sense of school belonging is categorized as "high sense of school belonging," "sense of school belonging", and "little sense of school belonging" by an index in the TIMSS 2015 database. It is derived from students' responses to the question "What do you think about your school?" Some of the item examples were "I like being in school," "I feel safe when I am at school," "I feel like I belong at this school," and "I like to see my classmates at school". This score was aggregated from student-level to school level data.

2.2.3.4. Quality of Mathematics Teaching at School. Relevant literature indicates that it is beneficial to consider the relationship between achievement and variables built up from

students' responses on topics of teaching practices at class, quality of teaching, and so on to obtain reasonable results (Eriksson et al., 2019). The study used an index score from the TIMSS database aggregated from the student level to the school level regarding the quality of mathematics teaching (Gustafsson et al., 2016). The index obtained from student responses to items such as: "I know what my teacher expects me to do," "My teacher is easy to understand," "My teacher gives me interesting things to do," "My teacher has clear answers to my questions," and "My teacher is good at explaining mathematics". The index scored through "very engaging teaching," "engaging teaching", and "less than engaging teaching".

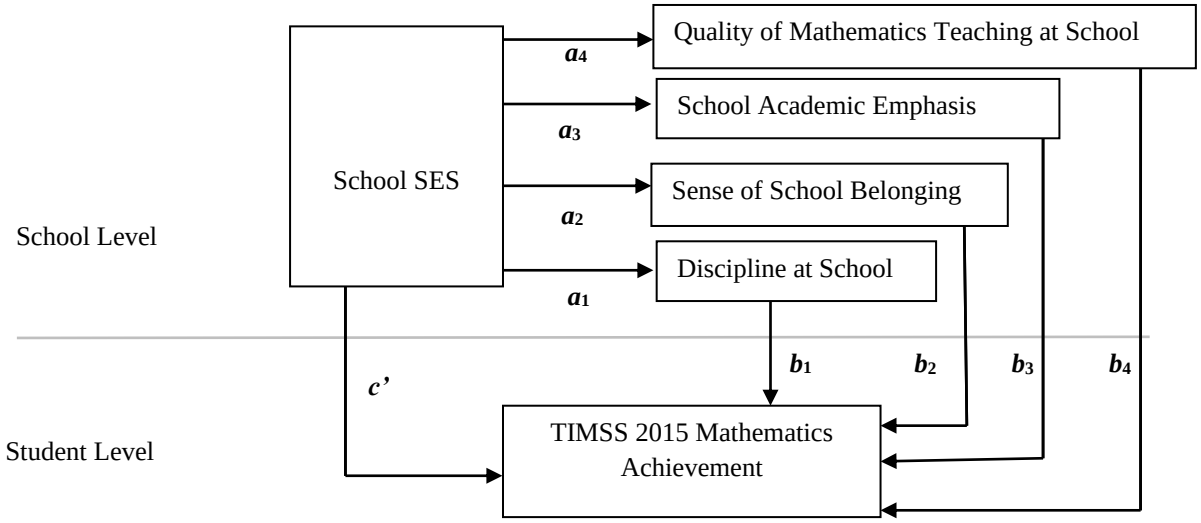
2.2.3.5. Controlling Variables. The variables "sense of school belonging" and "quality of mathematics teaching at school" are used as student-level control variables as suggested since they were aggregated from student-level data (Armor et al., 2017). In addition, previous studies reveal that student gender (Contini et al., 2017), self-confidence (Ker, 2016; Wang et al., 2012), and student SES (Sirin, 2005) may be related to mathematics achievement. Therefore, these variables were also used as control variables. Student gender variable was coded 1 for girls and 0 for boys. For student SES, this study used the "home educational resources" scale. At this scale, students with "many resources" have 100 or more books, private rooms, and the Internet at home and at least one parent holds a Bachelor's degree. Students with "few resources," on the contrary, are described as having 25 or fewer books, no Internet connection, and no private room at home, and none of the parents holds a higher degree than a secondary school degree. Other students were assigned to the "some resources" category. For self-confidence, the scale constructed from student responses to items such as, "I usually do well in mathematics" and "Mathematics is more difficult for me than for many of my classmates" was used. On this scale, students were categorized as "very confident", "confident", and "not confident".

2.3. Statistical Analyses

In mediation models, one or more variables transmit the effect of an independent variable (X) on an independent variable (Y). These variables are named mediator (M). In this study, there are four mediators (quality of mathematics teaching at school, school academic emphasis, sense of school belonging, and discipline at school) and these mediators transmit the effect of school SES (X) on student mathematics achievement (Y). Figure 2 visualizes the effects of these mediators.

As seen in Figure 2, the independent variable (school SES) and mediating variables (quality of mathematics teaching at school and school academic emphasis, sense of school belonging, and discipline at school) are at the school level (level 2), and the dependent variable (student mathematics achievement) is at the student level (level 1). In this multilevel structure, mediation is referred to as the 2-2-1 mediation model (Bauer et al., 2006; Krull & MacKinnon, 2001). That is, in this mediation model, the independent variable (X) and mediators (M) are at level 2, and the dependent variable is at level 1. This mediation was tested by a multilevel mediation approach as indicated by Zhang et al. (2009). The following steps explain the multilevel mediation used in this study.

Figure 2. *Multilevel multiple mediation (indirect) effect. Student level control variables are not shown in the figure for clarity of the model.*



Step 1. Multiple regression analysis was performed to calculate the effect of school SES (X) on student mathematics achievement (Y), and this effect was indicated by ***c***.

Step 2. In this step, both school SES (X) and mediators (M) were included as simultaneous predictors of student achievement (Y) in multilevel regression analysis. The effects of mediators were indicated by $\boldsymbol{b}_1$, $\boldsymbol{b}_2$, $\boldsymbol{b}_3$, and $\boldsymbol{b}_4$. Similarly, the effect of school SES was indicated by ***c'***.

Step 3. Standard regression analyses were performed to calculate the effects of school SES (X) on mediators (M), and these effects were indicated by $\boldsymbol{a}_1$, $\boldsymbol{a}_2$, $\boldsymbol{a}_3$, and $\boldsymbol{a}_4$.

As seen, ***c*** coefficient denotes the effect of school SES on student achievement, whereas the ***c'*** signifies the effect of school SES on student achievement in the presence of mediators. In mediation analysis, ***c-c'*** estimates the total mediation effect and ***a.b*** estimates the mediation effect for a single mediator. In our analysis, $\boldsymbol{a}_1.\boldsymbol{b}_1$, $\boldsymbol{a}_2.\boldsymbol{b}_2$, $\boldsymbol{a}_3.\boldsymbol{b}_3$, and $\boldsymbol{a}_4.\boldsymbol{b}_4$ estimate the mediation effects for four mediators.

International Data Base Analysis Program (IDB analyzer) [IEA, 2017] was used to compute the effects indicated in Step 3. In Step 1 and Step 2, the effects were estimated using HLM6 (Raudenbush & Bryk, 2002). In HLM analyses, student-level variables were group-mean centered, while school-level variables were grand-mean centered, and the random intercept fixed slope method was used. In the analyses, gender, self-confidence, student SES, quality of mathematics teaching, and sense of school belonging were considered as control variables at the student level. Sampling weights in the TIMSS database were used both at school and student levels. Before the analyses, missing data were imputed with the SPSS expectation-maximization algorithm and the variables were standardized. In addition, before the mediation analysis, IDB Analyzer (IEA, 2017) was used to perform the descriptive statistics and correlations between the variables. Finally, to determine whether the mediation effects are statistically significant, the code calculating the Monte Carlo Confidence Intervals prepared by Preacher and Selig (2012) was used in R (R Development Core Team, 2017).

3. FINDINGS

Appendix 2 presents descriptive statistics (i.e., means, standard deviations, and associated standard errors) for the variables included in the analysis. We first examined the effects of school SES and school characteristics on student mathematics achievement. Then, we displayed

the relationships between school SES and school characteristics. Finally, we explained the mediating effects arising from these relationships.

3.1. Predicting Student Mathematics Achievement

As seen in Table 1, school SES effect on student mathematics achievement is positive and statistically significant in practically most of the educational systems, except for a few (China, Taiwan, Italy, Kazakhstan, Lebanon, Egypt, Russia, Thailand, and Oman). This effect is signified as the ***c*** coefficient in Table 1. However, in most of the educational systems, the initially positive association of school SES with mathematics achievement is reduced once school characteristics are accounted for. Also, the statistically significant positive school SES effect on student mathematics achievement disappears in Georgia, Kuwait and Norway. In Table 1, coefficient ***c'*** signifies the school SES effect on student mathematics achievement in the presence of the school characteristics. Concerning the proposed model, the sense of school belonging and school academic emphasis appear to be strong predictors of student mathematics achievement across some of the educational systems because of their effects (i.e., ***b*** coefficients in Table 1) considerably high and significant. However, discipline at school or the quality of mathematics teaching at school appears to be important factors for student mathematics achievement only in a few educational systems (e.g., Hungary and Kazakhstan). The last column of Table 1 shows the explained variance at school level when school SES and school characteristics simultaneously predicted student mathematics achievement in the multilevel regression analyses. On average, this value is 31% across educational systems.

Table 1. *The effect of school SES and school characteristics on mathematics achievement.*

	coef. *c*		coef. *c'*					
	Sc SES	R^2(%)	Sc SES	DS (b_1)	SSB (b_2)	SAE (b_3)	QMT (b_4)	R^2(%)
	β SE		*β* SE	*β* SE	*β* SE	*β* SE	*β* SE	
Australia	0.33 (0.03)***	32	0.17 (0.04)***	0.00 (0.03)	0.28 (0.04)***	0.05 (0.04)	-0.02 (0.03)	57
Bahrein	0.16 (0.07)*	6	0.13 (0.06)*	0.12 (0.04)**	0.21 (0.05)***	0.19 (0.05)***	-0.05 (0.06)	33
Botswana	0.30 (0.04)***	32	0.20 (0.04)***	0.03 (0.03)	0.05 (0.04)	0.26 (0.04)***	-0.02 (0.03)	54
Canada	0.16 (0.03)***	8	0.09 (0.03)**	0.01 (0.04)	0.17 (0.04)***	0.15 (0.04)***	0.00 (0.04)	25
Chile	0.43 (0.05)***	31	0.39 (0.05)***	0.09 (0.04)*	0.11(0.04)*	0.11 (0.07)	-0.06 (0.04)	40
China-Taiwan	0.20 (0.11)	-	0.14 (0.07)	0.11 (0.05)*	-0.04 (0.06)	0.24 (0.06)***	0.16 (0.06)*	42
Egypt	0.15 (0.08)	-	0.16 (0.07)	-0.01 (0.07)	0.02 (0.08)	0.01 (0.06)	0.05 (0.09)	-
England	0.40 (0.07)***	20	0.18 (0.08)*	-0.01 (0.06)	0.49 (0.07)***	0.07 (0.07)	-0.07 (0.07)	46
Georgia	0.12 (0.06)*	3	0.10 (0.07)	-0.02 (0.07)	0.13 (0.07)	-0.01 (0.07)	0.01 (0.07)	6
Hong Kong	0.34 (0.06)***	19	0.12 (0.05)*	0.02 (0.05)*	0.48 (0.05)***	0.08 (0.05)	-0.12 (0.05)*	52
Hungary	0.41 (0.06)***	32	0.31 (0.05)***	0.18 (0.06)**	0.10 (0.07)	0.08 (0.06)	-0.04 (0.08)	43
Iran	0.25 (0.05)***	16	0.19 (0.05)**	0.05 (0.04)	-0.14 (0.05)**	0.16 (0.06)*	0.03 (0.05)	25
Ireland	0.28 (0.06)***	21	0.15 (0.04)**	0.08 (0.05)	0.25 (0.07)***	0.03 (0.04)	-0.05 (0.04)	43
Israel	0.36 (0.05)***	28	0.32 (0.05)***	0.06 (0.05)	0.06 (0.05)	0.04 (0.06)	-0.06 (0.06)	23
Italy	0.08 (0.05)	-	0.06 (0.05)	0.03 (0.05)	0.02 (0.04)	0.02 (0.05)	-0.05 (0.05)	2
Japan	0.13 (0.04)***	11	0.11 (0.03)***	0.03 (0.04)	-0.05 (0.04)	0.13 (0.03)***	0.06 (0.03)*	24
Jordan	0.16 (0.05)**	10	0.12 (0.05)*	0.00 (0.04)	0.04 (0.04)	0.22 (0.04)***	0.01 (0.05)	27
Kazakhstan	0.13 (0.07)	-	0.11 (0.07)	0.07 (0.07)	-0.08 (0.09)	0.04 (0.05)	0.25 (0.09)**	11
Korea	0.25 (0.04)***	35	0.19 (0.03)***	-0.09 (0.03)**	0.11 (0.04)**	0.12 (0.03)***	-0.09 (0.03)**	51
Kuwait	0.020 (0.09)*	9	0.14 (0.08)	0.07 (0.08)	0.21 (0.08)*	0.11 (0.08)	-0.02 (0.09)	21
Lebanon	0.09 (0.07)	-	0.07 (0.06)	0.05 (0.05)	-0.10 (0.05)	0.22(0.05)***	0.10(0.06)	18

Table 1. *Continues*

Lithuania	0.21 (0.04)***	16	0.20 (0.04)***	0.09 (0.04)	-0.10 (0.05)*	0.00(0.04)	0.02(0.05)	20
Malaysia	0.29 (0.05)***	18	0.23 (0.05)***	0.07 (0.05)	-0.02 (0.07)	0.17 (0.05)**	0.14 (0.07)*	29
Malta	0.21 (0.06)**	17	0.13 (0.05)*	0.07 (0.06)	0.20 (0.04)***	0.14 (0.04)**	0.08 (0.04)*	62
Morocco	0.31 (0.03)***	37	0.22 (0.04)***	-0.01 (0.04)	-0.09 (0.04)*	0.10 (0.06)	0.08 (0.04)*	42
New Zealand	0.35 (0.04)***	44	0.28 (0.03)***	0.02 (0.04)	0.19 (0.07)**	0.07 (0.04)	0.00 (0.04)	57
Norway	0.11 (0.03)**	10	0.05 (0.03)	-0.02 (0.03)	0.11 (0.04)**	0.12 (0.03)***	-0.02 (0.04)	29
Oman	0.08 (0.05)	-	0.0 8(0.04)	0.06 (0.04)	0.07 (0.06)	0.00 (0.04)	0.09 (0.06)	-
Qatar	0.09 (0.04)*	1	0.16 (0.04)**	0.08 (0.04)	0.29 (0.07)***	0.05 (0.05)	0.10 (0.06)	28
Russia	0.02 (0.06)	-	0.02 (0.06)	0.10 (0.06)	0.06 (0.06)	0.17 (0.06)**	0.10 (0.07)	10
Singapore	0.42 (0.05)***	31	0.30 (0.06)***	0.04 (0.05)	0.24 (0.06)***	0.10 (0.05)*	0.05 (0.04)	47
Slovenia	0.08 (0.03)*	1	0.08 (0.03)*	0.02 (0.03)	0.02 (0.04)	0.12 (0.04)**	0.08 (0.05)	17
South Africa	0.35 (0.10)**	22	0.32 (0.10)**	0.19 (0.06)**	-0.01 (0.08)	0.02 (0.08)	-0.03 (0.07)	28
Sweden	0.28 (0.04)***	28	0.23 (0.06)***	0.01 (0.05)	0.10 (0.05)*	0.05 (0.06)	0.05 (0.04)	36
Thailand	0.14 (0.08)	-	0.13 (0.09)	0.04 (0.05)	0.16 (0.07)*	0.07 (0.06)	-0.13 (0.08)	14
Turkey	0.31 (0.08)***	23	0.21 (0.07)**	0.04 (0.05)	-0.03 (0.05)	0.21 (0.07)**	0.13 (0.05)*	40
UAE	0.20 (0.03)***	8	0.07 (0.03)*	0.05 (0.03)	0.21 (0.04)***	0.19 (0.03)***	0.07 (0.04)*	35
USA	0.32 (0.03)***	34	0.20 (0.03)***	-0.06 (0.05)	0.28 (0.04)***	0.09 (0.04)*	-0.02 (0.04)	46

***p<0.001; **p<0.01; *p<0.05; Sc SES: School SES; SSB: Sense of School Belonging; DS: Discipline at School; QMT: Quality of Mathematics Teaching at School; SAE: School Academic Emphasis; R^2: The variance explained at school level.

3.2. Predicting School Characteristics

Table 2 displays the school SES effect on school characteristics (i.e., coefficient ***a***). Evaluating interactions of school SES with school characteristics revealed that the school SES affects the school academic emphasis almost in all educational systems, confirming that the higher the school SES is, the higher the school academic emphasis is. However, a statistically significant relationship cannot be observable for Bahrein, Israel, Qatar, and Slovenia. In ten educational systems, there is a statistically significant positive relationship between school SES and the sense of school belonging, but a negative relation between school SES and sense of school belonging appears in Botswana, Morocco, South Africa, Qatar and Turkey. In these educational systems the higher the school SES is, the lower the sense of school belonging is. In twenty educational systems, a statistically significant and positive relation between school SES and discipline at school exists. Although the school SES interaction with other school characteristics is likely in the majority of educational systems, school SES can affect the quality of mathematics teaching at school positively only in Israel and the UAE, and negatively in South Africa, Qatar, and Thailand.

Table 2. *School SES effect on school characteristics.*

	coef. *a*			
	DS (a_1)	SSB (a_2)	SAE (a_3)	QMT (a_4)
	β SE	β SE	β SE	β SE
Australia	0.40 (0.06) ***	0.40 (0.09) ***	0.51 (0.06) ***	0.16 (0.07)
Bahrein	0.09 (0.10)	0.00 (0.08)	0.13 (0.08)	0.14 (0.10)
Botswana	0.31 (0.07) ***	-0.16 (0.08) *	0.38 (0.07) ***	0.08 (0.08)
Canada	0.19 (0.09) *	0.00 (0.08)	0.45 (0.06) ***	-0.13 (0.06)
Chile	0.11 (0.08) ***	-0.08 (0.08)	0.26 (0.08) ***	-0.04 (0.08)
China-Taiwan	0.12 (0.15)	-0.05 (0.18)	0.40 (0.11) ***	-0.21 (0.13)
Egypt	-0.01 (0.10)	-0.20 (0.08)	0.46 (0.08) ***	-0.14 (0.09)
England	0.20 (0.09) *	0.39 (0.06) ***	0.54 (0.07) ***	0.21 (0.09)
Georgia	-0.13 (0.13)	0.05 (0.14)	0.31 (0.07) ***	0.03 (0.11)
Hong Kong	0.23 (0.07) ***	0.36 (0.09) ***	0.56 (0.06) ***	0.02 (0.10)
Hungary	0.25(0.09) ***	0.11 (0.10) *	0.50 (0.08) ***	-0.10 (0.10)
Iran	-0.10 (0.09)	-0.19 (0.09)	0.23 (0.09) ***	-0.07 (0.07)
Ireland	0.26 (0.09) *	0.41 (0.09) ***	0.43 (0.07) ***	0.17 (0.09)
Israel	0.34 (0.07) ***	0.02 (0.08)	0.42 (0.06) ***	-0.03 (0.08)
Italy	0.12 (0.14)	0.11 (0.09)	0.21 (0.07) **	-0.19 (0.09)
Japan	0.15 (0.12) *	0.24 (0.17) *	0.25 (0.13) **	0.02 (0.21)
Jordan	-0.02 (0.10)	-0.01 (0.10)	0.21 (0.09) ***	-0.03 (0.08)
Kazakhstan	-0.14 (0.07)	0.04 (0.10)	0.07 (0.08) *	0.15 (0.09)
Korea	-0.11 (0.09)	0.02 (0.17)	0.27 (0.12) **	-0.22 (0.17)
Kuwait	0.25 (0.10) *	0.03 (0.11)	0.38 (0.11) **	0.00 (0.12)
Lebanon	-0.05 (0.14)	0.01 (0.08)	0.14 (0.12) **	-0.02 (0.09)
Lithuania	0.06 (0.10)	-0.07 (0.09)	0.06 (0.10) *	-0.14 (0.10)
Malaysia	0.12 (0.09) **	-0.03 (0.07)	0.34 (0.08) ***	-0.01 (0.07)
Malta	0.18 (0.20)	0.11 (0.14)	0.22 (0.15)	0.25 (0.15)
Morocco	0.20 (0.08) *	-0.18 (0.12) *	0.64 (0.07) *	0.09 (0.07)
New Zealand	0.37 (0.06) ***	0.17 (0.11)	0.51 (0.07) ***	-0.04 (0.09)
Norway	0.10 (0.10)	0.37 (0.11) ***	0.27 (0.12) *	0.25 (0.14)
Oman	0.06 (0.07)	-0.01 (0.06)	0.09 (0.07) *	0.04 (0.07)
Qatar	0.08 (0.01)	-0.21 (0.09) *	0.13 (0.09)	-0.20 (0.09) *
Russia	-0.03 (0.10)	-0.14 (0.10)	0.20 (0.08) **	-0.15 (0.08)
Singapore	0.16 (0.08) *	0.30 (0.08) ***	0.42 (0.06) ***	0.02 (0.08)
Slovenia	0.07 (0.08)	-0.04 (0.10)	0.05 (0.11)	-0.11 (0.07)
South Africa	0.09 (0.14) ***	-0.20 (0.07) **	0.19 (0.12) ***	-0.08 (0.10) **
Sweden	0.39 (0.08) ***	0.23 (0.09)	0.45 (0.07) ***	-0.11 (0.08)
Thailand	0.06 (0.10) **	-0.14 (0.11)	0.08 (0.09) ***	-0.23 (0.08) ***
Turkey	0.11 (0.10)	-0.29 (0.09) ***	0.37 (0.11) ***	0.00 (0.08)
UAE	0.12 (0.05) **	0.34 (0.04) ***	0.23 (0.05) ***	0.11 (0.05) *
USA	0.45 (0.09) ***	0.49 (0.08) ***	0.51 (0.06) ***	0.23 (0.09)

***p<0.001; **p<0.01; *p<0.05. SSB: Sense of School Belonging; DS: Discipline at School; QMT: Quality of Mathematics Teaching at School; SAE: School Academic Emphasis.

3.3. Test of Multiple Mediation

Table 3 depicts statistically significant values and confidence intervals regarding the mediating role of school characteristics between the school SES and student mathematics achievement. As seen in Table 3, the mediating effect of sense of school belonging between school SES and student mathematics achievement in seven educational systems (Australia, England, Hong Kong, Norway, Singapore, The UAE and the USA) is statistically significant and positive. However, in Qatar, the statistically significant mediating role of sense of school belonging is negative. In nine educational systems (Botswana, Canada, Iran, Jordan, Korea, Malaysia, Norway, Turkey, and the USA) the school academic emphasis between school SES and mathematics achievement has a statistically significant and positive mediating role. The mediating effect of discipline at school between the relation on school SES and mathematics achievement is, only in Hungary, found statistically significant and positive. In none of the educational systems, the quality of mathematics teaching at school has no mediating role between the school SES and student mathematics achievement.

Table 3. *The mediating role of school characteristics.*

	Mediating Effects					
	DS ($a_1.b_1$)	SSB ($a_2.b_2$)	SAE ($a_3.b_3$)	QMT ($a_4.b_4$)	Total (c-c')	Confidence Interval (c-c')
Australia		0.11**			0.11**	(0.044-0.200)
Botswana			0.10**		0.10**	(0.045-0.167)
Canada			0.07*		0.07**	(0.020-0.125)
England		0.20**			0.20**	(0.099-0.308)
Hong Kong	0.01	0.17**			0.18**	(0.059-0.309)
Hungary	0.05*				0.05*	(0.009-0.096)
Iran			0.03*		0.03*	(0.004-0.084)
Ireland		0.10**			0.10**	(0,022-0,213)
Jordan			0.05*		0.05*	(0.007-0.093)
Korea			0.03*		0.03*	(0.004-0.070)
Malaysia			0.06**			(0.011-0.125)
Norway		0.04**	0.03*		0.07**	(0.015-0.153)
Qatar		-0.06*			-0.06*	(-0.127; -0.009)
Singapore		0.07**	0.04		0.11**	(0.039-0.202)
Turkey			0.08**		0.08**	(0.007-0.193)
UAE		0.07**	0.04	0.01	0.12**	(0.076-0.178)
USA		0.10**	0.04*		0.14**	(0.094-0.288)

**p<0.01; * **p<0.05. SSB: Sense of School Belonging; DS: Discipline at School; QMT: Quality of Mathematics Teaching at School; SAE: School Academic Emphasis.

4. DISCUSSION and CONCLUSION

In this study, we examined the mediating role of school characteristics between school SES and student mathematics achievement across educational systems. Results showed that effects of school SES vary across the participating countries in TIMSS 2015 and part of school SES effects on student mathematics achievement can be explained by school characteristics. Also, the test of mediation revealed that the school academic emphasis and sense of school belonging were the variables that might have the potential to transmit the effect of school SES on student mathematics achievement.

4.1. Predicting Mathematics Achievement

The finding on the effect of school SES on mathematics achievement is consistent with the work of Chmielewski (2019), which states that inequity resulting from school SES does not decrease and continues to exist in many countries. Previous studies suggested that the school SES might be less influencing on achievement within centralized educational systems, implementing a standard curriculum with central exams (Broer et al., 2019). In this study, results regarding some educational systems are in line with this view, such as Italy and Lebanon. However, although the educational system in Norway has a decentralized organization, the results regarding Norway does not support the relationship between school SES and mathematics achievement. Besides, results also show that the statistically significant positive relationship between school SES and achievement may exist in both centralized (e.g., Turkey) and decentralized (e.g., Korea, Sweden, and the USA) education systems. This situation signifies that the inequity in educational systems may not be explained only by a decentralized education system.

Concerning the effects of school characteristics on mathematics achievement, we found a positive significant effect of school academic emphasis in eighteen educational systems. This result confirms that students attending schools where they are encouraged to do their best with higher academic expectations might have a higher mathematics achievement in line with previous research (Akyuz 2014; Brault et al., 2014; Hoy et al., 2006; Nilsen & Gustafsson, 2014; Nilsen et al., 2016).

For the sense of school belonging, the effect was significant and positive in eighteen educational systems. This result is in line with the studies stating that students with a higher sense of belonging towards the school's social and academic structure might have higher mathematics achievement (Hoy et al., 2006; Nilsen & Gustafsson, 2014; Wang & Degol, 2016). Lei et al. (2016) claim that the relationship between the sense of school belonging and achievement might culturally be dependent and is higher in Western educational systems. The present study does not make a clear-cut distinction but confirms that this relationship is observed more in Western educational systems (England, Ireland, and the USA) and Western-dominated educational systems (Hong Kong, Singapore, Qatar and the UAE).

For the discipline at school, in most of the educational systems, the results are in line with the work of Ma and Wilkins (2002), who stated that discipline at school might not be a predictor of achievement when variables such as school academic emphasis and school SES were considered. However, there were some exceptions in which this effect was statistically significant. We found a statistically significant positive effect of discipline at school on student mathematics achievement in five educational systems (Bahreyn, Chile, Hong Kong, Hungary and South Africa), revealing that students perform better in mathematics in a safe and peaceful school climate with fewer discipline problems (McCoy et al., 2013; Nilsen & Gustafsson, 2014). Another exception was Korea, in which this effect was negative. In Korea, the disciplinary climate of schools might not have satisfied the expectations of secondary level students with higher mathematics achievement. This finding, however, was contrary to those

of Shin et al. (2009), whose research findings indicated a positive relationship between school discipline and Korean students' PISA mathematics achievement.

Similarly, we did not observe a significant effect of the quality of mathematics teaching at school on student mathematics achievement in most of the educational systems. The exceptions in which this effect is positively significant are China-Taiwan, Japan, Kazakhstan, Malaysia, Malta, Morocco, Turkey, and the UAE. This finding supports the view that the quality of mathematics teaching is a key factor influencing student achievement at least in some of the countries (Baumert et al., 2010; Klieme et al., 2009). Other exceptions in which this effect is negatively significant are Hong Kong and Korea. The explanation of this negative effect might be the negative responses of students with a higher level of performance in mathematics. In these countries, students with higher mathematics performance may have higher teaching expectations from their schools and the schools may not satisfy these expectations.

4.2. Predicting School Characteristics

The effect of the school SES on the school characteristics differed across educational systems. With regard to the effect of school SES on discipline at school, we found a statistically significant positive effect in twenty-one educational systems. As stated by Brantlinger (2003), the reason of this positive effect might be attributable to the safe and ordered school climate demands of both students and their families in high SES schools. This result is also in line with the view that low SES schools have more disciplinary problems than those of the high SES schools (Bryk & Schneider, 2002; Thapa et al., 2013).

Similarly, we observed a positive effect of school SES on school academic emphasis in most of the educational systems, revealing that high SES schools have a high academic emphasis on achievement (Dumay & Dupriez, 2008; Nilsen & Gustafsson, 2014; Opdenakker & Van Damme, 2001). Bahrein, Israel, Malta, Slovenia and Qatar were the exceptions, where this effect was not statistically significant.

For the sense of school belonging, the effect of school SES was statistically significant in fifteen educational systems. The educational systems where the relation between school SES and sense of school belonging was positiveare mostly the developed countries such as Hong Kong, Japan, Singapore, and the USA. This result implies that schools in these countries might have more resources to connect students with high SES socially and emotionally to their schools. However, this effect was negative in Botswana, Morocco, South Africa, Qatar and Turkey. In this group of developing and low achieving countries, in contrast, schools might not have enough resources to fulfill expectations of students with high SES. Another explanation of this negative effect might be the negative rate of students with high SES due to their more critical perspectives towards their schools (Atlay et al., 2019).

In addition, we did not observe a statistically significant relationship between school SES and the quality of mathematics teaching at school across educational systems, with few exceptions. The effect of school SES on the quality of mathematics teaching at school was statistically significant and positive in Israel and the UAE, revealing that the quality of mathematics teaching in high SES schools is better than low SES schools. This effect was negative in Qatar, South Africa, and Thailand. Quality of teaching at school might be another school characteristics that students with high SES rate negatively due to their sense of entitlement (Atlay et al., 2019).

4.3. Mediating Role of School Characteristics

Previous research reported that school SES has an indirect effect on mathematics (Hoy et al., 2006) or science (Nilsen & Gustafsson, 2014) achievement through school academic emphasis. In this study, the finding of the mediating role of school academic emphasis between school SES and mathematics achievement in Botswana, Canada, Iran, Jordan, Korea, Malaysia,

Norway, Turkey, and the USA is consistent with the previous research. Similarly, in this study, findings show that the sense of school belonging is another school characteristics that has the potential to mediate the relationship between school SES and student mathematics achievement in Australia, England, Hong Kong, Ireland, Norway, Singapore, and the USA. It seems that high SES schools in this group of educational systems might influence mathematics achievement by creating a healthy school environment and a sense of school belonging. However, the mediating role of the sense of school belonging in Qatar is unexpectedly negative, possibly due to negative ratings to items related to school belonging in high SES schools. These results show that the mechanism of school SES and achievement relationship differ across educational systems.

In their studies, Nielsen and Gustafsson (2014) stated that school academic emphasis has a mediating role in the relation between SES and science achievement in Norway. Combined with the current findings it appears that both school academic emphasis and sense of school belonging may have a mediating role on the relationship between school SES and mathematics achievement in Norway.

Previous research also stated that school disciplinary climate might have a mediating role between school SES and achievement (Berkowitz et al., 2015; Nilsen & Gustafsson, 2014; Liu et al., 2015). However, we observed only in Hungary, a small but statistically significant mediating role of discipline at school between school SES and mathematics achievement. Although school SES positively affects discipline at school in most of the countries, it seems that school SES does not influence student mathematics achievement through discipline at school. This finding shows the importance of examining the joint effects of school characteristics on student mathematics achievement.

In addition, in none of the educational systems, the results of this study did not support the view that mathematics teaching in high SES schools is more qualified, and thus students tend to have higher levels of achievement. This finding is similar to that of Hansen and Strietholt (2018), whose research findings suggested that the mediating role of quality of mathematics teaching, between SES (both in student and school levels) and mathematics achievement, may not be statistically significant in the presence of student self-confidence. Also, several studies showed that the quantity of instruction has a mediating role on the relation between school SES and achievement (Hansen & Strietholt, 2018; Rjosk et al., 2014; Schmidt et al., 2015). Combined with the current findings, it appears that the quality of instruction does not mediate the relationship of school SES and achievement as the quantity of instruction does. However, the mediating effects of quantity and quality of instruction should be detailed further by controlling the effect of student self-confidence.

The present study has some limitations. First, measurement of school characteristics is based on principal's or students' self-report measures. Studies considering observational data may strengthen the relationships found in this study. Second, the data used in this study are cross-sectional. Therefore, we cannot indicate definite causal conclusions. Third, the relations were examined in the mathematics domain, and the results might differ for other subjects.

In conclusion, we were able to find that the sense of school belonging and school academic emphasis might be two meaningful mediators accounting for the mechanism of school SES in some educational systems. Analyses suggest that the disadvantages of being a student in low SES schools might be alleviated if the sense of school belonging in low SES schools could be increased in Australia, England, Hong Kong, Norway, Singapore, the UAE, and the USA. This result emphasizes the importance of principals and teachers who are aware of the student needs such as the feeling of welcomed, respected, and supported by others in the school social environment. As students having a sense of school belonging are successful in mathematics, creating school environments to enhance students' feeling of a member of school/classroom life

would be helpful to eliminate the negative effects of low SES. Similarly, analyses also suggest the need to give importance to academic emphasis in low SES schools to decrease the relationship between school SES and mathematics achievement in Botswana, Canada, Iran, Jordan, Korea, Malaysia, Norway, Turkey, and the USA. It seems that building a learning community that gives importance to academic achievement in low SES schools would improve the quality of student learning. Parents, teachers, and students are the members of the community who determine the school's emphasis on academic success. The notable involvement of these community members with a shared vision would contribute to reducing school SES effects. For example, parents, teachers, and students may benefit from parental engagement. When parents are engaged in education, they might have better contact with the teachers. In low SES schools, parents' and teachers' shared responsibility for encouraging learning may increase students' motivation to learn.

Declaration of Conflicting Interests and Ethics

The authors declare no conflict of interest. This research study complies with research publishing ethics. The scientific and legal responsibility for manuscripts published in IJATE belongs to the authors.

Authorship Contribution Statement

Ozlem Albayrakoglu: Investigation, Resources, Visualization, Software, Formal Analysis, and Writing - original draft. **Selda Yildirim**: Investigation, Resources, Methodology, Formal Analysis, Writing -original draft, Supervision, and Validation.

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REFERENCES

Akyuz, G. (2014). The effects of student and school factors on mathematics achievement in TIMSS 2011. *Egitim ve Bilim*, *39*(172), 150-162.

Armor, D.J., Cotla, C.R., & Stratmann, T. (2017). Spurious relationships arising from aggregate variables in linear regression. *Quality and Quantity*, *51*(3), 1359-1379.

Atlay, C., Tieben, N., Fauth, B., & Hillmert, S. (2019). The role of socioeconomic background and prior achievement for students' perception of teacher support. *British Journal of Sociology of Education*, *40*(7), 970-991.

Bauer, D.J., Preacher, K.J., & Gil, K.M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: new procedures and recommendations. *Psychological Methods*, *11*(2), 142-163.

Baumert, J., Kunter, M., Blum, W., Brunner, M., Voss, T., Jordan, A., & Tsai, Y.M. (2010). Teachers' mathematical knowledge, cognitive activation in the classroom, and student progress. *American Educational Research Journal*, *47*(1), 133–180.

Berkowitz, R., Glickman, H., Benbenishty, R., Ben-Artzi, E., Raz, T., Lipshtadt, N., & Astor, R.A. (2015). Compensating, mediating, and moderating effects of school climate on academic achievement gaps in Israel. *Teachers College Rec.*, *117*, article no: 070308, 1-34.

Berkowitz, R., Moore, H., Astor, R.A., & Benbenishty, R. (2017). A research synthesis of the associations between socioeconomic background, inequity, school climate, and academic achievement. *Review of Educational Research*, *87*(2), 425-469.

Boonen, T., Pinxten, M., Van Damme, J., & Onghena, P. (2014). Should schools be optimistic? An investigation of the association between academic optimism of schools and student achievement in primary education. *Educational Research and Evaluation*, *20*, 3–24.

Borman, G., & Dowling, M. (2010). Schools and inequality: A multilevel analysis of Coleman's equality of educational opportunity data. *Teachers College Record*, *112*(5), 1201-1246.

Brantlinger, E.A. (2003). *Dividing classes: How the middle class negotiates and rationalizes school advantage.* Routledge Falmer.

Brault, M.C., Janosz, M., & Archambault, I. (2014). Effects of school composition and school climate on teacher expectations of students: A multilevel analysis. *Teaching and Teacher Education*, *44*, 148-159.

Broer, M., Bai, Y., & Fonseca, F. (2019). A Review of the Literature on Socioeconomic Status and Educational Achievement. In Socioeconomic *Inequality and Educational Outcomes* (pp. 7-17). Springer, Cham.

Brophy, J., & Good, T.L. (1986). *Teacher behavior and student achievement.* In M. C. Wittrock (Ed.), *Handbook of Research on Teaching* (3rd ed., pp. 328–375). Macmillan.

Bryk, A., & Schneider, B. (2002). *Trust in schools: A core resource for improvement*. Russell Sage Foundation.

Chmielewski, A.K. (2019). The global increase in the socioeconomic achievement gap, 1964 to 2015. *American Sociological Review*, *84*(3), 517-544. https://doi.org/10.1177/0003122419847165

Contini, D., DiTommaso, M.L., & Mendolia, S. (2017). The gender gap in mathematics achievement: Evidence from Italian data. *Economics of Education Review*, *58*, 32-42.

Driessen, G. (2002). School composition and achievement in primary education: A large scale multilevel approach. *Studies in Educational Evaluation*, *28*, 347-368.

Dumay, X., & Dupriez, V. (2008). Does the school composition effect matter? Evidence from Belgian data. *British Journal of Educational Studies*, *56*, 440-477. http://dx.doi.org/10.1111/j.1467-8527.2008.00418.x

Eriksson, K., Helenius, O., & Ryve, A. (2019). Using TIMSS items to evaluate the effectiveness of different instructional practices. *Instructional Science*, *47*(1), 1-18.

Goodenow, C. (1993). The psychological sense of school membership among adolescents: Scale development and educational correlates. *Psychology in the Schools*, *30*(1), 79-90.

Gustafsson, J.E., Nilsen, T., & Hansen, K.Y. (2016). School characteristics moderating the relation between student socio-economic status and mathematics achievement in grade 8. Evidence from 50 countries in TIMSS 2011. *Studies in Educational Evaluation*, *57*, 16-30.

Hansen, K.Y., & Strietholt, R. (2018). Does schooling actually perpetuate educational inequality in mathematics performance? A validity question on the measures of opportunity to learn in PISA. *ZDM*, 1-16.

Hoy, W.K., Tarter, C.J., & Hoy, A.W. (2006). Academic optimism of schools: A force for student achievement. *American Educational Research Journal*, *43*(3), 425-446.

Hoy, W. (2012). School characteristics that make a difference for the achievement of all students: A 40-year odyssey. *Journal of Educational Administration*, *50*(1), 76-97.

International Association for the Evaluation of Educational Achievement. (2017). *IDB Analyzer (version 4.0)*. IEA Hamburg. http://www.iea.nl/data.html

Ker, H.W. (2016). The impacts of student- teacher and school-level factors on mathematics achievement: an exploratory comparative investigation of Singaporean students and the USA students. *Educational Psychology*, *36*(2), 254-276. https://doi.org/10.1080/01443410.2015.1026801

Klieme, E., Pauli, C., & Reusser, K. (2009). The Pythagoras study: Investigating effects of teaching and learning in Swiss and German Classrooms, in T. Janik, & T. Seidel (Eds.). *The power of video studies in investigating teaching and learning in the classroom*, pp. 137–160. Waxmann Verlag.

Krull, J.L., & MacKinnon, D.P. (2001). Multilevel modeling of individual and group level mediated effects. *Multivariate Behavioral Research,36*, 249-277.

Lei, H., Cui, Y. & M.M. Chiu. 2016. Affective teacher-student relationships and students 'externalizing behavior problems: A meta-analysis. *Frontiers in Psychology, 7*, 1-12. https://doi.org/10.3389/fpsyg.2016.01311

Liu, H., Van Damme, J., Gielen, S., & Van Den Noortgate, W. (2015). School processes mediate school compositional effects: model specification and estimation. *British Educational Research Journal*, *41*(3), 423-447.

Ma, X., & Wilkins, J.L. (2002). The development of science achievement in middle and high school: individual differences and school effects. *Evaluation Review, 26*, 395-417.

Martin, M.O., Mullis, I.V.S., & Hooper, M. (Eds.). (2016). *Methods and Procedures in TIMSS 2015*.TIMSS and PIRLS International Study Center Boston College. http://timss.bc.edu/publications/timss/2015-methods.html

McCoy, D.C., Roy, A.L., & Sirkman, G.M. (2013). Neighborhood crime and school climate as predictors of elementary school academic quality: A cross-lagged panel analysis. *American Journal of Community Psychology*, *52*, 128–140. https://doi.org/10.1007/s10464-013-9583-5

Mullis, I.V.S., Martin, M.O., Foy, P., & Arora, A. (2011). *TIMSS 2011 International Results in Mathematics*. Boston College, TIMSS & PIRLS International Study Center, https://timssandpirls.bc.edu/timss2011/international-results-mathematics.html

Mullis, I.V.S., Martin, M.O., Foy, P., & Hooper, M. (2016). *TIMSS 2015 International Results in Mathematics*. Boston College, TIMSS and PIRLS International Study Center. http://timssandpirls.bc.edu/timss2015/international-results/

National Council of Teachers of Mathematics [NCTM] (2000). *Principles and standards for school mathematics*. Author.Reston.VA.

Munk, T. (2007). *Full-school engagement as a mediator of ethnic and economic composition effects on grade 8 mathematics test scores: a two-level structural equation model.* [Unpublished doctoral dissertation]. https://doi.org/10.17615/8n2x-6s56

Nilsen, T., Blömeke, S., Hansen, K.Y., & Gustafsson, J.E. (2016). Are school characteristics related to equity? The answer may depend on a country's developmental level. *International Association for the Evaluation of Educational Achievement*. Policy Brief No. 10.

Nilsen, T., & Gustafsson, J.E. (2014). School emphasis on academic success: Exploring changes in science performance in Norway between 2007 and 2011 employing two-level SEM. *Educational Research and Evaluation*, *20*(4), 308-327.

Opdenakker, M.C., &Van Damme, J. (2001). Relationship between school composition and characteristics of school process and their effect on mathematics achievement. *British Educational Research Journal*, *27*(4), 407-432.

Olmez, I.B. (2020). Modeling mathematics achievement using hierarchical linear models. *Elementary Education Online*, *19*(2), 944-957. https://doi:10.17051/ilkonline.2020.695837

Perry, L.B., & McConney, A. (2010). Does the SES of the school matter? An examination of socioeconomic status and student achievement using PISA 2003. *Teachers College Record*, *112*(4), 1137-1162.

Preacher, K.J., & Selig, J.P. (2012). Advantages of Monte Carlo confidence intervals for indirect effects. *Communication Methods and Measures*, *6*(2), 77-98.

R Development Core Team (2017). *R: A language and environment for statistical computing*. The R foundation of statistical computing.

Raudenbush, S.W., & Bryk, A.S. (2002). *Hierarchical Linear Models: Applications and Data Analysis Methods*. Sage.

Rjosk, C., Richter, D., Hochweber, J., Lüdtke, O., Klieme, E., & Stanat, P. (2014). Socioeconomic and language minority classroom composition and individual reading achievement: The mediating role of instructional quality. *Learning and Instruction*, *32*, 63-72.

Rumberger, R. W., & Palardy, G. J. (2005). Does segregation still matter? The impact of student composition on academic achievement in high school. *Teachers' College Record*, *107*(9), 1999-2045.

Schmidt, W.H., Burroughs, N.A., Zoido, P., & Houang, R.T. (2015). The role of schooling in perpetuating educational inequality: An international perspective. *Educational Researcher*, *44*(7), 371-386.

Shin, J., Lee, H., & Kim, Y. (2009). Student and school factors affecting mathematics achievement: International comparisons between Korea, Japan and the USA. *School Psychology International*, *30*(5), 520-537.

Sirin, S.R. (2005). Socioeconomic status and academic achievement: A meta-analysis. *Review of Educational Research*, *75*(3), 417–453.

Thapa, A., Cohen, J., Guffey, S., & Higgins-D'Alessandro, A. (2013). A review of school climate research. *Review of Educational Research*, *83*(3), 357-385.

Thrupp, M., Lauder, H., & Robinson, T. (2002). School composition and peer effects. *International Journal of Educational Research*, *37*(5), 483-504.

Wang, Z., Osterlind, S.J., & Bergin, D.A. (2012). Building mathematics achievement models in four countries using TIMSS 2003. *International Journal of Science and Mathematics Education,10*(5), 1215-1242.

Wang, M.T., & Degol, J.L. (2016). School climate: A review of the construct, measurement, and impact on student outcomes. *Educational Psychology Review*, *28*(2), 315-352.

Wu, M. (2004). Plausible values. *Rasch Measurement Transactions*, *18*(2), 976-978.

Wu, J.H., Hoy, W.K., & Tarter, C.J. (2013). Enabling school structure, collective responsibility, and a culture of academic optimism. *Journal of Educational Administration*, *51*(2), 176-193.

Yavuz, H.C., Demirtasli, R.N., Yalcin, S., & Dibek, M.I. (2017). The effects of student and teacher level variables on TIMSS 2007 and 2011 mathematics achievement of Turkish students. *Education and Science, 42*(189), 27-47.

Zhang, Z., Zyphur, M.J., & Preacher, K.J. (2009). Testing multilevel mediation using hierarchical linear models: Problems and solutions. *Organizational Research Methods*, *12*(4), 695-719.

APPENDIX

Appendix 1. *Distribution of students and schools participating in TIMSS 2015 by country.*

	Student N	School N		Student N	School N
Australia	10.338	285	Kuwait	4.503	168
Bahrein	4.918	105	Lebanon	3.873	138
Botswana	5.964	159	Lithuania	4.347	208
Canada	8.757	276	Malaysia	9.726	207
Chile	4.849	171	Malta	3.817	48
China-Taiwan	5.711	190	Morocco	13.035	100
Egypt	7.822	211	New Zealand	8.142	145
England	4.814	143	Norway	4.697	143
Georgia	4.035	153	Oman	8.883	301
Hong Kong	4.155	133	Qatar	5.403	131
Hungary	4.893	144	Russia	4.87	204
Iran	6.13	250	Singapore	6.116	167
Ireland	4.704	149	Slovenia	4.257	148
Israel	5.223	189	South Africa	12.514	292
Italy	4.481	161	Sweden	4.09	150
Japan	4.745	147	Thailand	6.482	204
Jordan	7.865	252	Turkey	6.079	218
Kazakhstan	4.887	172	USA	10.221	246
Korea	5.309	150	UAE	18.012	477

Appendix 2. *Descriptive Statistics about Countries Participating in TIMSS 2015 Assessment*.

Student Level Descriptive Statistics												
	Student Gender		Confidence in Mathematics Learning		Student SES		Sense of School Belonging		Quality of Mathematics Teaching		TIMSS 2015 Mathematics Achievement	
	$\bar{X}$ SE	SD SE	$\bar{X}$ SE	SD SE	$\bar{X}$ SE	SD SE	$\bar{X}$ SE	SD SE	$\bar{X}$ SE	SD SE	$\bar{X}$ SE	SD SE
USA	1.50(0.01)	0.50(0.00)	1.81(0.01)	0.75(0.00)	2.15(0.01)	0.51(0.00)	2.23(0.01)	0.67(0.00)	2.22(0.02)	0.76(0.01)	518.30(3.08)	83.3(1.58)
Australia	1.49(0.02)	0.50(0.00)	1.72(0.01)	0.70(0.01)	2.19(0.01)	0.48(0.01)	2.29(0.01)	0.65(0.01)	2.09(0.02)	0.75(0.01)	504.96(3.1)	82.36(1.89)
UAE	1.50(0.03)	0.50(0.00)	1.83(0.01)	0.69(0.00)	2.01(0.01)	0.47(0.01)	2.02(0.01)	0.75(0.01)	2.31(0.01)	0.70(0.01)	464.78(2.0)	97.9(1.51)
Bahrein	1.52(0.01)	0.50(0.00)	1.72(0.01)	0.70(0.01)	1.95(0.01)	0.46(0.01)	2.28(0.02)	0.66(0.01)	2.22(0.03)	0.76(0.01)	453.95(1.44)	80.33(1.41)
Botswana	1.49(0.01)	0.54(0.00)	1.61(0.01)	0.62(0.01)	1.55(0.01)	0.54(0.00)	2.47(0.01)	0.59(0.01)	2.49(0.02)	0.66(0.01)	390.84(2.04)	83.40(1.13)
China-Taiwan	1.51(0.01)	0.50(0.00)	1.49(0.01)	0.66(0.01)	2.03(0.01)	0.52(0.01)	2.17(0.01)	0.58(0.01)	1.98(0.03)	0.69(0.01)	599.11(2.42)	97.18(1.69)
Morocco	1.54(0.01)	0.50(0.00)	1.68(0.01)	0.63(0.00)	1.47(0.01)	0.53(0.00)	2.70(0.01)	0.51(0.01)	2.52(0.02)	0.66(0.01)	384.39(2.25)	80.05(1.27)
South Africa	1.49(0.01)	0.50(0.00)	1.62(0.01)	0.65(0.01)	1.71(0.01)	0.51(0.01)	2.56(0.01)	0.57(0.01)	2.52(0.02)	0.64(0.01)	372.37(4.53)	87.07(3.02)
Georgia	1.53(0.01)	0.50(0.00)	1.67(0.02)	0.68(0.01)	2.16(0.01)	0.52(0.01)	2.38(0.01)	0.58(0.01)	2.44(0.02)	0.63(0.01)	453.20(3.44)	91.96(1.71)
Hong Kong	1.53(0.02)	0.50(0.00)	1.56(0.01)	0.67(0.01)	1.97(0.02)	0.51(0.01)	2.16(0.02)	0.65(0.01)	2.02(0.03)	0.71(0.01)	594.25(4.62)	78.41(2.80)
UK	1.49(0.02)	0.50(0.00)	1.80(0.02)	0.67(0.01)	2.14(0.01)	0.46(0.01)	2.24(0.02)	0.62(0.01)	2.18(0.03)	0.73(0.01)	518.26(4.17)	79.84(2.62)
Iran	1.52(0.01)	0.50(0.00)	1.74(0.02)	0.72(0.01)	1.73(0.02)	0.61(0.01)	2.38(0.02)	0.61(0.01)	2.43(0.02)	0.69(0.01)	436.35(4.64)	94.08(2.73)
Ireland	1.50(0.01)	0.50(0.00)	1.73(0.02)	0.71(0.01)	2.15(0.01)	0.48(0.01)	2.32(0.02)	0.64(0.01)	2.15(0.02)	0.75(0.01)	523.49(2.73)	73.95(2.31)
Israel	1.51(0.01)	0.50(0.00)	1.92(0.02)	0.74(0.01)	2.06(0.01)	0.39(0.01)	2.38(0.02)	0.66(0.01)	2.25(0.02)	0.76(0.01)	510.90(4.10)	102.01(2.32)
Sweden	1.52(0.01)	0.50(0.00)	1.76(0.02)	0.73(0.01)	2.19(0.01)	0.47(0.01)	2.25(0.02)	0.61(0.01)	2.10(0.03)	0.70(0.01)	500.72(2.76)	71.96(1.89)
Italy	1.51(0.00)	0.50(0.01)	1.75(0.01)	0.75(0.02)	1.97(0.01)	0.52(0.02)	2.16(0.01)	0.60(0.01)	2.13(0.01)	0.69(0.02)	494.39(1.75)	74.54(2.52)
Japan	1.49(0.01)	0.50(0.00)	1.41(0.01)	0.58(0.01)	2.16(0.01)	0.45(0.01)	2.14(0.02)	0.62(0.01)	1.70(0.02)	0.64(0.01)	586.47(2.27)	88.90(1.28)
Canada	1.49(0.01)	0.50(0.00)	1.92(0.01)	0.75(0.01)	2.19(0.01)	0.44(0.01)	2.37(0.01)	0.61(0.01)	2.32(0.02)	0.69(0.01)	527.28(2.15)	69.76(1.27)
Qatar	1.50(0.03)	0.50(0.00)	1.7680.01)	0.69(0.01)	2.05(0.01)	0.46(0.01)	2.23(0.02)	0.75(0.01)	2.23(0.02)	0.75(0.01)	437.11(2.99)	102.22(2.20)
Kazakhstan	1.51(0.01)	0.50(0.00)	1.86(0.02)	0.64(0.01)	2.00(0.02)	0.46(0.01)	2.64(0.01)	0.50(0.01)	2.45(0.02)	0.57(0.01)	527.81(5.28)	93.23(2.26)
Korea	1.53(0.01)	0.50(0.00)	1.53(0.01)	0.63(0.01)	2.35(0.01)	0.53(0.00)	2.17(0.01)	0.53(0.01)	1.67(0.02)	0.61(0.01)	605.74(2.60)	85.29(1.07)
Kuwait	1.50(0.03)	0.50(0.00)	1.78(0.02)	0.67(0.01)	1.92(0.01)	0.40(0.01)	2.45(0.02)	0.61(0.01)	2.35(0.02)	0.69(0.01)	392.47(4.65)	91.07(3.33)
Lithuania	1.50(0.01)	0.50(0.00)	1.75(0.02)	0.70(0.01)	2.09(0.01)	0.43(0.01)	2.30(0.02)	0.60(0.01)	2.22(0.03)	0.71(0.01)	511.31(2.77)	77.32(1.53)
Lebanon	1.47(0.02)	0.50(0.00)	1.79(0.02)	0.69(0.01)	1.87(0.01)	0.50(0.01)	2.45(0.01)	0.63(0.01)	2.52(0.02)	0.68(0.01)	442.43(3.63)	75.26(1.72)
Hungary	1.50(0.01)	0.50(0.00)	1.77(0.02)	0.74(0.01)	2.15(0.02)	0.52(0.01)	2.17(0.02)	0.63(0.01)	2.14(0.03)	0.72(0.01)	514.41(3.78)	93.39(2.24)
Malaysia	1.50(0.02)	0.50(0.00)	1.49(0.01)	0.57(0.00)	1.82(0.01)	0.49(0.01)	2.42(0.02)	0.57(0.01)	2.29(0.02)	0.65(0.01)	465.31(3.57)	86.64(2.05)
Malta	1.51(0.00)	0.50(0.00)	1.64(0.01)	0.70(0.00)	2.01(0.01)	0.50(0.01)	2.17(0.01)	0.67(0.01)	2.19(0.01)	0.76(0.01)	493.54(0.99)	88.44(0.88)
Egypt	1.47(0.02)	0.50(0.00)	1.80(0.02)	0.67(0.01)	1.76(0.01)	0.52(0.01)	2.56(0.02)	0.62(0.01)	2.57(0.02)	0.64(0.01)	392.23(4.12)	98.56(2.01)
Norway	1.50(0.01)	0.50(0.00)	1.87(0.02)	0.76(0.01)	2.28(0.01)	0.48(0.01)	2.45(0.02)	0.62(0.01)	2.10(0.03)	0.74(0.01)	511.54(2.25)	70.05(1.22)
Russia	1.51(0.01)	0.50(0.00)	1.66(0.02)	0.68(0.01)	2.08(0.01)	0.48(0.01)	2.28(0.01)	0.61(0.01)	2.33(0.02)	0.66(0.01)	538.00(4.66)	81.71(1.76)
Singapore	1.51(0.01)	0.50(0.00)	1.67(0.01)	0.69(0.01)	2.00(0.01)	0.48(0.01)	2.28(0.01)	0.61(0.01)	2.17(0.02)	0.67(0.01)	620.96(3.20)	82.13(2.15)
Slovenia	1.52(0.01)	0.50(0.00)	2.32(0.01)	0.67(0.01)	1.90(0.01)	0.39(0.01)	2.10(0.02)	0.57(0.01)	2.02(0.02)	0.64(0.01)	516.34(2.09)	69.35(1.35)
Chile	1.52(0.02)	0.50(0.00)	1.60(0.02)	0.69(0.01)	1.90(0.01)	0.45(0.01)	2.39(0.02)	0.67(0.01)	2.28(0.03)	0.76(0.01)	427.43(3.22)	79.96(1.92)
Thailand	1.46(0.02)	0.50(0.00)	1.34(0.01)	0.53(0.01)	1.66(0.01)	0.53(0.01)	2.56(0.01)	0.54(0.00)	2.34(0.02)	0.64(0.01)	431.42(4.76)	89.18(3.40)
Turkey	1.52(0.01)	0.50(0.00)	1.60(0.02)	0.72(0.01)	1.67(0.02)	0.59(0.01)	2.52(0.01)	0.61(0.01)	2.50(0.02)	0.66(0.01)	457.63(4.74)	105.41(2.78)
Oman	1.52(0.02)	0.50(0.00)	1.86(0.01)	0.68(0.00)	1.78(0.01)	0.53(0.00)	2.57(0.01)	0.58(0.01)	2.51(0.02)	0.63(0.01)	403.16(2.43)	96.13(1.29)
Jordan	1.50(0.03)	0.50(0.00)	1.82(0.01)	0.70(0.01)	1.83(0.01)	0.49(0.01)	2.60(0.02)	0.62(0.01)	2.60(0.02)	0.62(0.01)	385.55(3.23)	93.83(1.73)
New Zealand	1.49(0.02)	0.50(0.00)	1.68(0.01)	0.67(0.01)	2.12(0.01)	0.48(0.01)	2.35(0.01)	0.61(0.01)	2.09(0.03)	0.73(0.01)	492.72(3.36)	87.88(2.04)

School Level Descriptive Statistics										
	School SES		Sense School Belonging		Discipline at School		Quality of Mathematics Teaching at School		School Academic Emphasis	
	$\bar{X}$ SE	SD SE	$\bar{X}$ SE	SD SE	$\bar{X}$ SE	SD SE	$\bar{X}$ SE	SD SE	$\bar{X}$ SE	SD SE
USA	2.53(0.09)	0.56(0.04)	2.33(0.04)	0.27(0.02)	2.53(0.01)	0.56(0.06)	2.28(0.04)	0.2980.02)	1.6(0.05)	0.53(0.04)
Australia	1.93(0.05)	0.71(0.04)	2.25(0.03)	0.29(0.03)	2.49(0.05)	0.51(0.01)	2.11(0.02)	0.31(0.02)	1.69(0.05)	0.66(0.03)
UAE	2.12(0.04)	0.84(0.02)	1.93(0.02)	0.49(0.01)	2.50(0.03)	0.56(0.02)	2.27(0.01)	0.29(0.01)	1.91(0.03)	0.59(0.02
Bahrein	2.21(0.06)	0.76(0.05)	2.32(0.02)	0.25(0.01)	2.47(0.07)	0.67(0.04)	2.28(0.03)	0.25(0.01)	1.73(0.05)	0.62(0.03)
Botswana	1.53(0.05)	0.72(0.03)	2.46(0.01)	0.15(0.01)	1.94(0.05)	0.57(0.03)	2.48(0.02)	0.24(0.02)	1.20(0.02)	0.45(0.03)
China-Taiwan	1.90(0.09)	0.68(0.04)	2.18(0.02)	0.17(0.01)	2.53(0.07)	0.52(0.01)	1.98(0.05)	0.31(0.02)	1.41(0.04)	0.55(0.02)
Morocco	1.57(0.05)	0.80(0.03)	2.71(0.02)	0.17(0.01)	1.71(0.07)	0.76(0.03)	2.53(0.02)	0.28(0.02)	1.25(0.03)	0.45(0.02)
South Africa	1.37(0.08)	0.69(0.08)	2.54(0.02)	0.18(0.01)	1.83(0.06)	0.67(0.04)	2.52(0.02)	0.25(0.02)	1.33(0.03)	0.50(0.02)
Georgia	1.65(0.08)	0.79(0.04)	2.41(0.03)	0.21(0.02)	2.66(0.04)	0.56(0.03)	2.46(0.02)	0.23(0.02)	1.67(0.05)	0.49(0.02)
Hong Kong	1.72(0.05)	0.73(0.03)	2.14(0.02)	0.24(0.02)	2.65(0.04)	0.48(0.02)	2.02(0.03)	0.31(0.02)	1.50(0.04)	0.60(0.03)
UK	2.08(0.05)	0.71(0.03)	2.23(0.02)	0.27(0.01)	2.76(0.03)	0.37(0.02)	2.18(0.04)	0.35(0.02)	2.05(0.04)	0.62(0.03)
Iran	1.58(0.05)	0.78(0.03)	2.43(0.03)	0.24(0.01)	2.61(0.05)	0.55(0.02)	2.50(0.03)	0.31(0.02)	1.49(0.05)	0.59(0.04)
Ireland	1.90(0.07)	0.84(0.05)	2.31(0.02)	0.22(0.02)	2.60(0.05)	0.52(0.03)	2.16(0.03)	0.27(0.02)	1.92(0.05)	0.61(0.04)
Israel	1.69(0.06)	0.75(0.03)	2.37(0.03)	0.27(0.02)	2.16(0.06)	0.64(0.03)	2.27(0.03)	0.29(0.02)	1.63(0.05)	0.54(0.02)
Sweden	2.40(0.07)	0.74(0.04)	2.25(0.02)	0.23(0.02)	2.24(0.05)	0.52(0.03)	2.09(0.03)	0.28(0.02)	1.49(0.06)	0.59(0.04)
Italy	2.03(0.09)	0.79(0.08)	2.16(0.02)	0.20(0.01)	2.18(0.07)	0.62(0.04)	2.13(0.03)	0.32(0.02)	1.31(0.04)	0.46(0.02)
Japan	2.38(0.05)	0.66(0.03)	2.22(0.05)	0.25(0.04)	2.55(0.07)	0.59(0.03)	1.78(0.07)	0.34(0.04)	1.58(0.07)	0.52(0.02)
Canada	2.05(0.06)	0.76(0.03)	2.38(0.02)	0.23(0.01)	2.52(0.04)	0.49(0.01)	2.37(0.04)	0.31(0.02)	1.60(0.05)	0.61(0.03)
Qatar	2.73(0.05)	0.62(0.05)	2.21(0.02)	0.28(0.02)	2.47(0.06)	0.67(0.04)	2.24(0.03)	0.30(0.02)	2.03(0.05)	0.63(0.04)
Kazakhstan	2.64(0.07)	0.59(0.06)	2.68(0.02)	0.19(0.01)	2.54(0.06)	0.75(0.04)	2.48(0.03)	0.21(0.01)	1.91(0.05)	0.48(0.05)
Korea	1.62(0.05)	0.64(0.03)	2.18(0.03)	0.16(0.01)	2.57(0.05)	0.59(0.03)	1.75(0.05)	0.27(0.05)	1.83(0.09)	0.59(0.05)
Kuwait	1.85(0.10)	0.82(0.04)	2.45(0.02)	0.24(0.02)	2.14(0.07)	0.70(0.03)	2.35(0.03)	0.32(0.02)	1.70(0.08)	0.62(0.07)
Lithuania	2.11(0.07)	0.77(0.03)	2.33(0.02)	0.23(0.01)	2.41(0.05)	0.53(0.02)	2.25(0.03)	0.31(0.03)	1.57(0.06)	0.53(0.02)
Lebanon	1.54(0.10)	0.84(0.06)	2.48(0.02)	0.24(0.01)	2.26(0.07)	0.80(0.03)	2.55(0.03)	0.28(0.02)	1.57(0.05)	0.54(0.02)
Hungary	1.73(0.07)	0.75(0.03)	2.18(0.02)	0.24(0.01)	2.18(0.05)	0.58(0.04)	2.16(0.04)	0.33(0.02)	1.58(0.04)	0.50(0.01)
Malaysia	1.40(0.05)	0.64(0.04)	2.46(0.02)	0.18(0.01)	2.52(0.06)	0.55(0.04)	2.34(0.02)	0.24(0.01)	1.83(0.06)	0.57(0.03)
Malta	2.30(0.07)	0.54(0.04)	2.22(0.03)	0.23(0.02)	2.51(0.08)	0.61(0.06)	2.20(0.03)	0.23(0.03)	1.83(0.06)	0.60(0.05)
Egypt	1.81(0.07)	0.77(0.04)	2.55(0.02)	0.23(0.01)	1.80(0.08)	0.79(0.03)	2.55(0.03)	0.25(0.02)	1.48(0.06)	0.58(0.03)
Norway	2.47(0.07)	0.58(0.04)	2.48(0.05)	0.25(0.03)	2.78(0.04)	0.40(0.03)	2.19(0.07)	0.38(0.05)	1.43(0.05)	0.48(0.01)
Russia	2.21(0.08)	0.85(0.04)	2.33(0.03)	0.31(0.03)	2.65(0.05)	0.50(0.03)	2.40(0.03)	0.30(0.02)	1.19(0.04)	0.39(0.03)
Singapore	2.14(0.05)	0.67(0.03)	2.27(0.01)	0.21(0.01)	2.73(0.03)	0.45(0.02)	2.18(0.02)	0.22(0.01)	1.80(0.04)	0.56(0.03)
Slovenia	1.82(0.05)	0.71(0.03)	1.92(0.02)	0.18(0.01)	1.56(0.04)	0.54(0.02)	2.02(0.03)	0.24(0.02)	2.64(0.05)	0.48(0.02)
Chile	1.36(0.04)	0.64(0.03)	2.40(0.03)	0.26(0.01)	2.20(0.06)	0.62(0.04)	2.35(0.03)	0.34(0.02)	1.27(0.04)	0.46(0.03)
Thailand	1.19(0.07)	0.61(0.07)	2.63(0.03)	0.19(0.01)	2.49(0.06)	0.58(0.04)	2.43(0.02)	0.22(0.01)	1.57(0.08)	0.57(0.03)
Turkey	1.55(0.09)	0.78(0.05)	2.60(0.03)	0.21(0.01)	1.94(0.08)	0.74(0.02)	2.59(0.03)	0.25(0.02)	1.34(0.06)	0.56(0.06)
Oman	2.11(0.06)	0.76(0.03)	2.56(0.02)	0.24(0.02)	2.32(0.06)	0.80(0.02)	2.52(0.02)	0.27(0.02)	1.62(0.03)	0.54(0.02)
Jordan	1.56(0.08)	0.73(0.04)	2.64(0.03)	0.23(0.02)	2.22(0.08)	0.78(0.03)	2.64(0.02)	0.22(0.02)	1.46(0.06)	0.55(0.01)
New Zealand	1.95(0.06)	0.82(0.04)	2.34(0.02)	0.23(0.02)	2.27(0.05)	0.56(0.03)	2.10(0.03)	0.28(0.02)	1.83(0.05)	0.64(0.03)