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A Global Perspective on Socioeconomic Differences in Learning Outcomes

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A Global Perspective on Socioeconomic Differences in Learning Outcomes

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The goal of this research is to provide an assessment of current status of socioeconomic differences in learning outcomes across school subjects. Learning outcome refers to academic achievement or academic competence tested through standardized paper-and-pencil instruments. To update the research literature on socioeconomic effects from a global perspective, this research seeks the most recent data available from international student assessments to identify challenges in reducing socioeconomic differences in learning outcomes.

International student assessment is a procedure designed to obtain information about cognitive and affective outcomes of school-aged learners from different participating countries. International student assessments have long been considered a valid method for cross-national comparative research. Information gathered from international student assessments is often used for a variety of evaluative purposes, one of which is to examine the equality issues in learning outcomes. All existing international student assessments contain measures on family socioeconomic background and student learning outcomes, making it appropriate to use international student assessments for a global evaluation of socioeconomic differences in learning outcomes. International student assessments draw nationally representative samples, providing an ideal avenue to examine socioeconomic differences in learning outcomes at the national level and allowing international comparisons of socioeconomic differences in learning outcomes within and possibly across particular assessments.

This research aims to analyze recent data from existing international student assessments to address the issue of the relationship between family socioeconomic background and student learning outcomes in multiple school subjects. International student assessments examined in this research include (a) Programme for International Student Assessment (PISA), (b) Third International Mathematics and Science Study (TIMSS), and (c) Civic Education Study (CivEd).

Because countries from different regions take part in international student assessments, there are opportunities to examine socioeconomic differences in learning outcomes both within and between regions.

International student assessments often include different populations (or age groups) of students for the purpose of cross-sectional comparisons. PISA defines 1 population of students in Grade 8. TIMSS defines 3 populations of students in Grades 4, 8, and 12. CivEd defines 2 populations of students in Grade 8 and 12. Not all populations are analyzed for socioeconomic differences in learning outcomes in this research. One reason is to seek commonality between international student assessments to increase cross-assessment comparability. Therefore, students in Grade 8 are singled out as the target population of this research. The other reason that students in Grades 4 and 12 are not used for data analysis is that students in Grade 4 are too young to provide accurate socioeconomic information about their families and students in Grade 12 are soon leaving their schools (so that it is too late to implement any intervention for socioeconomic differences in learning outcomes).

With the target population decided for this research, the most recent data available from the 3 international student assessments are obtained for data analysis. The following data have been obtained for this research: (a) PISA 2006 data that cover 3 school subjects (reading, mathematics, and science), (b) TIMSS 2003 data that cover 2 school subjects (mathematics and science), and (c) CivEd 1999 data that cover 1 school subject (civic education).

Questionnaire data from each international student assessment have also been obtained for measures of family socioeconomic background. To increase comparability across international student assessments, common measures of family socioeconomic background are sought whenever possible. As a result, the following family socioeconomic variables have been

selected for this research that examines their relationships with student learning outcomes: (a) socioeconomic status (SES) (available only in PISA), (b) parental occupation (a component of SES available only in PISA), (c) parental education (a component of SES commonly available in PISA, TIMSS, and CivEd), (d) family possession (a component of SES available only in PISA), (e) restricted family possession (a simplified measure of family possession available in PISA and TIMSS), (f) home literacy (commonly available in PISA, TIMSS, and CivEd), (g) family size (available in TIMSS and CivEd), and (h) home language (commonly available in PISA, TIMSS, and CivEd).

Most family socioeconomic variables are self-explanatory. Restricted family possession asks students whether the following items are available for them at home: (a) desk, (b) computer, (c) calculator, and (d) dictionary. Therefore, this variable measures some basic and necessary learning resources at home. An index variable is created as a result of the integration of these 4 items. Home literacy is measured through sensible indicators of books available at home. It has 3 categories: (a) having no more than 10 books at home, (b) having 11 to 100 books at home, and (c) having more than 101 books at home. For analytical purposes, home literacy takes a baseline of having no more than 10 books at home against which having 11 to 100 books at home and having more than 101 books at home are examined for effects on learning outcomes. Therefore, home literacy has actually 2 variables for representation. One is having 11 to 100 books at home (versus having no more than 10 books at home); the other is having more than 101 books at home (versus having no more than 10 books at home). To save space, home literacy refers to having more than 101 books at home in the subsequent interpretation, unless stated otherwise with a special note to refer to having 11 to 100 books at home. Family size measures how many people live together at home with a student. Number of siblings is a more informative variable.

However, across the 3 international student assessments, there is no measure of the number of parents who live together with a student. Because of this, it is impossible to figure out how many siblings live together with a student. Home language refers to whether or not a student speaks the language of the test at home, often meaning the official language of each country.

Analytically speaking, SES, the 3 components of SES, restricted family possession, and family size are continuous variables (SES and its 3 components are standardized continuous variables). Home literacy (2 variables) and home language are dichotomous variables that have been dummy coded (0 and 1) for data analysis. These continuous and dichotomous variables are used in data analysis as the independent variables that predict or explain variance in learning outcomes. Learning outcomes (reading, mathematics, science, and civic education) are the dependent variables that are analyzed separately for socioeconomic differences.

Statistically, MRC (multiple regression and correlation) is employed to analyze the relationships between family socioeconomic variables and student learning outcomes, weighted by student weights (and school weights in the case of PISA). Each family socioeconomic variable is examined first separately for its absolute importance to student learning outcomes, and then all family socioeconomic variables are examined together for their relative importance to student learning outcomes. Collectively how important family socioeconomic variables are to student learning outcomes is determined by the estimation of the proportion of variance in student learning outcomes that has been accounted for by the collection of family socioeconomic variables. Because family socioeconomic variables function at the student level, it is also informative to partition variance in student learning outcomes into variance components attributable to students (families) and schools. Such an analysis provides yet another way to estimate how important family socioeconomic variables are to student learning outcomes.

Altogether, this research identifies the most critical family socioeconomic variables to student learning outcomes and evaluates how important these family socioeconomic variables are in explaining student learning outcomes.

The analytical results are interpreted in a non-technical manner. To show the magnitude of effects and compare effects across variables within and across participating countries, effects are scaled into a common metric that reports statistical results in effect size units or standard deviation (SD) units. The conventional social sciences standard typically classifies effect sizes more than 0.50 SD as large, between 0.30 and 0.50 SD as moderate, and less than 0.30 SD as small. This classification is employed in this research to derive effect size measures for effects of family socioeconomic variables on student learning outcomes.

1. Socioeconomic Differences in Reading Literacy

Reading literacy data were obtained from PISA 2006 for the present analysis. PISA defines reading literacy as the ability to understand, apply, and reflect on written texts in order to participate effectively in life (see Organization for Economic Cooperation and Development [OECD], 2001). In PISA, reading literacy was standardized scores with a mean of 500 points and a standard deviation of 100 points. There were 3 countries from Arab States, 15 countries from Central and Eastern Europe, 2 countries from Central Asia, 9 countries from East Asia and the Pacific, 6 countries from Latin America and the Caribbean, and 21 countries from North America and Western Europe in PISA 2006 (reading literacy data from United States were not available in the PISA international database). Data analysis of socioeconomic differences in reading literacy was conducted at the country level, and comparative interpretation of analytical results was carried out at the regional level (with regions defined above following the UNESCO categorization).

1.1. Effects of Socioeconomic Status on Reading Literacy

Part of Table 1 presents socioeconomic differences in reading literacy associated with socioeconomic status (SES) that combines parental occupation, parental education, and home possession. It is evident from the table that SES had significant positive effects on reading literacy in all participating countries. Students of parents with high SES demonstrated higher reading literacy than students of parents with low SES. Given that one standard deviation was 100 points in PISA, the SES effects in Table 1 (and also other upcoming tables) can be easily transformed into effect size measures. For example, the SES effects for Jordan was 0.28 SD, indicating small effects.

 insert Table 1 about here

All 3 participating countries from Arab States demonstrated small SES effects on reading literacy, ranging from 0.17 to 0.28 SD. Participating Central and Eastern European countries highlighted Bulgaria and Czech Republic as having large SES effects (0.55 SD and 0.51 SD) and Montenegro and Estonia as having small SES effects (0.24 SD and 0.29 SD). The remaining 11 participating countries from this region showed moderate SES effects (from 0.31 to 0.45 SD). The 2 countries from Central Asia showed different SES effects, with Kyrgyzstan showing moderate effects (0.37 SD) and Azerbaijan showing small effects (0.18 SD). Among the participating countries from East Asia and the Pacific, New Zealand, Australia, Japan, and Taiwan showed moderate SES effects (from 0.38 to 0.48 SD). The other 5 participating countries showed small SES effects (from 0.12 to 0.28 SD). Macao was representative of this category with effects below 0.20 SD. Similar situation occurred among the participating countries from

Latin America and the Caribbean, with Argentina, Chile, and Uruguay showing moderate SES effects (from 0.38 to 0.39 SD) and Brazil, Chile, and Mexico showing small SES effects (from 0.28 to 0.30 SD). Note that the pattern of SES effects was well balanced among the participating countries from Central Asia, East Asia and the Pacific, and Latin America and the Caribbean. This balanced pattern was not observed among the participating countries from North America and Western Europe, with a lot more participating countries showing moderate than small SES effects (17 out of 21 participating countries with moderate effects from 0.32 to 0.48 SD). Analytical results highlighted France, Belgium, Germany, and Austria with SES effects above 0.45 SD and Iceland, Spain, Finland, and Italy with SES effects below 0.30 SD (from 0.24 to 0.30 SD).

In summary, participating countries from Central and Eastern Europe as well as North America and Western Europe shared a similar pattern of SES effects, with a lot more participating countries showing moderate (even large in the case of Central and Eastern Europe) SES effects than small SES effects. On the other hand, participating countries from Central Asia, East Asia and the Pacific, and Latin America and the Caribbean showed balanced SES effects with similar numbers of countries having moderate and small SES effects. Participating countries from Arab States had only small SES effects.

Finally, the SES effects on reading literacy reported above can be graphed for a visual illustration of the SES effects. For each country, reading literacy was predicted according to the SES effects based on the range of SES in that country. Predicted reading literacy was then graphed in a linear manner against observed SES. This line segment (or slope segment) is the so-called socioeconomic gradient (or SES gradient) of reading literacy for that country. Therefore, the SES gradients of reading literacy did not represent any additional analyses but a visual

illustration of the reading literacy part of Table 1. Figures 1.1 to 1.12 present the SES gradients of reading literacy across regions.

 insert Figures 1.1 to 1.12 about here

For each SES gradient in each figure, the intercept indicated the average reading literacy of its corresponding country: the larger the intercept, the higher the average reading literacy. Meanwhile, the slope indicated the SES effects of its corresponding country: the shallower the slope, the smaller the SES effects (or the better the socioeconomic equity).

1.2. Effects of Parental Occupation on Reading Literacy

As mentioned earlier, SES is a composite variable that combines parental occupation, parental education, and home possession. It is informative to decompose SES into parental occupation, parental education, and home possession in order to examine the effects of these distinct socioeconomic aspects on learning outcomes. Part of Table 2 presents socioeconomic differences in reading literacy associated with parental occupation. It is evident from the table that parental occupation had significant positive effects on reading literacy in all participating countries, indicating that students of parents of high prestigious occupations outperformed students of parents of low prestigious occupations in reading literacy. Nevertheless, the effects of parental occupation on reading literacy were small across all countries in all regions, indicating a global (unified) pattern of small parental occupational effects.

 insert Table 2 about here

1.3. Effects of Parental Education on Reading Literacy

Part of Table 3 presents socioeconomic differences in reading literacy associated with parental education. It is evident from the table that parental education had significant positive effects on reading literacy in all participating countries. Students of more educated parents demonstrated higher reading literacy than students of less educated parents. Nevertheless, the effects of parental education on reading literacy were small across all countries in all regions, indicating a global (unified) pattern of small parental educational effects. Interestingly, parental occupation and parental education demonstrated quite similar global patterns of effects on reading literacy.

 insert Table 3 about here

1.4. Effects of Family Possession on Reading Literacy

Part of Table 4 presents socioeconomic differences in reading literacy associated with family possession. It is evident from the table that family possession had significant positive effects on reading literacy in all participating countries except Qatar. Students from families with more family possession outperformed students from families with less family possession in reading literacy.

 insert Table 4 about here

The 3 participating countries from Arab States demonstrated either null effects or small effects of family possession (from 0.00 to 0.25 SD). Five participating Central and Eastern

European countries (Bulgaria, Czech Republic, Lithuania, Slovak Republic, and Hungary) reported moderate effects of family possession (from 0.32 to 0.47 SD). The remaining 10 participating countries from this region showed small effects (from 0.12 to 0.30 SD). Montenegro and Estonia were representative in this category with effects below 0.20 SD. The 2 countries from Central Asia (Azerbaijan and Kyrgyzstan) reported small effects of family possession (0.13 SD and 0.26 SD). Among the participating countries from East Asia and the Pacific, only New Zealand reported moderate effects (0.34 SD). The other 8 participating countries all reported small effects (from 0.13 to 0.30 SD). Macao was representative of this category with effects below 0.20 SD. Among the participating countries from Latin America and the Caribbean, Argentina, Brazil, Uruguay, and Chile reported moderate effects (from 0.35 to 0.42 SD) and Chile and Mexico showed small effects (0.26 SD and 0.29 SD). In the region of North America and Western Europe, there were more participating countries reporting small effects than moderate effects (13 participating countries with small effects from 0.06 to 0.30 SD and 8 participating countries with moderate effects from 0.32 to 0.42 SD). Analytical results highlighted France and Belgium with effects above 0.40 SD and Iceland, Finland, and Norway with effects below 0.20 SD.

In summary, participating countries from Central and Eastern Europe as well as North America and Western Europe shared a similar pattern, with more participating countries reporting small effects than moderate effects of family possession on reading literacy. Meanwhile, participating countries from Central Asia, East Asia and the Pacific, and Latin America and the Caribbean shared a similar pattern, with all participating countries in these regions reporting small effects of family possession (except New Zealand with moderate effects).

1.5. What Aspect of Socioeconomic Status Matters the Most to Reading Literacy?

Tables 2 to 4 represent separate analyses of each aspect of SES as it relates to reading literacy (i.e., parental occupation, parental education, and home possession). Although such separate analyses are informative, the effects of different aspects of SES cannot be directly compared because different measurement units were used across the 3 aspects of SES. To discern the most important aspect of SES to reading literacy, the 3 aspects of SES were analyzed together and standardized effects were obtained to allow direct comparison of the effects of the 3 aspects of SES. Part of Table 5 presents results that address the issue of what aspect of SES matters the most to reading literacy.

 insert Table 5 about here

Among the 3 participating Arab States countries, family possession was the most important SES component in Jordan and Tunisia, and parental education was the most important SES component in Qatar. In Central and Eastern Europe, parental occupation was the most important SES component in 11 out of the 15 participating countries, family possession was the most important SES component in 3 out of the 15 participating countries, and parental education was the most important SES component in Hungary. Among the 2 countries from Central Asia, parental occupation was the most important SES component in Azerbaijan, whereas family possession was the most important SES component in Kyrgyzstan. As far as East Asia and the Pacific is concerned, family possession was the most important SES component in 5 out of the 9 participating countries, parental occupation was the most important SES component in 2 out of the 9 participating countries, and parental education was the most important SES component in 2

out of the 9 participating countries. Family possession was the most important SES component in 4 out of the 6 participating countries from Latin America and the Caribbean, whereas parental occupation was the most important SES component in 2 out of the 6 participating countries. Finally, parental occupation was the most important SES component in 19 out of the 21 participating countries from North America and Western Europe, parental education was the most important SES component in Iceland, and family possession was the most important SES component in Portugal.

Some patterns from the above interpretation of the analytical results are clear. Parental occupation was the most important SES component, particularly in relatively more developed regions such as Central and Eastern Europe as well as North America and Western Europe. On the other hand, family possession was the most important SES component, particularly in relatively less developed regions such as East Asia and the Pacific as well as Latin America and the Caribbean. Overall, parental occupation was the most important SES component that mattered the most to reading literacy.

When the next (second) important SES component to reading literacy was sought, parental education was the second important SES component in 2 out of the 3 participating Arab States countries, and parental occupation was the second important SES component in Qatar. In Central and Eastern Europe, family possession was the second important SES component in 9 out of the 15 participating countries, parental occupation was the second important SES component in 4 out of the 15 participating countries, and parental education was the second important SES component in 2 out of the 15 participating countries. Among the 2 countries from Central Asia, family possession was the second important SES component in Azerbaijan, whereas parental occupation was the second important SES component in Kyrgyzstan. As far as

East Asia and the Pacific is concerned, Macao did not show any second important SES component, parental occupation was the second important SES component in 6 out of the 9 participating countries, parental education was the second important SES component in Australia, and family possession was the second important SES component in New Zealand. In Latin America and the Caribbean, parental occupation was the second important SES component in 3 out of the 6 participating countries, family possession was the second important SES component in 2 out of the 6 participating countries, and parental education was the second important SES component in Mexico. Finally, in North America and Western Europe, family possession was the second important SES component in 13 out of the 21 participating countries, parental education was the second important SES component in 6 out of the 21 participating countries, and parental occupation was the second important SES component in 2 out of the 21 participating countries.

Based on the above interpretation of the analytical results, family possession was the second important SES component (in 26 participating countries), followed by parental occupation (in 17 participating countries) and parental education (in 12 participating countries) as the second important SES component. To some extent, there is a switch of pattern in most participating countries: family possession was the second important SES component in relatively more developed regions, whereas parental occupation was the second important SES component in relatively less developed regions. Overall, family possession was the second important SES component that mattered to reading literacy.

Interestingly, as many as 20 participating countries did not witness the third important SES component to reading literacy at all. For those 36 participating countries with the third important SES component, parental education appeared most often (in 22 participating

countries). Therefore, parental education was the third important SES component for those participating countries with a significant third SES component.

1.6. Effects of Restricted Family Possession on Reading Literacy

To increase the degree of comparability among international student assessments, common measures were sought whenever possible across international student assessments. PISA and TIMSS share a few common items that were used to measure family possession. These items were obtained from both assessments and turned into an index labeled as restricted family possession because it is only a small part of items in both assessments that intended to measure family possession. Part of Table 6 presents socioeconomic differences in reading literacy associated with restricted family possession. It is evident from the table that restricted family possession had significant positive effects on reading literacy in all participating countries. Students from families with more restricted family possession outperformed students from families with less restricted family possession in reading literacy. Furthermore, the effects of restricted family possession on reading literacy were large across all countries in all regions (the only exception was Estonia with moderate effects of 0.47 SD), indicating a global (unified) pattern of the importance of some basic or necessary family possession items closely related to learning (i.e., desk, computer, calculator, and dictionary).

insert Table 6 about here

1.7. Effects of Home Literacy on Reading Literacy

Part of Table 7 presents socioeconomic differences in reading literacy associated with home literacy. Home literacy had a baseline of having no more than 10 books at home against

which having 11 to 100 books at home and having more than 101 books at home were examined for effects on reading literacy. In the case of having 11 to 100 books at home, it is evident from the table that it had significant positive effects on reading literacy in all participating countries (except Liechtenstein). Students from families having 11 to 100 books demonstrated higher reading literacy than students from families having no more than 10 books.

Among the participating countries from Arab States, Tunisia demonstrated moderate effects of home literacy on reading literacy (0.37 SD), whereas Jordan and Qatar demonstrated small effects (0.23 SD and 0.29 SD). Central and Eastern Europe highlighted 8 participating countries as having large effects (from 0.53 to 0.94 SD). Czech Republic, Slovak Republic, Bulgaria, and Hungary were representative in this category with effects above 0.70 SD. The remaining 7 participating countries from this region showed moderate effects (from 0.36 to 0.50 SD). Montenegro was representative in this category with effects below 0.40 SD. The 2 countries from Central Asia had different effects of home literacy, with Kyrgyzstan having moderate effects (0.34 SD) and Azerbaijan having small effects (0.13 SD). Among the participating countries from East Asia and the Pacific, Korea, Taiwan, and Japan had large effects (from 0.55 to 0.68 SD), whereas Indonesia, Macao, and Thailand had small effects (from 0.15 to 0.29 SD). The other 3 participating countries showed moderate effects (from 0.44 to 0.48 SD). Among the participating countries from Latin America and the Caribbean, Argentina, Colombia, and Chile had large effects (from 0.51 to 0.57 SD) and Brazil, Chile, and Mexico had moderate effects (from 0.33 to 0.47 SD). This balanced pattern was not observed among participating countries from North America and Western Europe. In this region, there were no significant effects of home literacy in Liechtenstein, but 14 participating countries had large effects (from 0.53 to 0.97 SD). Germany and Austria were representative of this category with effects above 0.80 SD. The

other 6 participating countries had moderate effects (from 0.34 to 0.48 SD). Finland, Denmark, Iceland, and Greece were representative of this category with effects below 0.40 SD.

 insert Table 7 about here

In summary, the majority of the participating countries from North America and Western Europe, more than half of the participating countries from Central and Eastern Europe, and half of the participating countries from Latin America and the Caribbean had large effects of home literacy without any small effects. In contrast, participating countries from both Arab States and Central Asia had small (and moderate) effects without any large effects. Although participating countries from East Asia and the Pacific had large effects, they were balanced with moderate effects and small effects in terms of the number of countries in each category.

In the case of having more than 101 books at home (see Table 7), it is evident from the table that it had significant positive effects on reading literacy in all participating countries. Students from families having more than 101 books demonstrated higher reading literacy than students from families having no more than 10 books.

Among the participating countries from Arab States, Tunisia demonstrated large effects of home literacy on reading literacy (0.72 SD), whereas Jordan and Qatar demonstrated moderate effects (0.43 SD and 0.35 SD). All participating countries from Central and Eastern Europe demonstrated large effects (from 0.70 to 1.56 SD). Czech Republic, Slovak Republic, Hungary, Bulgaria, Slovenia, and Poland were representative of this category with effects above 1.00 SD. The 2 countries from Central Asia had different effects of home literacy, with Kyrgyzstan having large effects (1.07 SD) and Azerbaijan having moderate effects (0.50 SD). Among the

participating countries from East Asia and the Pacific, 7 participating countries demonstrated large effects (from 0.65 to 1.08 SD) with Korea and New Zealand having effects above 1.00 SD, whereas Macao demonstrated small effects (0.29 SD) and Indonesia demonstrated moderate effects (0.38 SD). All participating countries from Latin America and the Caribbean demonstrated large effects (from 0.67 to 1.13 SD). Argentina and Chile were representative of this category with effects above 1.00 SD. Similarly, all participating countries from North America and Western Europe demonstrated large effects (from 0.75 to 1.59 SD). Germany and Austria were representative of this category with effects above 1.50 SD.

In summary, only Macao demonstrated small effects on reading literacy associated with having more than 101 books at home. Even moderate effects were difficult to find, existing only in a couple of countries (i.e., Azerbaijan, Indonesia, Jordan, and Qatar). All other participating countries demonstrated large effects. In particular, all participating countries from Central and Eastern Europe, Latin America and the Caribbean, and North America and Western Europe demonstrated large effects.

1.8. Effects of Home Language on Reading Literacy

Part of Table 8 presents socioeconomic differences in reading literacy associated with home language. Considerable regional variation was observed in the table. None of the 3 participating countries from Arab States showed any significant effects of home language on reading literacy. The majority (13 out of 15) of the participating Central and Eastern European countries showed significant positive effects. Students speaking the language of the test demonstrated higher reading literacy than students speaking languages other than the language of the test. This region highlighted 7 participating countries as having large effects (from 0.55 to 0.96 SD). Bulgaria, Czech Republic, and Hungary were representative of this category with

effects above 0.70 SD. On the other hand, Latvia and Serbia showed no significant effects at all, and Estonia, Romania, Montenegro, and Lithuania showed small effects (from 0.17 to 0.28 SD). The remaining 2 participating countries from this region showed moderate effects (0.32 SD and 0.45 SD).

The 2 countries from Central Asia showed significant negative effects of home language on reading literacy (-0.37 SD and -0.32 SD). Students speaking languages other than the language of the test demonstrated higher reading literacy than students speaking the language of the test. Language has always been a complex social issue in many countries in Central Asia. North Azerbaijani, the official language, is only one of a great variety of Azerbaijani languages spoken in Azerbaijan. Kyrgyz was forced by the Kyrgyzstan government to become the official language in the early 1990s, triggering many related social problems. These unique conditions and situations explain the negative effects of home (official) language on reading literacy in Azerbaijan and Kyrgyzstan.

insert Table 8 about here

All participating countries from East Asia and the Pacific showed significant positive effects of home language on reading literacy except Macao. Korea and Japan showed large effects (1.16 SD and 1.01 SD). Among the remaining 6 participating countries, Taiwan and New Zealand showed moderate effects (0.45 SD and 0.44 SD), whereas Australia, Indonesia, Thailand, and Hong Kong showed small effects (from 0.20 to 0.28). There were no significant effects of home language among half of the participating countries from Latin America and the Caribbean (Brazil, Chile, and Colombia). Argentina and Mexico showed large effects (1.24 SD

and 0.93 SD), whereas Uruguay showed moderate effects (0.48 SD). The majority (18 out of 21) of the participating North American and Western European countries showed significant positive effects. This region highlighted 11 participating countries as having large effects (from 0.53 to 0.98 SD). Liechtenstein, Germany, and Iceland were representative of this category with effects above 0.85 SD. On the other hand, Ireland, Luxembourg, and Spain showed no significant effects at all, and Israel, Belgium, Finland, and Canada showed small effects (from 0.21 to 0.30 SD). The remaining 3 participating countries from this region showed moderate effects (from 0.35 to 0.50 SD).

In summary, participating countries from Central and Eastern Europe, East Asia and the Pacific, and North America and Western Europe shared a similar pattern of home language effects. The majority of the participating countries showed significant (positive) effects in these regions, and there were much more participating countries showing large and moderate effects than small effects in each region. More similar to this pattern than any other was also the pattern shown among the participating countries from Latin America and the Caribbean. Effects of home language (though negative) were also significant among the participating countries in Central Asia. On the other hand, participating countries from Arab States did not show any significant effects.

1.9. What Family Socioeconomic Variables Matter the Most to Reading Literacy?

The effects of family socioeconomic variables were examined separately in the previous tables. Similar to the case of different components of SES, although these separate analyses are informative, the effects of family socioeconomic variables cannot be directly compared because different measurement units were used across these family socioeconomic variables. To discern the most important family socioeconomic variables to reading literacy, the 3 components of SES

and all other family socioeconomic variables were analyzed together and standardized effects were sought in order to directly compare the effects of family socioeconomic variables. Table 9 presents the results of such a combined analysis.

 insert Table 9 about here

Family possession was the most important family socioeconomic variable in all participating Arab States countries except Qatar where home literacy was the most important family socioeconomic variable. Home literacy was the most important family socioeconomic variable in all Central and Eastern European countries except Turkey where family possession was the most important family socioeconomic variable. In Central Asia, parental occupation was the most important family socioeconomic variable in Azerbaijan, and home literacy was the most important family socioeconomic variable in Kyrgyzstan. Home literacy was the most important family socioeconomic variable in all participating East Asian and the Pacific countries (referring to having 11 to 100 books at home in the case of Macao) except Indonesia and Thailand where family possession was the most important family socioeconomic variable. Family possession was the most important family socioeconomic variable in all participating Latin American and the Caribbean countries except Chile and Uruguay where parental occupation was the most important family socioeconomic variable. Home literacy was the most important family socioeconomic variable in all participating North American and Western European countries except Luxembourg where home language was the most important family socioeconomic variable and Portugal where parental occupation was the most important family socioeconomic variable.

Therefore, a clear pattern emerged. Home literacy was the most important family socioeconomic variable (in 42 participating countries), followed in far distance by family possession (in 9 participating countries). Scattered in a couple of participating countries was parental occupation as the most important family socioeconomic variable (Azerbaijan, Chile, Portugal, and Uruguay). Home language was an isolated case only in Luxembourg. It is also clear that participating countries where family possession was the most important family socioeconomic variable were all relatively less developed countries, whereas in the vast majority of the relatively more developed participating countries, home literacy was the most important family socioeconomic variable. Overall, home literacy was the most important family socioeconomic variable that mattered the most to reading literacy.

In the region of Arab States, parental education was the second important family socioeconomic variable in Jordan and Qatar, and parental occupation was the second important family socioeconomic variable in Tunisia. In the region of Central and Eastern Europe, home literacy was the second important family socioeconomic variable in 8 out of the 15 participating countries (referring to having 11 to 100 books at home in 7 participating countries), parental occupation was the second important family socioeconomic variable in 7 out of the 15 participating countries. In the region of Central Asia, home literacy was the second important family socioeconomic variable in Azerbaijan, and parental occupation was the second important family socioeconomic variable in Kyrgyzstan. In the region of East Asia and the Pacific, parental occupation was the second important family socioeconomic variable in 4 out of the 9 participating countries, home literacy (referring to having 11 to 100 books at home) was the second important family socioeconomic variable in 4 out of the 9 participating countries, and family possession was the second important family socioeconomic variable in Macao. In the

region of Latin America and the Caribbean, home literacy was the second important family socioeconomic variable in 3 out of the 6 participating countries (referring to having 11 to 100 books at home in Colombia), parental occupation was the second important family socioeconomic variable in 2 out of the 6 participating countries, and family possession was the second important family socioeconomic variable in Chile. In the region of North America and Western Europe, home literacy was the second important family socioeconomic variable in 13 out of the 21 participating countries (referring to having 11 to 100 books at home in 11 participating countries), parental occupation was the second important family socioeconomic variable in 7 out of the 21 participating countries, and parental education was the second important family socioeconomic variable in Iceland.

Therefore, home literacy was the second important family socioeconomic variable in 29 participating countries (referring to having 11 to 100 books at home in most cases), and parental occupation was the second important family socioeconomic variable in 22 participating countries. Scattered in a couple of participating countries was parental education as the second important family socioeconomic variable (Iceland, Jordan, and Qatar). Family possession was an isolated case only in Chile. Overall, aspects of home literacy continued to be the second important family socioeconomic variable that mattered to reading literacy.

In the region of Arab States, parental occupation was the third important family socioeconomic variable in Jordan and Qatar, whereas home literacy was the third important family socioeconomic variable in Tunisia. In the region of Central and Eastern Europe, parental occupation was the third important family socioeconomic variable in 8 out of the 15 participating countries, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 6 out of the 15 participating countries, and family possession

was the third important family socioeconomic variable in Lithuania. In the region of Central Asia, family possession was the third important family socioeconomic variable in both Azerbaijan and Kyrgyzstan. In the region of East Asia and the Pacific, home literacy was the third important family socioeconomic variable in 4 out of the 9 participating countries (referring to having 11 to 100 books at home in 2 participating countries), parental education was the third important family socioeconomic variable in 2 out of the 9 participating countries, parental occupation was the third important family socioeconomic variable in Hong Kong, family possession was the third important family socioeconomic variable in Korea, and home language was the third important family socioeconomic variable in Taiwan. In the region of Latin America and the Caribbean, home literacy was the third important family socioeconomic variable in 3 out of the 6 participating countries, parental occupation was the third important family socioeconomic variable in Brazil, parental education was the third important family socioeconomic variable in Mexico, and family possession was the third important family socioeconomic variable in Uruguay. In the region of North America and Western Europe, parental occupation was the third important family socioeconomic variable in 11 out of the 21 participating countries, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 7 out of the 21 participating countries, home language was the third important family socioeconomic variable in Denmark, parental education was the third important family socioeconomic variable in Liechtenstein, and family possession was the third important family socioeconomic variable in Portugal.

Therefore, parental occupation was the third important family socioeconomic variable in 23 participating countries, home literacy (referring to having 11 to 100 books at home in most cases) was the third important family socioeconomic variable in 21 participating countries, and

family possession was the third important family socioeconomic variable in 6 participating countries. Scattered among a couple of participating countries was parental education (Indonesia, Japan, Liechtenstein, and Mexico) and home language (Denmark and Taiwan) as the third important family socioeconomic variable. Overall, there was a close match between parental occupation and home literacy as to the third important family socioeconomic variable (parental occupation was the third important family socioeconomic variable in only a few more participating countries than home literacy). Both variables should be emphasized as the third important family socioeconomic variables that mattered to reading literacy. All in all, home literacy and parental occupation, in this order, were important family socioeconomic variables that mattered to reading literacy.

1.10 How Important Are Family Socioeconomic Variables to Reading Literacy?

Student (family) effects and school effects are both important to learning outcomes of students. Which type of effects is more influential to learning outcomes? To help address this issue, it is informative to partition variance in reading literacy into variance attributable to students (families) and variance attributable to schools. The former is a good indicator of student (family) effects for which family socioeconomic effects are a key component, and the latter is a good indicator of school effects. Appendix A presents this partition of variance. For example, in Jordan, students (families) were responsible for 67% of the variance in reading literacy, and schools were responsible for 33% of the variance in reading literacy.

Appendix A indicates that in Arab States, 1 out of the 3 participating countries had more variance at the student than school level. In Central and Eastern Europe, 8 out of the 15 participating countries had more variance at the student than school level. The 2 participating Central Asian countries both had more variance at the student than school level. In East Asia and

the Pacific, 7 out of the 9 participating countries had more variance at the student than school level. In Latin America and the Caribbean, 2 out of the 6 participating countries had more variance at the student than school level. Finally, in North America and Western Europe, 15 out of the 21 participating countries had more variance at the student than school level. Therefore, students (families) were more responsible for variance in reading literacy for the majority of the participating countries in each region (except Arab States and Latin America and the Caribbean).

Family socioeconomic variables are not the only variables that affect academic achievement in reading literacy at the student level. Other variables, such as gender, attitude, and career aspiration, may also affect academic achievement in reading literacy. To estimate how important family socioeconomic variables are to reading literacy, the proportion of variance explained by family socioeconomic variables was calculated (based on the combined analysis that incorporated all family socioeconomic variables into one analysis). Appendix B presents the proportion of variance in reading literacy accounted for by family socioeconomic variables. For example, in Jordan, 28% of the variance in reading literacy was explained by family socioeconomic variables (mainly by the 3 most important family socioeconomic variables reported earlier).

Appendix B indicates that family socioeconomic variables explained from 4% to 28% of the variance among the participating Arab States countries, from 16% to 32% of the variance among the participating Central and Eastern European countries, 8% and 18% of the variance in Azerbaijan and Kyrgyzstan (the participating Central Asian countries), from 5% to 26% of the variance among the participating East Asian and the Pacific countries, from 15% to 21% of the variance among the participating Latin American and the Caribbean countries, and from 15% to 35% of the variance among the participating North American and Western European countries.

In general, family socioeconomic variables were responsible for less than one third of the variance in reading literacy in all but one participating country. Therefore, family socioeconomic variables were moderately important to reading literacy.

2. Socioeconomic Differences in Mathematics Literacy

Mathematics literacy data were obtained from both PISA 2006 and TIMSS 2003 for the present analysis. PISA defines mathematics literacy as the ability to formulate and solve mathematical problems in situations encountered in life (see OECD, 2001). The TIMSS 2003 tests in mathematics (and science) were developed on the basis of the *TIMSS Assessment Frameworks and Specifications 2003* and contained questions requiring students to solve problems typical of common school mathematics (and science) curricula identified through an international consensus-building process. In both PISA and TIMSS, mathematics literacy was standardized scores with a mean of 500 points and a standard deviation of 100 points. There were 3 countries from Arab States, 15 countries from Central and Eastern Europe, 2 countries from Central Asia, 9 countries from East Asia and the Pacific, 6 countries from Latin America and the Caribbean, and 21 countries from North America and Western Europe in PISA 2006. There were 9 countries from Arab States, 12 countries from Central and Eastern Europe, 1 country from Central Asia, 10 countries from East Asia and the Pacific, 1 country from Latin America and the Caribbean, 10 countries from North America and Western Europe, 1 country from South and West Asia, and 3 countries from Sub-Saharan Africa in TIMSS 2003. For each international student assessment, data analysis of socioeconomic differences in mathematics literacy was conducted at the country level, and comparative interpretation of analytical results was carried out at the regional level (with regions defined above following the UNESCO categorization).

2.1. Effects of Socioeconomic Status on Mathematics Literacy

Part of Table 1 presents socioeconomic differences in mathematics literacy associated with socioeconomic status (SES) that combines parental occupation, parental education, and home possession. It is evident from the table that SES had significant positive effects on mathematics literacy in all participating countries except Azerbaijan. Students of parents with high SES demonstrated higher mathematics literacy than students of parents with low SES. Similar to the case of reading literacy, the SES effects in Table 1 (and also other upcoming tables) were transformed into effect size measures for interpretation.

All participating Arab States countries showed small SES effects on mathematics literacy (from 0.21 to 0.27 SD). Participating Central and Eastern European countries highlighted Czech Republic as having large SES effects (0.54 SD) and Montenegro as having small SES effects (0.27 SD). The remaining 13 participating countries from this region showed moderate SES effects (from 0.31 to 0.47 SD). In Central Asia, Azerbaijan showed no significant SES effects, whereas Kyrgyzstan showed moderate SES effects (0.33 SD). Among the participating countries from East Asia and the Pacific, 5 of them showed moderate SES effects (from 0.38 to 0.46 SD). New Zealand and Taiwan were representative of this category with SES effects above 0.40 SD. The other 4 participating countries showed small SES effects (from 0.14 to 0.28 SD). Macao was representative of this category with SES effects below 0.20 SD. Among the participating countries from Latin America and the Caribbean, Argentina, Chile, Uruguay, and Brazil showed moderate SES effects (from 0.32 to 0.38 SD), whereas Mexico and Colombia showed small SES effects (0.26 SD). Participating countries from North America and Western Europe highlighted France as having large SES effects (0.51 SD). On the other hand, Iceland, Italy, Portugal,

Canada, and Spain showed small SES effects (from 0.28 to 0.30 SD). The other 17 participating countries showed moderate SES effects (from 0.33 to 0.49 SD).

In summary, there was a common pattern across participating regions. The majority (at very least half) of the participating countries showed moderate SES effects on mathematics literacy across all participating regions except Arab States where participating countries showed small SES effects.

Similar to the case of reading literacy, the SES effects on mathematics literacy reported above can be graphed for a visual illustration of the SES effects. These SES gradients of mathematics literacy did not represent any additional analyses but a visual illustration of the mathematics literacy part of Table 1. Figures 2.1 to 2.12 present the SES gradients of mathematics literacy across regions.

 insert Figures 2.1 to 2.12 about here

2.2. Effects of Parental Occupation on Mathematics Literacy

Similar to the case of reading literacy, components of SES (parental occupation, parental education, and home possession) were examined to investigate the effects of these distinct socioeconomic aspects on mathematics literacy. Part of Table 2 presents socioeconomic differences in mathematics literacy associated with parental occupation. It is evident from the table that parental occupation had significant positive effects on mathematics literacy in all participating countries except Azerbaijan. Students of parents of high prestigious occupations outperformed students of parents of low prestigious occupations in mathematics literacy. Nevertheless, the effects of parental occupation on mathematics literacy were small across all

countries in all regions. This conclusion represents a global (unified) pattern of small parental occupational effects on mathematics literacy.

2.3. Effects of Parental Education on Mathematics Literacy

Part of Table 3 presents socioeconomic differences in mathematics literacy associated with parental education. It is evident from the table that parental education had significant positive effects on mathematics literacy in all participating countries. Students of more educated parents demonstrated higher mathematics literacy than students of less educated parents. Nevertheless, the effects of parental education on mathematics literacy were small across all countries in all regions, indicating a global (unified) pattern of small parental educational effects on mathematics literacy. Note that parental occupation and parental education demonstrated quite similar global patterns of effects on mathematics literacy.

Parental education data were also available from TIMSS 2003. Part of Table 10 presents TIMSS results on socioeconomic differences in mathematics literacy associated with parental education. Note that parental education data were completely comparable between PISA and TIMSS. Given that PISA and TIMSS also shared a common measurement system for mathematics literacy, Tables 1 and 10 can be directly compared. It is evident from Table 10 that parental education had significant positive effects on mathematics literacy in all participating countries. Although such a finding indicates that students of more educated parents outperformed students of less educated parents in mathematics literacy, the effects of parental education on mathematics literacy were small across all countries in all regions. As a matter of fact, analytical results between PISA and TIMSS were amazingly consistent. For example, if two students have parents with their education one year apart in Jordan, the student with more educated parents would score 6 points higher in PISA mathematics literacy and 8 points higher in TIMSS

mathematics literacy than the student with less educated parents. Therefore, the global (unified) pattern of small parental educational effects on mathematics literacy generated earlier was cross-validated between PISA and TIMSS.

 insert Table 10 about here

2.4. Effects of Family Possession on Mathematics Literacy

Part of Table 4 presents socioeconomic differences in mathematics literacy associated with family possession. It is evident from the table that family possession had significant positive effects on mathematics literacy in all participating countries except Azerbaijan. Students from families with more possession outperformed students from families with less possession in mathematics literacy.

All participating Arab States countries demonstrated small effects of family possession on mathematics literacy (from 0.10 to 0.26 SD). Five participating Central and Eastern European countries showed moderate effects (from 0.33 to 0.41 SD). Bulgaria was representative of this category with effects above 0.40 SD. The remaining 10 participating countries from this region showed small effects (from 0.18 to 0.28 SD). Montenegro was representative of this category with effects below 0.20 SD. As to Central Asia, Azerbaijan showed no significant effects of family possession, whereas Kyrgyzstan showed small effects (0.23 SD). Among the participating countries from East Asia and the Pacific, Korea, Taiwan, and New Zealand showed moderate effects (from 0.31 to 0.35 SD). The other 6 participating countries showed small effects (from 0.15 to 0.27 SD). Macao was representative of this category with effects below 0.20 SD. Among the participating countries from Latin America and the Caribbean, 4 of them showed moderate

effects (from 0.35 to 0.41 SD). Argentina was representative of this category with effects above 0.40 SD. Mexico and Colombia showed small effects (0.25 SD and 0.26 SD). In the region of North America and Western Europe, 9 participating countries showed moderate effects (from 0.31 to 0.43 SD). Belgium was representative of this category with effects above 0.40 SD. The remaining 13 participating countries showed small effects (from 0.10 to 0.30 SD). Iceland, Norway, and Canada were representative of this category with effects below 0.20 SD.

In summary, the majority of the participating countries showed small effects of family possession on mathematics literacy across almost all participating regions. The only exception was Latin America and the Caribbean where family possession showed moderate effects in the majority of the participating countries.

2.5. What Aspect of Socioeconomic Status Matters the Most to Mathematics Literacy?

Similar to the case of reading literacy, to discern the most important aspect of SES to mathematics literacy, the 3 aspects of SES were analyzed together and standardized effects were obtained to allow direct comparison of the effects of the 3 aspects of SES. Part of Table 5 presents results that address the issue of what aspect of SES matters the most to mathematics literacy. Parental education was the most important SES component in all 3 participating Arab States countries. In Central and Eastern Europe, parental occupation was the most important SES component in 9 out of the 15 participating countries, family possession was the most important SES component in 4 out of the 15 participating countries, and parental education was the most important SES component in 2 out of the 15 participating countries. Among the 2 countries from Central Asia, none of the SES components was important in Azerbaijan, whereas family possession was the most important SES component in Kyrgyzstan. As far as East Asia and the Pacific is concerned, family possession was the most important SES component in 5 out of the 9

participating countries, parental occupation was the most important SES component in 2 out of the 9 participating countries, and parental education was the most important SES component in 2 out of the 9 participating countries. Family possession was the most important SES component in 5 out of the 6 participating countries from Latin America and the Caribbean, whereas parental occupation was the most important SES component in Chile. Finally, parental occupation was the most important SES component in 19 out of the 22 participating countries from North America and Western Europe, family possession was the most important SES component in 2 out of the 22 participating countries, and parental education was the most important SES component in Iceland.

Some patterns from the above interpretation of the analytical results can be identified. Parental occupation was the most important SES component and mattered the most to mathematics literacy, particularly in relatively more developed regions such as Central and Eastern Europe as well as North America and Western Europe. On the other hand, family possession was the most important SES component and mattered the most to mathematics literacy, particularly in relatively less developed regions such as East Asia and the Pacific as well as Latin America and the Caribbean. Uniquely, parental education was the most important SES component and mattered the most to mathematics literacy in all participating Arab States countries. Overall, parental occupation was the most important SES component and mattered the most to mathematics literacy.

When the next (second) important SES component to mathematics literacy was sought, parental education was the second important SES component in 2 out of the 3 participating Arab States countries, and family possession was the second important SES component in Tunisia. In Central and Eastern Europe, family possession was the second important SES component in 8

out of the 15 participating countries, parental occupation was the second important SES component in 5 out of the 15 participating countries, and parental education was the second important SES component in 2 out of the 15 participating countries. Among the 2 countries from Central Asia, none of the SES components was important in Azerbaijan, whereas parental occupation was the second important SES component in Kyrgyzstan. As far as East Asia and the Pacific is concerned, family possession was the second important SES component in 3 out of the 9 participating countries, parental occupation was the second important SES component in 3 out of the 9 participating countries, and parental education was the second important SES component in 3 out of the 9 participating countries. In Latin America and the Caribbean, parental occupation was the second important SES component in 4 out of the 6 participating countries, family possession was the second important SES component in Chile, and parental education was the second important SES component in Mexico. Finally, in North America and Western Europe, family possession was the second important SES component in 16 out of the 22 participating countries, parental occupation was the second important SES component in 3 out of the 22 participating countries, and parental education was the second important SES component in 3 out of the 22 participating countries.

Based on the above interpretation of the analytical results, family possession was the second important SES component that mattered to mathematics literacy (in 29 participating countries), followed in far distance by parental occupation (in 12 participating countries) and parental education (in 11 participating countries) as the second important SES component. To some extent, there is a switch of pattern in most participating countries: family possession was the second important SES component in relatively more developed regions, whereas parental occupation was the second important SES component in relatively less developed regions.

Interestingly, as many as 15 participating countries did not witness the third important SES component at all. For those 42 participating countries with the third important SES component, parental education appeared most often (in 29 participating countries).

2.6. Effects of Restricted Family Possession on Mathematics Literacy

Part of Table 6 presents socioeconomic differences in mathematics literacy associated with restricted family possession. It is evident from the table that restricted family possession had significant positive effects on mathematics literacy in all participating countries except Azerbaijan and Liechtenstein. Students from families with more restricted possession outperformed students from families with less restricted possession in mathematics literacy. Furthermore, the effects of restricted family possession on mathematics literacy were large across all participating countries in all participating regions, indicating a global (unified) pattern of the importance of some basic or necessary family possession items closely related to learning (i.e., desk, computer, calculator, and dictionary).

Data on restricted family possession were also available from TIMSS 2003. Part of Table 11 presents TIMSS results on socioeconomic differences in mathematics literacy associated with restricted family possession. Because data on restricted family possession were completely comparable between PISA and TIMSS and the 2 international student assessments shared a common measurement system for mathematics literacy, Tables 6 and 11 can be directly compared. It is evident from Table 11 that restricted family possession had significant positive effects on mathematics literacy in all participating countries. Furthermore, the effects of restricted family possession on mathematics literacy were large across all participating countries in all participating regions except two participating countries, Morocco and Ghana, with moderate effects at 0.33 SD and 0.46 SD. Overall, the global (unified) pattern reported earlier

was cross-validated between PISA and TIMSS even though the same country might have different effects between PISA and TIMSS. Of course, there is no reason to expect similar effects between PISA and TIMSS results because they define (and thus measure) mathematics literacy differently. The facts that almost all participating countries showed significant effects and that almost all effects were large across PISA and TIMSS are strong enough evidence to cross-validate the reported pattern.

 insert Table 11 about here

2.7. Effects of Home Literacy on Mathematics Literacy

Part of Table 7 presents socioeconomic differences in mathematics literacy associated with home literacy. In the case of having 11 to 100 books at home, it is evident from the table that it had significant positive effects on mathematics literacy in all participating countries (except Azerbaijan and Liechtenstein). Students from families having 11 to 100 books demonstrated higher mathematics literacy than students from families having no more than 10 books.

Among the participating countries from Arab States, Jordan demonstrated small effects of home literacy on mathematics literacy (0.23 SD), whereas Qatar and Tunisia demonstrated moderate effects (0.37 SD and 0.36 SD). Central and Eastern Europe highlighted 4 participating countries as having large effects (from 0.51 to 0.91 SD). Slovak Republic and Czech Republic were representative of this category with effects above 0.70 SD. On the other hand, Russian Federation showed small effects (0.28). The remaining 10 participating countries showed moderate effects (from 0.33 to 0.50 SD). As to Central Asia, Azerbaijan showed no significant

effects, and Kyrgyzstan showed small effects (0.29 SD). Among the participating countries from East Asia and the Pacific, Taiwan and Korea had large effects (0.77 SD and 0.76 SD), whereas Indonesia, Macao, and Thailand had small effects (from 0.10 to 0.20 SD). The other 4 participating countries showed moderate effects (from 0.39 to 0.47 SD). Among the participating countries from Latin America and the Caribbean, Argentina had large effects (0.57 SD), whereas Brazil showed small effects (0.30 SD). The other 4 participating countries had moderate effects (from 0.32 to 0.49 SD). In the region of North America and Western Europe, there were no significant effects in Liechtenstein, but 7 participating countries showed large effects (from 0.52 to 0.71 SD). Austria was representative of this category with effects above 0.70 SD. The remaining 14 participating countries had moderate effects (from 0.31 to 0.49 SD).

In summary, the majority of the participating countries from Central and Eastern Europe, East Asia and the Pacific, Latin America and the Caribbean, and North America and Western Europe showed at least moderate effects of home literacy on mathematics literacy. In contrast, participating countries from both Arab States and Central Asia showed small effects.

In the case of having more than 101 books at home (see Table 7), it is evident from the table that it had significant positive effects on mathematics literacy in all participating countries. Students from families having more than 101 books demonstrated higher mathematics literacy than students from families having no more than 10 books.

Among participating countries from Arab States, Tunisia demonstrated large effects of home literacy on mathematics literacy (0.93 SD), whereas Jordan and Qatar demonstrated moderate effects (0.45 SD and 0.43 SD). All participating countries from Central and Eastern Europe demonstrated large effects (from 0.71 to 1.43 SD). Slovak Republic, Czech Republic, Bulgaria, Hungary, Slovenia, and Lithuania were representative with effects above 1.00 SD. The

2 countries from Central Asia had different effects of home literacy, with Kyrgyzstan having large effects (0.92 SD) and Azerbaijan having small effects (0.15 SD). Among the participating countries from East Asia and the Pacific, 7 participating countries demonstrated large effects (from 0.59 to 1.25 SD). Korea and Taiwan were representative of this category, having effects above 1.00 SD. Macao and Indonesia demonstrated moderate effects (0.31 SD and 0.32 SD). All participating countries from Latin America and the Caribbean demonstrated large effects (from 0.68 to 1.10 SD). Argentina and Chile were representative with effects above 1.00 SD. All participating countries from North America and Western Europe demonstrated large effects (from 0.71 to 1.34 SD). Note that 9 participating countries demonstrated effects above 1.00 SD with Germany and Austria leading the way, having effects above 1.30 SD.

In summary, small effects on mathematics literacy associated with having more than 101 books at home were extremely rare with Azerbaijan as the only case. Even moderate effects were uncommon, scattered only in a couple of countries (Indonesia, Jordan, Macao, and Qatar). All other participating countries demonstrated large effects. In particular, all participating countries from Central and Eastern Europe, Latin America and the Caribbean, and North America and Western Europe demonstrated large effects.

Data on home literacy were also available from TIMSS 2003. Part of Table 12 presents TIMSS results on socioeconomic differences in mathematics literacy associated with home literacy. In the case of having 11 to 100 books at home, it is evident from the table that it had significant positive effects on mathematics literacy in all participating countries (except Morocco and Indonesia).

Participating Arab States countries highlighted Morocco as having no significant effects of home literacy on mathematics literacy and Lebanon as having moderate effects (0.35 SD). The

remaining 7 participating countries demonstrated small effects (from 0.14 to 0.29 SD). Central and Eastern Europe highlighted 4 participating countries as having large effects (from 0.52 to 0.74 SD). Hungary and Slovak Republic were representative of this category with effects above 0.70 SD. On the other hand, Bulgaria and Moldova showed small effects (0.26 SD and 0.28 SD). The remaining 6 participating countries showed moderate effects (from 0.38 to 0.44 SD). Armenia from Central Asia showed moderate effects (0.34 SD). Among the participating countries from East Asia and the Pacific, Taiwan and Singapore had large effects (0.63 SD and 0.53 SD), whereas Indonesia had no significant effects at all and Hong Kong had small effects (0.29 SD). The other 6 participating countries showed moderate effects (from 0.32 to 0.46 SD). Chile from Latin America and the Caribbean had moderate effects (0.44 SD). In the region of North America and Western Europe, Israel showed small effects (0.19 SD). The other 9 participating countries showed moderate effects (from 0.31 to 0.50 SD). Cyprus, Belgium, Norway, and Netherlands were representative of this category with effects above 0.45 SD. Iran from South and West Asia showed moderate effects (0.32 SD). All participating countries from Sub-Saharan Africa (Ghana, Botswana, and South Africa) showed small effects (from 0.15 SD and 0.22 SD).

 insert Table 12 about here

In summary, the majority of the participating countries from Central and Eastern Europe, East Asia and the Pacific, and North America and Western Europe showed at least moderate effects of home literacy on mathematics literacy. The single participating country from each region of Central Asia, Latin America and the Caribbean, and South and West Asia also showed

at least moderate effects of home literacy. In contrast, participating countries from both Arab States and Sub-Saharan Africa showed small effects.

In the case of TIMSS results regarding having more than 101 books at home, it is evident from Table 12 that it had significant positive effects on mathematics literacy in all participating countries except Morocco. Students from families having more than 101 books demonstrated higher mathematics literacy than students from families having no more than 10 books.

Among participating countries from Arab States, Tunisia, Jordan, and Lebanon showed large effects of home literacy on mathematics literacy (0.59 SD), whereas Morocco showed no significant effects at all. The remaining 5 participating countries showed moderate effects (from 0.31 to 0.43 SD). All participating countries from Central and Eastern Europe showed large effects (from 0.55 to 1.35 SD). Hungary and Slovak Republic were representative with effects above 1.00 SD. Armenia from Central Asia showed large effects (0.59 SD). Among the participating countries from East Asia and the Pacific, 8 participating countries showed large effects (from 0.54 to 1.09 SD). Taiwan was representative of this category with effects above 1.00 SD. On the other hand, Philippines and Indonesia showed moderate effects (0.34 SD and 0.38 SD). Chile from Latin America and the Caribbean showed large effects (1.06 SD). All participating countries from North America and Western Europe showed large effects (from 0.56 to 1.00 SD). Scotland and England were representative, having effects above 0.95 SD. Iran from South and West Asia showed large effects (0.76 SD). In the region of Sub-Saharan Africa, Ghana showed small effects (0.13 SD), whereas South Africa and Botswana showed large effects (0.75 SD and 0.52 SD).

In summary, similar to the case of PISA, null or small effects on mathematics literacy associated with having more than 101 books at home were extremely rare (Morocco and Ghana).

Even moderate effects were not common, coming mainly from the region of Arab States (5 participating countries). The majority of the participating countries from East Asia and the Pacific and Sub-Saharan Africa showed large effects. Furthermore, all participating countries from Central and Eastern Europe and North America and Western Europe showed large effects. The single participating country from each region of Central Asia, Latin America and the Caribbean, and South and West Asia also showed large effects.

2.8. Effects of Family Size on Mathematics Literacy

Part of Table 13 presents TIMSS results on socioeconomic differences in mathematics literacy associated with family size. In the region of Arab States, Bahrain and Saudi Arabia did not show any significant effects at all, whereas 6 participating countries showed negative small effects of family size on mathematics literacy (from -0.02 to -0.11 SD), indicating that students from small families outperformed students from large families in mathematics literacy. Lebanon was representative of this category (-0.11 SD). The positive small effects from Palestinian A. T. were rather rare (0.02 SD), indicating that students from large families outperformed students from small families in mathematics literacy. In the region of Central and East Europe, Estonia, Slovak Republic, and Slovenia did not show any significant effects at all, whereas the remaining 9 participating countries showed negative small effects (from -0.04 to -0.12 SD). Macedonia and Romania were representative of this category (-0.12 SD). Armenia from Central Asia showed negative small effects (-0.05 SD). In the region of East Asia and the Pacific, Indonesia, Japan, and Philippines did not show any significant effects at all, whereas the remaining 7 participating countries showed negative small effects (from -0.02 to -0.07 SD). Chile from Latin America and the Caribbean showed negative small effects (-0.05 SD). In the region of North America and Western Europe, Netherlands, Norway, and Scotland did not show any significant effects at all,

whereas the remaining 7 participating countries showed negative small effects (from -0.02 to -0.07 SD). Iran from South and West Asia showed negative small effects (-0.13 SD). All participating Sub-Saharan African countries showed significant effects, with Botswana and South Africa showing negative small effects (-0.04 SD and -0.08 SD) and Ghana showing positive small effects (0.02 SD).

 insert Table 13 about here

In summary, the effects of family size on mathematics literacy did not exist in quite a few participating countries. When the effects of family size did exist, they were negative and small in the vast majority of the participating countries. Rare positive (and small) effects were found only in Palestinian A. T. and Ghana.

2.9. Effects of Home Language on Mathematics Literacy

Part of Table 8 presents socioeconomic differences in mathematics literacy associated with home language. Considerable variation both within and between regions was observed in the table. Positive effects indicate that students speaking the language of the test outperformed students speaking languages other than the language of the test in mathematics literacy. Negative effects indicate that students speaking languages other than the language of the test outperformed students speaking the language of the test in mathematics literacy.

In the region of Arab States, Jordan did not show any significant effects of home language on mathematics literacy, Tunisia showed significant negative (small) effects (-0.20 SD), and Qatar showed significant negative (moderate) effects (-0.33 SD). In the region of Central and Eastern Europe, Poland, Romania, and Serbia did not show any significant effects,

whereas the majority (12 out of 15) of the participating countries showed significant positive effects. Bulgaria and Hungary showed large effects (0.81 SD and 0.62 SD). On the other hand, 4 participating countries showed small effects (from 0.13 to 0.27 SD). Estonia and Latvia were representative of this category with effects below 0.20 SD. The remaining 6 participating countries showed moderate effects (0.35 SD and 0.50 SD). In the region of Central Asia, Azerbaijan showed significant negative (small) effects (-0.14 SD), and Kyrgyzstan showed significant negative (moderate) effects (-0.34 SD). In the region of East Asia and the Pacific, Australia, Indonesia, Macao, and New Zealand did not show any significant effects, whereas the remaining 5 participating countries showed significant positive effects. Japan and Korea showed large effects (1.02 SD and 0.91 SD), Taiwan and Hong Kong showed moderate effects (0.50 SD), and Thailand showed small effects (0.25 SD). In the region of Latin America and the Caribbean, Argentina, Chile, and Colombia did not show any significant effects, whereas the remaining 3 participating countries showed significant effects. Brazil showed negative large effects (-0.67 SD), Mexico showed positive large effects (0.63 SD), and Uruguay showed positive moderate effects (0.32 SD). In the region of North American and Western Europe, Israel, Luxembourg, and Portugal did not show any significant effects, whereas the majority (19 out of 22) of the participating countries showed significant positive effects. This region highlighted 11 participating countries as having large effects (from 0.51 to 0.88 SD). Liechtenstein and Germany were representative of this category with effects above 0.80 SD. On the other hand, 4 participating countries showed small effects (from 0.09 to 0.28 SD). Canada was representative of this category with effects below 0.10 SD. The remaining 4 participating countries showed moderate effects (from 0.34 to 0.45 SD).

In summary, the effects of home language on mathematics literacy did not exist in quite a few participating countries across 5 regions (Arab States, Central and Eastern Europe, East Asia and the Pacific, Latin America and the Caribbean, and North America and Western Europe). Among the participating countries with significant effects, Central and Eastern Europe, East Asia and the Pacific, and North America and Western Europe shared a similar pattern. The majority of the participating countries showed significant positive effects in these regions, and there were much more participating countries showing large and moderate effects than small effects in each region. Negative effects were found scattered in a couple of participating countries (Azerbaijan, Brazil, Kyrgyzstan, Qatar, and Tunisia). There are a couple of reasonable speculations. It is possible that the official language (the language of the test) may not be the language that most people speak daily, as in the case of Kyrgyzstan (see discussion in the case of reading literacy). It is also possible that higher achieving students in mathematics are immigrant students who do not speak the language of the test, as in the case of United States (see Fuligni, 1997). Finally, the considerable variation both within and between regions is what separates the effects of home language from the effects of other family socioeconomic variables on mathematics literacy.

Part of Table 14 presents TIMSS results on socioeconomic differences in mathematics literacy associated with home language. In the region of Arab States, Bahrain, Jordan, Morocco, Syria, and Tunisia did not show any significant effects of home language on mathematics literacy, Egypt showed significant negative (small) effects (-0.07 SD), and Palestinian A. T. and Lebanon showed significant positive (small) effects (0.08 SD and 0.11 SD). In the region of Central and Eastern Europe, all participating countries showed significant positive effects except Lithuania that did not show any significant effects. This region highlighted 5 participating countries with moderate effects (from 0.33 to 0.43 SD). Slovenia was representative of this

category with effects above 0.40 SD. The remaining 6 countries showed small effects (from 0.14 to 0.29 SD). Armenia from Central Asia showed significant positive (small) effects (0.20 SD). In the region of East Asia and the Pacific, all participating countries showed significant effects except Indonesia and Philippines that did not show any significant effects. Korea, Hong Kong, and Taiwan showed positive large effects (from 0.58 to 0.70 SD), and Japan and Singapore showed positive moderate effects (0.37 SD and 0.34 SD). On the other hand, Malaysia showed negative large effects (-0.51 SD), Australia showed negative moderate effects (-0.40 SD), and New Zealand showed negative small effects (-0.22 SD). Chile from Latin America and the Caribbean showed significant positive (moderate) effects (0.48 SD). In the region of North America and Western Europe, all participating countries showed significant positive effects except England that did not show any significant effects. Netherlands, Belgium, and Italy showed large effects (from 0.53 to 0.60 SD), whereas Israel and Cyprus showed small effects (0.12 SD and 0.25 SD). The remaining 4 participating countries showed moderate effects (from 0.37 to 0.50 SD). Iran from South and West Asia showed significant positive (moderate) effects (0.33 SD). In the region of Sub-Saharan Africa, Ghana did not show any significant effects, Botswana showed significant positive (small) effects (0.30 SD), and South Africa showed significant positive (large) effects (0.73 SD).

 insert Table 14 about here

In summary, although null effects of home language on mathematics literacy were found in several participating countries (Bahrain, England, Ghana, Indonesia, Jordan, Lithuania, Morocco, Philippines, Syria, and Tunisia) and so were large effects (Belgium, Korea, Hong

Kong, Malaysia, Netherlands, Italy, South Africa, and Taiwan), small and moderate effects were far more common across all participating regions. Negative effects were found scattered in a couple of participating countries (Australia, Egypt, Malaysia, and New Zealand). Finally, the considerable variation both within and between regions is what separates the effects of home language from the effects of other family socioeconomic variables on mathematics literacy in TIMSS.

2.10. What Family Socioeconomic Variables Matter the Most to Mathematics Literacy?

Part of Table 9 presents the results that discern the most important family socioeconomic variables to mathematics literacy. The 3 participating Arab States countries showed inconsistent results regarding the most important family socioeconomic variable (parental education for Jordan, home literacy referring to having 11 to 100 books at home for Qatar, and parental occupation for Tunisia). Home literacy was the most important family socioeconomic variable in all Central and Eastern European countries except Croatia where parental occupation was the most important family socioeconomic variable and Turkey where family possession was the most important family socioeconomic variable. Home literacy was also the most important family socioeconomic variable in both Azerbaijan and Kyrgyzstan in Central Asia. Home literacy was the most important family socioeconomic variable in all participating East Asian and the Pacific countries except Indonesia, Macao, and Thailand where family possession was the most important family socioeconomic variable. Family possession was the most important family socioeconomic variable in all participating Latin American and the Caribbean countries except Chile where parental occupation was the most important family socioeconomic variable. Home literacy was the most important family socioeconomic variable in all participating North American and Western European countries except Liechtenstein where home language was the

most important family socioeconomic variable and Portugal where parental occupation was the most important family socioeconomic variable.

Overall, home literacy was the most important family socioeconomic variable that mattered the most to mathematics literacy (in 43 participating countries) (referring to having 11 to 100 books at home for Qatar), followed in far distance by family possession (in 9 participating countries). Scattered in a couple of participating countries was parental occupation as the most important family socioeconomic variable (Chile, Croatia, Portugal, and Tunisia). Parental education was an isolated case only in Jordan; so was home language only in Liechtenstein. It is also clear that participating countries where family possession was the most important family socioeconomic variable were all relatively less developed countries, whereas in the vast majority of relatively more developed participating countries, home literacy was the most important family socioeconomic variable. In conclusion, home literacy was the most important family socioeconomic variable that mattered the most to mathematics literacy.

The 3 participating Arab States countries showed inconsistent results regarding the next (second) important family socioeconomic variable (parental occupation for Jordan, parental education for Qatar, and family possession for Tunisia). In the region of Central and Eastern Europe, home literacy was the second important family socioeconomic variable in 8 out of the 15 participating countries (referring to having 11 to 100 books at home in 6 participating countries), parental occupation was the second important family socioeconomic variable in 6 out of the 15 participating countries, and parental education was the second important family socioeconomic variable in Hungary. In the region of Central Asia, home language was the second important family socioeconomic variable in Azerbaijan, and parental occupation was the second important family socioeconomic variable in Kyrgyzstan. In the region of East Asia and the Pacific, parental

occupation was the second important family socioeconomic variable in 4 out of the 9 participating countries, home literacy was the second important family socioeconomic variable in 4 out of the 9 participating countries (referring to having 11 to 100 books at home in 3 participating countries), and parental education was the second important family socioeconomic variable in Japan. In the region of Latin America and the Caribbean, parental occupation was the second important family socioeconomic variable in 3 out of the 6 participating countries, home literacy was the second important family socioeconomic variable in 2 out of the 6 participating countries, and parental education was the second important family socioeconomic variable in Mexico. In the region of North America and Western Europe, parental occupation was the second important family socioeconomic variable in 14 out of the 22 participating countries, and home literacy was the second important family socioeconomic variable in 8 out of the 22 participating countries (referring to having 11 to 100 books at home in 6 participating countries).

Overall, parental occupation was the second important family socioeconomic variable in 29 participating countries, and home literacy was the second important family socioeconomic variable in 20 participating countries (referring to having 11 to 100 books at home in 15 participating countries). Scattered in a couple of participating countries was parental education as the second important family socioeconomic variable (Hungary, Japan, Mexico, and Qatar). Family possession was an isolated case only in Tunisia; so was home language only in Azerbaijan. In conclusion, parental occupation was the second important family socioeconomic variable that mattered to mathematics literacy.

In the region of Arab States, home literacy was the third important family socioeconomic variable for Qatar and Tunisia, whereas family possession was the third important family socioeconomic variable for Jordan. In the region of Central and Eastern Europe, home literacy

(referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 7 out of the 15 participating countries, parental occupation was the third important family socioeconomic variable in 7 out of the 15 participating countries, and parental education was the third important family socioeconomic variable in Poland. In the region of Central Asia, parental education was the third important family socioeconomic variable in Azerbaijan, and family possession was the third important family socioeconomic variable in Kyrgyzstan. In the region of East Asia and the Pacific, parental education was the third important family socioeconomic variable in 4 out of the 9 participating countries, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 3 out of the 9 participating countries, home language was the third important family socioeconomic variable in Hong Kong, and family possession was the third important family socioeconomic variable in Korea. In the region of Latin America and the Caribbean, parental occupation was the third important family socioeconomic variable in 2 out of the 6 participating countries, home literacy was the third important family socioeconomic variable in 2 out of the 6 participating countries (referring to having 11 to 100 books at home in 1 participating country), parental education was the third important family socioeconomic variable in Brazil, and family possession was the third important family socioeconomic variable in Chile. In the region of North America and Western Europe, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 13 out of the 22 participating countries, parental occupation was the third important family socioeconomic variable in 6 out of the 22 participating countries, parental education was the third important family socioeconomic variable in Greece and Iceland, and family possession was the third important family socioeconomic variable in Portugal.

Overall, home literacy was the third important family socioeconomic variable in 27 participating countries (referring to having 11 to 100 books at home in 24 participating countries), parental occupation was the third important family socioeconomic variable in 15 participating countries, parental education was the third important family socioeconomic variable in 9 participating countries, and family possession was the third important family socioeconomic variable in 5 participating countries. Home language was an isolated case only in Hong Kong. In conclusion, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable that mattered to mathematics literacy.

Part of Table 15 presents TIMSS results on the top 3 important family socioeconomic variables that matter to mathematics literacy. Note that Tables 9 and 15 cannot be directly compared because PISA does not have family size as a family socioeconomic variable and TIMSS does not have parental occupation and family possession as family socioeconomic variables (restricted family possession replaces family possession in this case).

 insert Table 15 about here

Parental education was the most important family socioeconomic variable in all participating Arab States except Jordan where restricted family possession was the most important family socioeconomic variable. In the region of Central and Eastern Europe, home literacy was the most important family socioeconomic variable in 8 out of the 12 participating countries, parental education was the most important family socioeconomic variable in 3 out of the 12 participating countries, and restricted family possession was the most important family socioeconomic variable in Romania. Home literacy was the most important family

socioeconomic variable in Armenia in Central Asia. In the region of East Asia and the Pacific, home literacy was the most important family socioeconomic variable in 8 out of the 10 participating countries, restricted family possession was the most important family socioeconomic variable in Indonesia, and parental education was the most important family socioeconomic variable in Philippines. Parental education was the most important family socioeconomic variable in Chile in Latin America and the Caribbean. In the region of North America and Western Europe, home literacy was the most important family socioeconomic variable in 7 out of the 10 participating countries, parental education was the most important family socioeconomic variable in Belgium and Israel, and restricted family possession was the most important family socioeconomic variable in Cyprus. Home literacy was the most important family socioeconomic variable in Iran in South and West Asia. In the region of Sub-Saharan Africa, restricted family possession was the most important family socioeconomic variable in Botswana and Ghana, and home language was the most important family socioeconomic variable in South Africa.

Overall, home literacy was the most important family socioeconomic variable that mattered the most to mathematics literacy (in 25 participating countries), followed by parental education (in 15 participating countries) and restricted family possession (in 6 participating countries). Home language was an isolated case only in South Africa. Therefore, home literacy was the most important family socioeconomic variable that mattered the most to mathematics literacy.

In the region of Arab States, restricted family possession was the second important family socioeconomic variable in 6 out of the 9 participating countries, and parental education was the second important family socioeconomic variable in 3 out of the 9 participating countries. In the

region of Central and Eastern Europe, parental education was the second important family socioeconomic variable in 6 out of the 12 participating countries, and home literacy was the second important family socioeconomic variable in 6 out of the 12 participating countries (referring to having 11 to 100 books at home in 3 participating countries). Restricted family possession was the second important family socioeconomic variable in Armenia in Central Asia. In the region of East Asia and the Pacific, parental education was the second important family socioeconomic variable in 5 out of the 10 participating countries, home literacy (referring to having 11 to 100 books at home) was the second important family socioeconomic variable in 3 out of the 10 participating countries, home language was the second important family socioeconomic variable in Hong Kong, and restricted family possession was the second important family socioeconomic variable in Philippines. Home literacy was the second important family socioeconomic variable in Chile in Latin America and the Caribbean. In the region of North America and Western Europe, parental education was the second important family socioeconomic variable in 5 out of the 10 participating countries, and home literacy was the second important family socioeconomic variable in 5 out of the 10 participating countries (referring to having 11 to 100 books at home in 2 participating countries). Parental education was the second important family socioeconomic variable in Iran in South and West Asia. In the region of Sub-Saharan Africa, parental education was the second important family socioeconomic variable in Ghana and South Africa, and home literacy was the second important family socioeconomic variable in Botswana.

Overall, parental education was the second important family socioeconomic variable (in 22 participating countries), followed by home literacy (in 16 participating countries) and restricted family possession (in 8 participating countries). Home language was an isolated case

only in Hong Kong. Therefore, parental education was the second important family socioeconomic variable that mattered to mathematics literacy.

In the region of Arab States, 3 participating countries did not have the third important family socioeconomic variable. Home literacy was the third important family socioeconomic variable in 3 out of the 9 participating countries (referring to having 11 to 100 books at home in 1 participating country), restricted family possession was the third important family socioeconomic variable in 2 out of the 9 participating countries, and in Palestinian A. T. family size was the third important family socioeconomic variable. In the region of Central and Eastern Europe, home literacy was the third important family socioeconomic variable in 5 out of the 12 participating countries (referring to having 11 to 100 books at home in 4 participating countries), restricted family possession was the third important family socioeconomic variable in 4 out of the 12 participating countries, parental education was the third important family socioeconomic variable in 2 out of the 12 participating countries, and family size was the third important family socioeconomic variable in Moldova. Home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in Armenia in Central Asia. In the region of East Asia and the Pacific, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 5 out of the 10 participating countries, parental education was the third important family socioeconomic variable in 3 out of the 10 participating countries, home language was the third important family socioeconomic variable in Indonesia, and restricted family possession was the third important family socioeconomic variable in Malaysia. Restricted family possession was the third important family socioeconomic variable in Chile in Latin America and the Caribbean. In the region of North America and Western Europe, home literacy (referring to having 11 to 100 books at home) was the third

important family socioeconomic variable in 6 out of the 10 participating countries, parental education was the third important family socioeconomic variable in 3 out of the 10 participating countries, and restricted family possession was the third important family socioeconomic variable in Israel. Family size was the third important family socioeconomic variable in Iran in South and West Asia. In the region of Sub-Saharan Africa, parental education was the third important family socioeconomic variable in Botswana, family size was the third important family socioeconomic variable in Ghana, and restricted family possession was the third important family socioeconomic variable in South Africa.

Overall, home literacy (referring to having 11 to 100 books at home in most cases) was the third important family socioeconomic variable (in 20 participating countries), followed by restricted family possession (in 10 participating countries) and parental education (in 9 participating countries). Scattered in a couple of participating countries was family size as the third important family socioeconomic variable (Ghana, Iran, Moldova, and Palestinian A. T.). Home language was an isolated case only in Indonesia. Therefore, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable that mattered to mathematics literacy.

2.11 How Important Are Family Socioeconomic Variables to Mathematics Literacy?

Appendix A presents the partition of variance in mathematics literacy to examine student (family) effects and school effects on mathematics literacy. In the region of Arab States, 2 out of the 3 participating countries had more variance at the student than school level. In the region of Central and Eastern Europe, 9 out of the 15 participating countries had more variance at the student than school level. In the region of Central Asia, 1 out of the 2 participating countries had more variance at the student than school level. In the region of East Asia and the Pacific, 6 out of

the 9 participating countries had more variance at the student than school level. In the region of Latin America and the Caribbean, 2 out of the 6 participating countries had more variance at the student than school level. Finally, in the region of North America and Western Europe, 16 out of the 22 participating countries had more variance at the student than school level. Therefore, students (families) were more responsible for variance in mathematics literacy for the majority of the participating countries in each region (except Latin America and the Caribbean).

Appendix B presents the proportion of variance in mathematics literacy accounted for by family socioeconomic variables as a way to estimate how important family socioeconomic variables are to mathematics literacy. Family socioeconomic variables explained from 6% to 26% of the variance among the participating Arab States countries, from 12% to 30% of the variance among the participating Central and Eastern European countries, null of the variance for Azerbaijan and 19% of the variance for Kyrgyzstan as the participating Central Asian countries, from 4% to 23% of the variance among the participating East Asian and the Pacific countries, from 17% to 28% of the variance among the participating Latin American and the Caribbean countries, and from 14% to 32% of the variance among the participating North American and Western European countries. In general, family socioeconomic variables were responsible for less than one third of the variance in mathematics literacy in all participating countries.

Therefore, family socioeconomic variables were important moderately to mathematics literacy.

Appendix C presents TIMSS results on the partition of variance in mathematics literacy. In the region of Arab States, 3 out of the 9 participating countries had more variance at the student than school level. In the region of Central and Eastern Europe, Slovenia was the only participating country (out of the 12 participating countries) with more variance at the student than school level. Armenia from Central Asia had less variance at the student than school level.

In the region of East Asia and the Pacific, Korea was the only participating country (out of the 9 participating countries) with more variance at the student than school level. Chile from Latin America and the Caribbean had less variance at the student than school level. In the region of North America and Western Europe, 2 out of the 10 participating countries had more variance at the student than school level. Iran from South and West Asia had less variance at the student than school level. In the region of Sub-Saharan Africa, none of the 3 participating countries had more variance at the student than school level. Therefore, schools were more responsible for variance in mathematics literacy for the majority of the participating countries in each region. Given this fact, the proportion of variance in mathematics literacy explained by family socioeconomic variables was expected to be small.

Appendix D presents the proportion of variance in mathematics literacy accounted for by family socioeconomic variables as a way to estimate how important family socioeconomic variables are to mathematics literacy. Family socioeconomic variables explained from 2% to 11% of the variance among the participating Arab States countries, from 7% to 22% of the variance among the participating Central and Eastern European countries, 5% of the variance in Armenia from Central Asia, from 5% to 20% of the variance among the participating East Asian and the Pacific countries, 20% of the variance in Chile from Latin America and the Caribbean, and from 9% to 16% of the variance among the participating North American and Western European countries, 10% of the variance in Iran from South and West Asia, and from 3% to 18% of the variance among the participating Sub-Saharan African countries. In general, family socioeconomic variables were responsible for at most one fifth of the variance in mathematics literacy in all but one participating country. Therefore, family socioeconomic variables were important marginally to mathematics literacy.

3. Socioeconomic Differences in Science Achievement

Science literacy data were obtained from both PISA 2006 and TIMSS 2003 for the present analysis. PISA defines science literacy as the ability to think scientifically (see OECD, 2001). The TIMSS 2003 tests in science (and mathematics) were developed on the basis of the *TIMSS Assessment Frameworks and Specifications 2003* and contained questions requiring students to solve problems typical of common school science (and mathematics) curricula identified through an international consensus-building process. In both PISA and TIMSS, science literacy was standardized scores with a mean of 500 points and a standard deviation of 100 points. There were 3 countries from Arab States, 15 countries from Central and Eastern Europe, 2 countries from Central Asia, 9 countries from East Asia and the Pacific, 6 countries from Latin America and the Caribbean, and 21 countries from North America and Western Europe in PISA 2006. There were 9 countries from Arab States, 12 countries from Central and Eastern Europe, 1 country from Central Asia, 10 countries from East Asia and the Pacific, 1 country from Latin America and the Caribbean, 10 countries from North America and Western Europe, 1 country from South and West Asia, and 3 countries from Sub-Saharan Africa in TIMSS 2003. For each international student assessment, data analysis of socioeconomic differences in science literacy was conducted at the country level, and comparative interpretation of analytical results was carried out at the regional level (with regions defined above following the UNESCO categorization).

3.1. *Effects of Socioeconomic Status on Science Literacy*

Part of Table 1 presents socioeconomic differences in science literacy associated with socioeconomic status (SES) that combines parental occupation, parental education, and home possession. It is evident from the table that SES had significant positive effects on science

literacy in all participating countries. Students of parents with high SES demonstrated higher science literacy than students of parents with low SES.

All participating Arab States countries showed small SES effects on science literacy (from 0.14 to 0.27 SD). The participating Central and Eastern European countries highlighted Bulgaria as having large SES effects (0.52 SD) and Montenegro and Latvia as having small SES effects (0.24 SD and 0.29 SD). The remaining 12 participating countries from this region showed moderate SES effects (from 0.31 to 0.50 SD). In Central Asia, both Azerbaijan and Kyrgyzstan showed small SES effects (0.12 SD and 0.28 SD). Among the participating countries from East Asia and the Pacific, 4 of them showed moderate effects (from 0.32 to 0.43 SD). New Zealand showed large SES effects (0.51 SD). The other 4 participating countries showed small SES effects (from 0.14 to 0.28 SD). Macao was representative of this category with SES effects below 0.20 SD. Among the participating countries from Latin America and the Caribbean, Argentina, Chile, and Uruguay showed moderate SES effects (from 0.34 to 0.38 SD), whereas Colombia, Mexico, and Brazil showed small SES effects (from 0.23 to 0.29 SD). The participating countries from North America and Western Europe highlighted France as having large SES effects (0.54 SD). On the other hand, Iceland and Portugal showed small SES effects (0.28 SD). The other 19 participating countries showed moderate SES effects (from 0.31 to 0.49 SD).

In summary, there was a common pattern across participating regions. The majority (at very least half) of the participating countries showed moderate SES effects on science literacy across all participating regions except Arab States where participating countries showed small SES effects. The SES effects on science literacy are also graphed as SES gradients for a visual illustration of the SES effects across regions (see Figures 3.1 to 3.12).

 insert Figures 3.1 to 3.12 about here

3.2. Effects of Parental Occupation on Science Literacy

Components of SES (parental occupation, parental education, and home possession) were also examined separately to investigate the effects of these distinct socioeconomic aspects on science literacy. Part of Table 2 presents socioeconomic differences in science literacy associated with parental occupation. It is evident from the table that parental occupation had significant positive effects on science literacy in all participating countries. Students of parents of high prestigious occupations outperformed students of parents of low prestigious occupations in science literacy. Nevertheless, the effects of parental occupation on science literacy were small across all countries in all regions, indicating a global (unified) pattern of small parental occupational effects on science literacy.

3.3. Effects of Parental Education on Science Literacy

Part of Table 3 presents socioeconomic differences in science literacy associated with parental education. It is evident from the table that parental education had significant positive effects on science literacy in all participating countries. Students of more educated parents demonstrated higher science literacy than students of less educated parents. Nevertheless, the effects of parental education on science literacy were small across all countries in all regions, indicating a global (unified) pattern of small parental educational effects on science literacy. Parental occupation and parental education showed quite similar global patterns of effects on science literacy.

Comparable parental education data were also available from TIMSS 2003. Part of Table 10 presents TIMSS results on socioeconomic differences in science literacy associated with parental education. It is evident from the table that parental education had significant positive effects on science literacy in all participating countries. Students of more educated parents outperformed students of less educated parents in science literacy, but the effects of parental education on science literacy were small across all countries in all regions. Importantly, the consistent analytical results between PISA and TIMSS cross-validated the global (unified) pattern of small parental educational effects on science literacy.

3.4. Effects of Family Possession on Science Literacy

Part of Table 4 presents socioeconomic differences in science literacy associated with family possession. It is evident from the table that family possession had significant positive effects on science literacy in all participating countries except Qatar. Students from families with more possession outperformed students from families with less possession in science literacy.

Two out of the 3 participating Arab States countries demonstrated small effects of family possession on science literacy (from 0.19 to 0.22 SD), with Qatar showing no significant effects. Five participating Central and Eastern European countries showed moderate effects (from 0.33 to 0.44 SD). Bulgaria was representative of this category with effects above 0.40 SD. The remaining 10 participating countries from this region showed small effects (from 0.19 to 0.30 SD). Montenegro was representative of this category with effects below 0.20 SD. In Central Asia, both Azerbaijan and Kyrgyzstan showed small effects (0.08 SD and 0.20 SD). Among the participating countries from East Asia and the Pacific, New Zealand showed moderate effects (0.37 SD). The other 8 participating countries showed small effects (from 0.12 to 0.29 SD). Macao and Indonesia were representative of this category with effects below 0.20 SD. Among

the participating countries from Latin America and the Caribbean, 4 of them showed moderate effects (from 0.33 to 0.40 SD). Argentina was representative of this category with effects at 0.40 SD. Colombia and Mexico showed small effects (0.23 SD and 0.24 SD). In the region of North America and Western Europe, 11 participating countries showed moderate effects (from 0.31 to 0.45 SD). France and Belgium were representative of this category with effects above 0.40 SD. The remaining 11 participating countries showed small effects (from 0.08 to 0.30 SD). Iceland, Norway, Canada, and Finland were representative of this category with effects below 0.20 SD.

In summary, the majority (at very least half) of the participating countries showed small effects of family possession on science literacy across almost all participating regions. The only exception was Latin America and the Caribbean where family possession showed moderate effects in the majority of the participating countries.

3.5. What Aspect of Socioeconomic Status Matters the Most to Science Literacy?

Part of Table 5 presents results that address the issue of what aspect of SES matters the most to science literacy. Parental education was the most important SES component in 2 out of the 3 participating Arab States countries (family possession was the most important SES component in Jordan). In Central and Eastern Europe, parental occupation was the most important SES component in 10 out of the 15 participating countries, family possession was the most important SES component in 3 out of the 15 participating countries, and parental education was the most important SES component in 2 out of the 15 participating countries. Among the 2 countries from Central Asia, parental education was the most important SES component in Azerbaijan, and family possession was the most important SES component in Kyrgyzstan. As far as East Asia and the Pacific is concerned, family possession was the most important SES component in 5 out of the 9 participating countries, parental occupation was the most important

SES component in 2 out of the 9 participating countries, and parental education was the most important SES component in 2 out of the 9 participating countries. Family possession was the most important SES component in 5 out of the 6 participating countries from Latin America and the Caribbean, whereas parental occupation was the most important SES component in Chile. Finally, parental occupation was the most important SES component in 20 out of the 22 participating countries from North America and Western Europe, parental education was the most important SES component in Liechtenstein, and family possession was the most important SES component in United States.

In summary, parental occupation was the most important SES component, particularly in relatively more developed regions such as Central and Eastern Europe as well as North America and Western Europe. On the other hand, family possession was the most important SES component, particularly in relatively less developed regions such as East Asia and the Pacific as well as Latin America and the Caribbean. Overall, parental occupation was the most important SES component that mattered the most to science literacy.

When the next (second) important SES component to science literacy was sought, parental occupation was the second important SES component in 2 out of the 3 participating Arab States countries, and family possession was the second important SES component in Tunisia. In Central and Eastern Europe, family possession was the second important SES component in 7 out of the 15 participating countries, parental occupation was the second important SES component in 5 out of the 15 participating countries, and parental education was the second important SES component in 3 out of the 15 participating countries. Parental occupation was the second important SES component in both Azerbaijan and Kyrgyzstan from Central Asia. As far as East Asia and the Pacific is concerned, parental education was the second

important SES component in 4 out of the 9 participating countries, parental occupation was the second important SES component in 3 out of the 9 participating countries, and family possession was the second important SES component in 2 out of the 9 participating countries. In Latin America and the Caribbean, parental occupation was the second important SES component in 4 out of the 6 participating countries, parental education was the second important SES component in Argentina, and family possession was the second important SES component in Chile. Finally, in North America and Western Europe, family possession was the second important SES component in 14 out of the 22 participating countries, parental education was the second important SES component in 6 out of the 22 participating countries, and parental occupation was the second important SES component in 2 out of the 22 participating countries.

Based on the above interpretation of the analytical results, family possession was the second important SES component that mattered to science literacy (in 25 participating countries), followed by parental occupation (in 18 participating countries) and parental education (in 14 participating countries) as the second important SES component.

Interestingly, as many as 13 participating countries did not witness the third important SES component at all. For those 44 participating countries with the third important SES component, parental education appeared most often (in 27 participating countries).

3.6. Effects of Restricted Family Possession on Science Literacy

Part of Table 6 presents socioeconomic differences in science literacy associated with restricted family possession. It is evident from the table that restricted family possession had significant positive effects on science literacy in all participating countries except Liechtenstein. Students from families with more restricted possession outperformed students from families with less restricted possession in science literacy. Furthermore, the effects of restricted family

possession on science literacy were large across all participating countries in all participating regions except Azerbaijan with moderate effects (0.33 SD), indicating a global (unified) pattern of the importance of some basic or necessary family possession items closely related to learning (i.e., desk, computer, calculator, and dictionary).

Comparable data on restricted family possession were also available from TIMSS 2003. Part of Table 11 presents TIMSS results on socioeconomic differences in science literacy associated with restricted family possession. It is evident from the table that restricted family possession had significant positive effects on science literacy in all participating countries. Furthermore, the effects of restricted family possession on science literacy were large across all participating countries in all participating regions except three participating countries (Morocco, Moldova, and Ghana) with moderate effects (from 0.33 to 0.49 SD). Overall, the facts that almost all participating countries showed significant effects and that almost all effects were large across PISA and TIMSS are strong evidence to cross-validate the global (unified) pattern reported earlier on the effects of restricted family possession.

3.7. Effects of Home Literacy on Science Literacy

Part of Table 7 presents socioeconomic differences in science literacy associated with home literacy. In the case of having 11 to 100 books at home, it is evident from the table that it had significant positive effects on science literacy in all participating countries (except Liechtenstein). Students from families having 11 to 100 books demonstrated higher science literacy than students from families having no more than 10 books.

All 3 participating Arab States countries demonstrated small effects of home literacy on science literacy (from 0.23 to 0.30 SD). Central and Eastern Europe highlighted 5 participating countries as having large effects (from 0.61 to 0.82 SD). Slovak Republic, Czech Republic, and

Bulgaria were representative of this category with effects above 0.70 SD. On the other hand, Russian Federation showed small effects (0.28 SD). The remaining 9 participating countries showed moderate effects (from 0.33 to 0.49 SD). Both Azerbaijan and Kyrgyzstan from Central Asia showed small effects (0.10 SD and 0.27 SD). Among the participating countries from East Asia and the Pacific, Korea, Taiwan, Japan, and New Zealand had large effects (from 0.54 to 0.67 SD), whereas Indonesia, Macao, and Thailand had small effects (from 0.09 to 0.25 SD). Australia and Hong Kong showed moderate effects (0.49 SD). Among the participating countries from Latin America and the Caribbean, Argentina had large effects (0.59 SD), whereas Brazil and Mexico showed small effects (0.29 SD and 0.30 SD). The other 3 participating countries had moderate effects (from 0.38 to 0.47 SD). In the region of North America and Western Europe, there were no significant effects in Liechtenstein, but 12 participating countries showed large effects (from 0.55 to 0.71 SD). Germany, Austria, and Switzerland were representative of this category with effects above 0.70 SD. The remaining 9 participating countries had moderate effects (from 0.33 to 0.49 SD).

In summary, the majority of the participating countries from Central and Eastern Europe, East Asia and the Pacific, Latin America and the Caribbean, and North America and Western Europe showed at least moderate effects of home literacy on science literacy. In contrast, the participating countries from both Arab States and Central Asia showed small effects.

In the case of having more than 101 books at home (see Table 7), it is evident from the table that it had significant positive effects on science literacy in all participating countries. Students from families having more than 101 books demonstrated higher science literacy than students from families having no more than 10 books.

Among the participating countries from Arab States, Tunisia demonstrated large effects of home literacy on science literacy (0.64 SD), Jordan demonstrated moderate effects (0.49 SD), and Qatar demonstrated small effects (0.28 SD). All participating countries from Central and Eastern Europe demonstrated large effects (from 0.72 to 1.37 SD). Czech Republic, Bulgaria, Slovak Republic, Slovenia, and Hungary were representative with effects above 1.00 SD. The 2 countries from Central Asia had different effects of home literacy, with Kyrgyzstan having large effects (0.86 SD) and Azerbaijan having moderate effects (0.36 SD). Among the participating countries from East Asia and the Pacific, 7 participating countries demonstrated large effects (from 0.64 to 1.16 SD). New Zealand, Korea, Taiwan, and Australia were representative of this category, having effects above 1.00 SD. Macao and Indonesia demonstrated moderate effects (0.31 SD and 0.33 SD). All participating countries from Latin America and the Caribbean demonstrated large effects (from 0.687 to 1.08 SD). Argentina and Chile were representative with effects above 1.00 SD. All participating countries from North America and Western Europe demonstrated large effects (from 0.79 to 1.38 SD). Note that as many as 13 participating countries demonstrated effects above 1.00 SD with Austria and Germany leading the way, having effects above 1.30 SD.

In summary, small effects on science literacy associated with having more than 101 books at home were extremely rare with Qatar as the only case. Even moderate effects were uncommon, scattered only in a couple of countries (Azerbaijan, Indonesia, and Macao). All other participating countries demonstrated large effects. In particular, all participating countries from Central and Eastern Europe, Latin America and the Caribbean, and North America and Western Europe demonstrated large effects.

Comparable data on home literacy were also available from TIMSS 2003. Part of Table 12 presents TIMSS results on socioeconomic differences in science literacy associated with home literacy. In the case of having 11 to 100 books at home, it is evident from the table that it had significant positive effects on science literacy in all participating countries except Morocco.

The participating Arab States countries highlighted Morocco as having no significant effects of home literacy on science literacy and Lebanon and Jordan as having moderate effects (0.39 SD and 0.35 SD). The remaining 6 participating countries demonstrated small effects (from 0.11 to 0.22 SD). In Central and Eastern Europe, Hungary, Slovak Republic, and Slovenia showed large effects (from 0.54 to 0.58 SD). On the other hand, 5 participating countries showed small effects (from 0.16 to 0.28 SD). Bulgaria was representative of this category with effects below 0.20 SD. The remaining 5 participating countries showed moderate effects (from 0.34 to 0.48 SD). Armenia from Central Asia showed small effects (0.25 SD). Among the participating countries from East Asia and the Pacific, Taiwan, Singapore, New Zealand, and Australia had large effects (from 0.52 to 0.61 SD), whereas Indonesia and Philippines had small effects (0.06 SD and 0.29 SD). The other 4 participating countries showed moderate effects (from 0.31 to 0.48 SD). Chile from Latin America and the Caribbean had moderate effects (0.38 SD). In the region of North America and Western Europe, Cyprus showed large effects (0.51 SD), whereas Israel showed small effects (0.24 SD). The other 8 participating countries showed moderate effects (from 0.33 to 0.47 SD). Iran from South and West Asia showed small effects (0.29 SD). All participating countries from Sub-Saharan Africa (Ghana, Botswana, and South Africa) showed small effects (from 0.15 to 0.22 SD).

In summary, the majority of the participating countries from Central and Eastern Europe, East Asia and the Pacific, and North America and Western Europe showed at least moderate

effects of home literacy on science literacy. The single participating country from Latin America and the Caribbean also showed moderate effects. In contrast, the participating countries from Arab States and Sub-Saharan Africa showed small effects. The single participating country from each region of Central Asia and South and West Asia also showed small effects.

In the case of TIMSS results regarding having more than 101 books at home, it is evident from Table 12 that it had significant positive effects on science literacy in all participating countries except Morocco. Students from families having more than 101 books demonstrated higher science literacy than students from families having no more than 10 books.

Among the participating countries from Arab States, Lebanon and Jordan showed large effects of home literacy on science literacy (0.77 SD and 0.59 SD), whereas Syria showed small effects (0.26 SD) and Morocco showed no significant effects at all. The remaining 5 participating countries showed moderate effects (from 0.32 to 0.43 SD). All participating countries but one from Central and Eastern Europe showed large effects (from 0.53 to 1.15 SD). Hungary and Slovak Republic were representative with effects above 1.00 SD. Bulgaria showed small effects (0.23 SD). Armenia from Central Asia showed moderate effects (0.43 SD). Among the participating countries from East Asia and the Pacific, 8 participating countries showed large effects (from 0.54 to 1.09 SD). New Zealand, Taiwan, and Singapore were representative of this category with effects above 1.00 SD. On the other hand, Philippines and Indonesia showed moderate effects (0.37 SD and 0.41 SD). Chile from Latin America and the Caribbean showed large effects (0.93 SD). All participating countries from North America and Western Europe showed large effects (from 0.56 to 1.03 SD). Scotland, England, and United States were representative, having effects above 1.00 SD. Iran from South and West Asia showed large

effects (0.67 SD). In the region of Sub-Saharan Africa, Ghana showed small effects (0.16 SD), whereas South Africa and Botswana showed large effects (0.75 SD and 0.54 SD).

In summary, similar to the case of PISA, null or small effects on science literacy associated with having more than 101 books at home were extremely rare (Morocco, Syria, and Ghana). Even moderate effects were not common, coming from a couple of countries in Arab States (5 participating countries) and East Asia and the Pacific (2 participating countries) as well as Armenia from Central Asia. The majority of the participating countries from Arab States, East Asia and the Pacific, and Sub-Saharan Africa showed at least moderate effects. Furthermore, all participating countries from Central and Eastern Europe and North America and Western Europe showed large effects. The single participating country from each region of Latin America and the Caribbean and South and West Asia also showed large effects.

3.8. Effects of Family Size on Science Literacy

Part of Table 13 presents TIMSS results on socioeconomic differences in science literacy associated with family size. In the region of Arab States, Bahrain, Morocco, Palestinian A. T., and Saudi Arabia did not show any significant effects at all, whereas 5 participating countries showed negative small effects of family size on science literacy (from -0.03 to -0.11 SD), indicating that students from small families outperformed students from large families in science literacy. Lebanon was representative of this category (-0.11 SD). In the region of Central and East Europe, Bulgaria, Estonia, and Slovenia did not show any significant effects at all, whereas the remaining 9 participating countries showed negative small effects (from -0.03 to -0.15 SD). Macedonia and Romania were representative of this category (-0.15 SD and -0.13 SD). Armenia from Central Asia showed negative small effects (-0.04 SD). In the region of East Asia and the Pacific, Indonesia, Korea, and Philippines did not show any significant effects at all, whereas 6

out of the remaining 7 participating countries showed negative small effects (from -0.02 to -0.07 SD). In addition, Japan showed positive small effects (0.03 SD), indicating that students from large families outperformed students from small families in science literacy. Chile from Latin America and the Caribbean showed negative small effects (-0.06 SD). In the region of North America and Western Europe, Scotland did not show any significant effects at all, whereas the remaining 9 participating countries showed negative small effects (from -0.04 to -0.08 SD). Iran from South and West Asia showed negative small effects (-0.13 SD). In the region of Sub-Saharan Africa, Ghana did not show any significant effects at all, whereas Botswana and South Africa showing negative small effects (-0.03 SD and -0.08 SD).

In summary, the effects of family size on science literacy did not exist in quite a few participating countries. When the effects of family size did exist, they were negative and small in the vast majority of the participating countries. Rare positive (and small) effects were found only in Japan.

3.9. Effects of Home Language on Science Literacy

Part of Table 8 presents socioeconomic differences in science literacy associated with home language. Considerable variation both within and between regions was observed in the table. Positive effects indicate that students speaking the language of the test outperformed students speaking languages other than the language of the test in science literacy. Negative effects indicate that students speaking languages other than the language of the test outperformed students speaking the language of the test in science literacy.

In the region of Arab States, none of the 3 participating countries showed any significant effects of home language on science literacy. In the region of Central and Eastern Europe, Poland, Romania, and Serbia did not show any significant effects, whereas the rest of the 12

participating countries all showed significant positive effects. On one hand, Croatia showed moderate effects (0.42 SD), and 6 participating countries showed large effects (from 0.53 to 0.96 SD). Bulgaria and Hungary were representative of this category with effects above 0.70 SD. On the other hand, 5 participating countries showed small effects (from 0.15 to 0.29 SD). Estonia was representative of this category with effects below 0.20 SD. In the region of Central Asia, both Azerbaijan and Kyrgyzstan showed significant negative (small) effects (-0.23 SD and -0.18 SD). In the region of East Asia and the Pacific, Indonesia, Korea, and Macao did not show any significant effects, whereas the remaining 6 participating countries showed significant positive effects. Japan showed large effects (1.21 SD), Hong Kong, Taiwan, and New Zealand showed moderate effects (from 0.41 to 0.50 SD), and Australia and Thailand showed small effects (0.22 SD and 0.25 SD). In the region of Latin America and the Caribbean, Argentina, Chile, Colombia, and Uruguay did not show any significant effects, whereas Brazil showed negative moderate effects (-0.48 SD) and Mexico showed positive large effects (0.66 SD). In the region of North American and Western Europe, Israel and Luxembourg did not show any significant effects, whereas the remaining 19 participating countries showed significant positive effects. This region highlighted 14 participating countries as having large effects (from 0.57 to 1.00 SD). Liechtenstein, Austria, and Germany were representative of this category with effects above 0.90 SD. On the other hand, Spain, Belgium, and Canada showed small effects (from 0.17 to 0.25 SD). The remaining 3 participating countries showed moderate effects (from 0.36 to 0.49 SD).

In summary, the effects of home language on science literacy did not exist in quite a few participating countries across 5 regions (Arab States, Central and Eastern Europe, East Asia and the Pacific, Latin America and the Caribbean, and North America and Western Europe). Among the participating countries with significant effects, Central and Eastern Europe, East Asia and the

Pacific, and North America and Western Europe shared a similar pattern. The majority of the participating countries showed significant positive effects in these regions, and there were much more participating countries showing large and moderate effects than small effects in each region. Negative effects were found scattered in a couple of participating countries (Azerbaijan, Brazil, and Kyrgyzstan). Finally, the considerable variation both within and between regions is what separates the effects of home language from the effects of other family socioeconomic variables on science literacy.

Part of Table 14 presents TIMSS results on socioeconomic differences in science literacy associated with home language. In the region of Arab States, Egypt, Morocco, Syria, and Tunisia did not show any significant effects of home language on science literacy, and Bahrain, Jordan, Lebanon, and Palestinian A. T. showed significant positive (small) effects (from 0.09 to 0.15 SD). In the region of Central and Eastern Europe, all participating countries showed significant positive effects except Hungary, Lithuania, and Romania that did not show any significant effects. This region highlighted Russia with large effects (0.54 SD). There were 4 participating countries with moderate effects (from 0.31 to 0.44 SD). The remaining 4 countries showed small effects (from 0.10 to 0.30 SD). Moldova was representative of this category with effects below 0.20 SD. Armenia from Central Asia showed significant positive (small) effects (0.20 SD). In the region of East Asia and the Pacific, all participating countries showed significant effects except Australia and Philippines that did not show any significant effects. Korea, Taiwan, Hong Kong, and Singapore showed positive large effects (from 0.53 to 0.68 SD), and Japan showed positive moderate effects (0.38 SD). On the other hand, Malaysia showed negative small effects (-0.19 SD) and New Zealand showed positive small effects (0.26 SD). Chile from Latin America and the Caribbean showed significant positive (large) effects (0.54 SD). In the region of North

America and Western Europe, all participating countries showed significant positive effects. There were 6 participating countries with large effects (from 0.59 to 0.70 SD). Sweden, Norway, and Netherlands were representative of this category with effects above 0.65 SD. Scotland showed moderate effects (0.48 SD), and Israel, Cyprus, and England showed small effects (from 0.14 to 0.24 SD). Iran from South and West Asia showed significant positive (moderate) effects (0.33 SD). In the region of Sub-Saharan Africa, Ghana did not show any significant effects, Botswana showed significant positive (moderate) effects (0.35 SD), and South Africa showed significant positive (large) effects (0.73 SD).

In summary, although null effects of home language on science literacy were found in several participating countries (Australia, Egypt, Ghana, Hungary, Lithuania, Morocco, Philippines, Romania, Syria, and Tunisia) and so were large effects (Belgium, Chile, Hong Kong, Italy, Korea, Netherlands, Norway, Russia, Singapore, South Africa, Sweden, Taiwan, and United States), small and moderate effects were far more common across all participating regions. Negative effects were found only in Malaysia. Finally, the considerable variation both within and between regions is what separates the effects of home language from the effects of other family socioeconomic variables on science literacy in TIMSS.

3.10. What Family Socioeconomic Variables Matter the Most to Science Literacy?

Part of Table 9 presents the results that discern the most important family socioeconomic variables to science literacy. In the region of Arab States, parental occupation was the most important family socioeconomic variable in 2 out of the 3 participating countries, and parental education was the most important family socioeconomic variable in Qatar. Home literacy was the most important family socioeconomic variable in all 15 participating Central and Eastern European countries. Home literacy was also the most important family socioeconomic variable

in both Azerbaijan and Kyrgyzstan in Central Asia. Home literacy was the most important family socioeconomic variable in all participating East Asian and the Pacific countries except Indonesia and Thailand where family possession was the most important family socioeconomic variable. In the region of Latin America and the Caribbean, family possession was the most important family socioeconomic variable in Argentina, Brazil, and Colombia, and parental occupation was the most important family socioeconomic variable in Chile, Mexico, and Uruguay. Home literacy was the most important family socioeconomic variable in all participating North American and Western European countries except Portugal where parental occupation was the most important family socioeconomic variable.

Overall, home literacy was the most important family socioeconomic variable (in 45 participating countries), followed in far distance by parental occupation (in 6 participating countries) and family possession (in 5 participating countries). Parental education was an isolated case only in Qatar. In summary, home literacy was the most important family socioeconomic variable that mattered the most to science literacy.

The 3 participating Arab States countries showed inconsistent results regarding the next (second) important family socioeconomic variable (parental education for Jordan, home literacy for Qatar, and family possession for Tunisia). In the region of Central and Eastern Europe, parental occupation was the second important family socioeconomic variable in 8 out of the 15 participating countries, home literacy (referring to having 11 to 100 books at home) was the second important family socioeconomic variable in 6 out of the 15 participating countries, and family possession was the second important family socioeconomic variable in Turkey. In the region of Central Asia, parental education was the second important family socioeconomic variable in Azerbaijan, and parental occupation was the second important family socioeconomic

variable in Kyrgyzstan. In the region of East Asia and the Pacific, home literacy (referring to having 11 to 100 books at home) was the second important family socioeconomic variable in 6 out of the 9 participating countries, and parental occupation was the second important family socioeconomic variable in 3 out of the 9 participating countries. In the region of Latin America and the Caribbean, home literacy was the second important family socioeconomic variable in 3 out of the 6 participating countries, and family possession was the second important family socioeconomic variable in Mexico and Uruguay, and parental occupation was the second important family socioeconomic variable in Brazil. In the region of North America and Western Europe, home literacy was the second important family socioeconomic variable in 11 out of the 22 participating countries (referring to having 11 to 100 books at home in 10 participating countries), parental occupation was the second important family socioeconomic variable in 10 out of the 22 participating countries, and home language was the second important family socioeconomic variable in Liechtenstein.

Overall, home literacy was the second important family socioeconomic variable in 27 participating countries (referring to having 11 to 100 books at home in 22 participating countries), and parental occupation was the second important family socioeconomic variable in 23 participating countries. Scattered in a couple of participating countries were parental education (Azerbaijan and Jordan) and family possession (Mexico, Turkey, Tunisia, and Uruguay) as the second important family socioeconomic variable. Home language was an isolated case only in Liechtenstein. In conclusion, there was a close match between home literacy and parental occupation as to the second important family socioeconomic variable that mattered to science literacy. Home literacy was the second important family socioeconomic variable in a few more participating countries than parental occupation. However, both variables should be

emphasized as the second important family socioeconomic variable that mattered to science literacy.

In the region of Arab States, family possession was the third important family socioeconomic variable in Jordan, parental occupation was the third important family socioeconomic variable in Qatar, and home literacy (referring to having more than 101 books at home) was the third important family socioeconomic variable in Tunisia. In the region of Central and Eastern Europe, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 7 out of the 15 participating countries, parental occupation was the third important family socioeconomic variable in 5 out of the 15 participating countries, parental education was the third important family socioeconomic variable in 2 out of the 15 participating countries, and home language was the third important family socioeconomic variable in Russia. In the region of Central Asia, parental occupation was the third important family socioeconomic variable in Azerbaijan, and home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in Kyrgyzstan. In the region of East Asia and the Pacific, parental education was the third important family socioeconomic variable in 5 out of the 9 participating countries, parental occupation was the third important family socioeconomic variable in Australia, home language was the third important family socioeconomic variable in Hong Kong, family possession was the third important family socioeconomic variable in Korea, and home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in New Zealand. In the region of Latin America and the Caribbean, parental education was the third important family socioeconomic variable in 2 out of the 6 participating countries, home literacy was the third important family socioeconomic variable in 2 out of the 6 participating countries (referring to

having 11 to 100 books at home in 1 participating country), parental occupation was the third important family socioeconomic variable in Colombia, and family possession was the third important family socioeconomic variable in Chile. In the region of North America and Western Europe, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 9 out of the 22 participating countries, parental occupation was the third important family socioeconomic variable in 8 out of the 22 participating countries, parental education was the third important family socioeconomic variable in 3 out of the 22 participating countries, home language was the third important family socioeconomic variable in Austria, and family possession was the third important family socioeconomic variable in Portugal.

Overall, home literacy was the third important family socioeconomic variable in 21 participating countries (referring to having 11 to 100 books at home in 20 participating countries), parental occupation was the third important family socioeconomic variable in 17 participating countries, and parental education was the third important family socioeconomic variable in 12 participating countries. Scattered in a couple of participating countries were family possession (Chile, Jordan, Korea, and Portugal) and home language (Austria, Hong Kong, and Russia) as the third important family socioeconomic variable. In conclusion, there was a close match between home literacy and parental occupation as to the third important family socioeconomic variable that mattered to science literacy. Although home literacy was the third important family socioeconomic variable in a few more participating countries than parental occupation, both variables should be emphasized. All in all, it is very clear that home literacy and parental occupation were the most important family socioeconomic variables that mattered to science literacy.

Part of Table 15 presents TIMSS results on the top 3 important family socioeconomic variables that matter to science literacy. Similar to the case of mathematics literacy, Tables 9 and 15 cannot be directly compared. In the region of Arab States, parental education was the most important family socioeconomic variable in 5 out of the 9 participating countries, restricted family possession was the most important family socioeconomic variable in 3 out of the 9 participating countries, and home literacy was the most important family socioeconomic variable in Lebanon. In the region of Central and Eastern Europe, home literacy was the most important family socioeconomic variable in 9 out of the 12 participating countries, parental education was the most important family socioeconomic variable in 2 out of the 12 participating countries, and restricted family possession was the most important family socioeconomic variable in Romania. Restricted family possession was the most important family socioeconomic variable in Armenia in Central Asia. In the region of East Asia and the Pacific, home literacy was the most important family socioeconomic variable in 8 out of the 10 participating countries, restricted family possession was the most important family socioeconomic variable in Indonesia, and parental education was the most important family socioeconomic variable in Philippines. Parental education was the most important family socioeconomic variable in Chile in Latin America and the Caribbean. In the region of North America and Western Europe, home literacy was the most important family socioeconomic variable in 8 out of the 10 participating countries, and parental education was the most important family socioeconomic variable in Belgium and Israel. Home literacy was the most important family socioeconomic variable in Iran in South and West Asia. In the region of Sub-Saharan Africa, parental education was the most important family socioeconomic variable in Botswana and Ghana, and home language was the most important family socioeconomic variable in South Africa.

Overall, home literacy was the most important family socioeconomic variable (in 27 participating countries), followed by parental education (in 13 participating countries) and restricted family possession (in 6 participating countries). Home language was an isolated case only in South Africa. Therefore, home literacy was the most important family socioeconomic variable that mattered the most to science literacy.

In the region of Arab States, restricted family possession was the second important family socioeconomic variable in 4 out of the 9 participating countries, parental education was the second important family socioeconomic variable in 4 out of the 9 participating countries, and home literacy was the second important family socioeconomic variable in Bahrain. In the region of Central and Eastern Europe, parental education was the second important family socioeconomic variable in 5 out of the 12 participating countries, home literacy was the second important family socioeconomic variable in 4 out of the 12 participating countries (referring to having 11 to 100 books at home in 2 participating countries), home language was the second important family socioeconomic variable in Bulgaria, restricted family possession was the second important family socioeconomic variable in Latvia, and family size was the second important family socioeconomic variable in Macedonia. Home literacy was the second important family socioeconomic variable in Armenia in Central Asia. In the region of East Asia and the Pacific, parental education was the second important family socioeconomic variable in 4 out of the 10 participating countries, home literacy (referring to having 11 to 100 books at home) was the second important family socioeconomic variable in 4 out of the 10 participating countries, home language was the second important family socioeconomic variable in Hong Kong, and restricted family possession was the second important family socioeconomic variable in Philippines. Home literacy was the second important family socioeconomic variable in Chile in

Latin America and the Caribbean. In the region of North America and Western Europe, parental education was the second important family socioeconomic variable in 6 out of the 10 participating countries, and home literacy was the second important family socioeconomic variable in 4 out of the 10 participating countries (referring to having 11 to 100 books at home in 2 participating countries). Family size was the second important family socioeconomic variable in Iran in South and West Asia. In the region of Sub-Saharan Africa, restricted family possession was the second important family socioeconomic variable in Botswana and Ghana, and parental education was the second important family socioeconomic variable in South Africa.

Overall, parental education was the second important family socioeconomic variable (in 20 participating countries), followed by home literacy (in 15 participating countries) and restricted family possession (in 8 participating countries). Scattered among a couple of participating countries were family size (Iran and Macedonia) and home language (Bulgaria and Hong Kong) as the second important family socioeconomic variable. Therefore, parental education was the second important family socioeconomic variable that mattered to science literacy.

In the region of Arab States, 3 participating countries did not have the third important family socioeconomic variable, home literacy was the third important family socioeconomic variable in 3 out of the 9 participating countries (referring to having 11 to 100 books at home in 1 participating country), restricted family possession was the third important family socioeconomic variable in 2 out of the 9 participating countries, and in Palestinian A. T. home language was the third important family socioeconomic variable. In the region of Central and Eastern Europe, Bulgaria did not have the third important family socioeconomic variable, home literacy (referring to having 11 to 100 books at home) was the third important family

socioeconomic variable in 7 out of the 12 participating countries, parental education was the third important family socioeconomic variable in 3 out of the 12 participating countries, and restricted family possession was the third important family socioeconomic variable in Lithuania. Home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in Armenia in Central Asia. In the region of East Asia and the Pacific, home literacy was the third important family socioeconomic variable in 6 out of the 10 participating countries (referring to having 11 to 100 books at home in 5 participating countries), and parental education was the third important family socioeconomic variable in 4 out of the 10 participating countries. Restricted family possession was the third important family socioeconomic variable in Chile in Latin America and the Caribbean. In the region of North America and Western Europe, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 5 out of the 10 participating countries, parental education was the third important family socioeconomic variable in 2 out of the 10 participating countries, home language was the third important family socioeconomic variable in Belgium and Sweden, and restricted family possession was the third important family socioeconomic variable in Israel. Home language was the third important family socioeconomic variable in Iran in South and West Asia. In the region of Sub-Saharan Africa, Ghana did not have any third important family socioeconomic variable, home literacy was the third important family socioeconomic variable in Botswana, and restricted family possession was the third important family socioeconomic variable in South Africa.

Overall, home literacy (referring to having 11 to 100 books at home in most cases) was the third important family socioeconomic variable (in 22 participating countries), followed by parental education (in 9 participating countries) and restricted family possession (in 6

participating countries). Scattered in a couple of participating countries was family size as the third important family socioeconomic variable (Belgium, Iran, Palestinian A. T., and Sweden). Therefore, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable that mattered to science literacy.

3.11 How Important Are Family Socioeconomic Variables to Science Literacy?

Appendix A presents the partition of variance in science literacy to examine student (family) effects and school effects on science literacy. In the region of Arab States, 2 out of the 3 participating countries had more variance at the student than school level. In the region of Central and Eastern Europe, 10 out of the 15 participating countries had more variance at the student than school level. In the region of Central Asia, both participating countries had more variance at the student than school level. In the region of East Asia and the Pacific, all participating countries (except Indonesia) had more variance at the student than school level. In the region of Latin America and the Caribbean, 4 out of the 6 participating countries had more variance at the student than school level. Finally, in the region of North America and Western Europe, 16 out of the 22 participating countries had more variance at the student than school level. Therefore, students (families) were more responsible for variance in science literacy for the majority of the participating countries in each region.

Appendix B presents the proportion of variance in science literacy accounted for by family socioeconomic variables as a way to estimate how important family socioeconomic variables are to science literacy. Family socioeconomic variables explained from null to 22% of the variance among the participating Arab States countries, from 14% to 33% of the variance among the participating Central and Eastern European countries, 7% and 19% of the variance for Azerbaijan and Kyrgyzstan as the participating Central Asian countries, from 5% to 26% of the

variance among the participating East Asian and the Pacific countries, from 14% to 27% of the variance among the participating Latin American and the Caribbean countries, and from 15% to 34% of the variance among the participating North American and Western European countries. In general, family socioeconomic variables were responsible for less than one third of the variance in science literacy in all participating countries (except Germany). Therefore, family socioeconomic variables were important moderately to science literacy.

Appendix C presents TIMSS results on the partition of variance in science literacy. In the region of Arab States, 4 out of the 9 participating countries had more variance at the student than school level. In the region of Central and Eastern Europe, Slovenia and Serbia were the only participating countries (out of the 12 participating countries) with more variance at the student than school level. Armenia from Central Asia had less variance at the student than school level. In the region of East Asia and the Pacific, Korea and Japan were the only participating countries (out of the 9 participating countries) with more variance at the student than school level. Chile from Latin America and the Caribbean had less variance at the student than school level. In the region of North America and Western Europe, 2 out of the 10 participating countries had more variance at the student than school level (Cyprus and Norway). Iran from South and West Asia had less variance at the student than school level. In the region of Sub-Saharan Africa, none of the 3 participating countries had more variance at the student than school level. Therefore, schools were more responsible for variance in science literacy for the majority of the participating countries in each region. Given this fact, the proportion of variance in science literacy explained by family socioeconomic variables was expected to be small.

Appendix D presents the proportion of variance in science literacy accounted for by family socioeconomic variables as a way to estimate how important family socioeconomic

variables are to science literacy. Family socioeconomic variables explained from 1% to 12% of the variance among the participating Arab States countries, from 5% to 19% of the variance among the participating Central and Eastern European countries, 7% of the variance in Armenia from Central Asia, from 5% to 20% of the variance among the participating East Asian and the Pacific countries, 16% of the variance in Chile from Latin America and the Caribbean, and from 8% to 17% of the variance among the participating North American and Western European countries, 9% of the variance in Iran from South and West Asia, and from 3% to 19% of the variance among the participating Sub-Saharan African countries. In general, family socioeconomic variables were responsible for at most one fifth of the variance in science literacy in all participating countries. Therefore, family socioeconomic variables were important marginally to science literacy.

4. Socioeconomic Differences in Civic Education

The (IEA) CivEd has been the largest and most rigorous international study of students' academic achievement in civic education defined in terms of civic knowledge and engagement and measured as standardized scores with a mean of 100 points and a standard deviation of 20 points. There were 11 countries from Central and Eastern Europe, 2 countries from East Asia and the Pacific, 2 countries from Latin America and the Caribbean, and 13 countries from North America and Western Europe in CivEd 1999. Data analysis of socioeconomic differences in civic knowledge and engagement was conducted at the country level, and comparative interpretation of analytical results was provided at the regional level (with regions presented above following the UNESCO categorization).

4.1. Effects of Parental Education on Civic Knowledge and Engagement

Table 16 presents socioeconomic differences in civic knowledge and engagement related to parental education. A global conclusion is evident in the table that parental education had significant positive effects on civic knowledge and engagement across all participating countries. Students of parents with more education demonstrated higher civic knowledge and engagement than students of parents with less education.

insert Table 16 about here

The participating Central and Eastern European countries highlighted Poland and Russia as having large effects of parental education on civic knowledge and engagement. In Poland, for example, one more year of parental education would be associated with an increase of 15 points in civic knowledge and engagement. Given that one SD was 20 points in CivEd, this increase was considered large (0.75 SD). So were the effects in Russia (0.60 SD). The other participating countries in this region all had moderate effects except Romania with small effects (0.20 SD). The 2 countries from East Asia and the Pacific showed dramatically different effects, with Australia showing large effects (0.60 SD) and Hong Kong showing small effects (0.10 SD). In contrast, the 2 countries from Latin America and the Caribbean, Chile and Colombia, showed consistent small effects (0.25 SD). The participating North American and Western European countries highlighted United States, Greece, and Italy as having large effects (from 0.50 to 0.75 SD). The other participating countries in this region had moderate effects except Finland and Switzerland with small effects (0.20 SD and 0.25 SD).

In summary, the effects of parental education on civic knowledge and engagement were consistent and moderate across the majority of the participating Central and Eastern European countries, surrounded by Russia and Poland with large effects and Romania with small effects. Meanwhile, the effects of parental education were also consistent and moderate across the majority of the participating North American and Western European countries, surrounded by United States, Greece, and Italy with large effects and Finland and Switzerland with small effects. In addition, large effects were observed in Australia, and small effects were observed in Chile, Colombia, and Hong Kong.

4.2. Effects of Home Literacy on Civic Knowledge and Engagement

Table 17 presents socioeconomic differences in civic knowledge and engagement related to home literacy. Compared with students from families with no more than 10 books, students from families with 11 to 100 books showed significant positive effects on civic knowledge and engagement in all participating countries except Czech Republic and Latvia, and students from families with more than 101 books showed significant positive effects on civic knowledge and engagement in all participating countries. The effects associated with having more than 101 books at home were much larger than the effects associated with having 11 to 100 books at home in all participating countries except Hong Kong.

insert Table 17 about here

In the case of having 11 to 100 books at home, the significant effects of home literacy were all large, ranging from 0.95 to 4.45 SD. In Poland, for example, students reporting having 11 to 101 books at home outperformed students reporting having no more than 10 books at home

by 89 points (i.e., 4.45 SD). Poland and Russia led the participating Central and Eastern European countries as having the largest large effects (4.45 SD and 3.35 SD), and the 2 countries without significant effects (Czech Republic and Latvia) came from this region. The other participating countries in this region had large effects ranging from 0.95 to 3.05 SD. Among the 2 countries from East Asia and the Pacific, Australia showed much larger effects than Hong Kong (2.55 SD and 1.45 SD). The 2 countries from Latin America and the Caribbean, Chile and Colombia, showed consistent large effects (2.40 SD and 2.00 SD). Sweden and Greece led the participating North American and Western European countries as having the largest large effects (3.25 SD and 2.95 SD). Norway and Portugal were on the other side of the effects spectrum in this region (1.30 SD and 1.45 SD).

In the case of having more than 101 books at home, all participating countries showed significant positive large effects of home literacy on civic knowledge and engagement. In Poland, for example, students reporting having more than 101 books at home outperformed students reporting having no more than 10 books at home by 139 points (i.e., 6.95 SD). Poland and Russia, again, led the participating Central and Eastern European countries as having the largest large effects (6.95 SD and 5.65 SD). The other participating countries in this region had effects ranging from 2.40 to 4.85 SD with Latvia showing the smallest large effects (2.40 SD). Among the 2 countries from East Asia and the Pacific, Australia, again, showed much larger effects than Hong Kong (4.40 SD and 0.60 SD). The 2 countries from Latin America and the Caribbean, Chile and Colombia, continued to show consistent large effects (3.25 SD and 2.80 SD). United States, Greece, and England led the participating North American and Western European countries as having the largest large effects, ranging from 5.00 to 5.80 SD. The other participating countries in this region had large effects ranging from 3.55 to 4.95 SD. Norway,

Portugal, and Demark were representative of the relatively small side of the effects spectrum (from 3.55 to 3.65 SD).

In summary, as to having 11 to 100 books at home, all participating countries except Czech Republic and Latvia demonstrated large effects; as to having more than 101 books at home, all participating countries demonstrated large effects. The latter showed much larger effects than the former in all participating countries except Hong Kong. Overall, a picture of the importance of home literacy emerged across all participating countries and across all participating regions. The more books (i.e., the richer literacy) at home, the higher academic achievement in civic knowledge and engagement.

4.3. Effects of Family Size on Civic Knowledge and Engagement

Table 18 presents socioeconomic differences in civic knowledge and engagement related to family size. A global conclusion is evident in the table that family size had significant negative effects on civic knowledge and engagement across all participating countries except Finland and Sweden. Students from large families had lower civic knowledge and engagement than students from small families. In Poland, for example, one more person in a family would decrease civic knowledge and engagement of a student by 15 points.

 insert Table 18 about here

Poland and Russia stood out from other participating Central and Eastern European countries to have large effects of family size on civic knowledge and engagement (0.75 SD and 0.55 SD). On the other hand, Romania, Estonia, Lithuania, Bulgaria, and Latvia had small effects ranging from 0.05 to 0.30 SD. Among the 2 countries from East Asia and the Pacific, Australia

showed moderate effects (0.35 SD), whereas Hong Kong showed small effects (0.20 SD). The 2 countries from Latin America and the Caribbean, Chile and Colombia, showed consistent small effects (0.20 SD). Greece and Italy stood out from other participating North American and Western European countries to have large effects (0.70 SD and 0.65 SD). On the other hand, family size had no effects in Finland and Sweden, and it had small effects in Switzerland, Norway, Portugal, Cyprus, and United States, ranging from 0.05 to 0.20 SD.

In summary, the effects of family size existed in almost all participating countries except Finland and Sweden, and the effects of family size were negative across all participating countries with significant effects. However, for the majority of the participating countries, family size effects were at most moderate.

4.4. Effects of Home Language on Civic Knowledge and Engagement

Table 19 presents socioeconomic differences in civic knowledge and engagement related to home language. Home language had significant positive effects in all participating countries except Czech Republic, Lithuania, and Romania. All significant effects were large. Students who spoke the language of the test outperformed students who spoke languages other than the language of the test. In Poland, for example, students who spoke the language of the test outperformed students who spoke languages other than the language of the test by 156 points.

 insert Table 19 about here

Poland stood out from other participating Central and Eastern European countries as having the largest large effects of home language on civic knowledge and engagement (7.80 SD). Interestingly, the 3 countries free of any effects of home language came also from this region

(Czech Republic, Lithuania, and Romania). The other participating countries had large effects ranging from 1.35 to 3.10 SD. Among the 2 countries from East Asia and the Pacific, Hong Kong showed larger effects than Australia (3.50 SD and 2.45 SD). The 2 countries from Latin America and the Caribbean, Chile and Colombia, showed consistent large effects (2.10 SD and 2.50 SD). United States, Denmark, and Finland stood out from other participating North American and Western European countries to have the largest large effects (from 3.50 to 4.25 SD). The other participating countries in this region had effects ranging from 1.55 to 3.25 SD. Portugal, England, and Greece were representative of the relatively small side of the effects spectrum.

In summary, home language had significant positive effects in all participating countries except Czech Republic, Lithuania, and Romania. All significant effects were large.

4.5. What Socioeconomic Variables Matter the Most to Civic Knowledge and Engagement?

The effects of family socioeconomic variables were examined separately in the previous tables. Table 20 presents the results of a combined analysis that incorporates all family socioeconomic variables into one analysis to discern the most important family socioeconomic effects on civic knowledge and engagement.

 insert Table 20 about here

Among the participating Central and Eastern European countries, home literacy was the most important family socioeconomic variable in 9 out of the 11 participating countries, and parental education was the most important family socioeconomic variable in Estonia and Latvia. Among the 2 East Asian and the Pacific countries, parental education was the most important family socioeconomic variable in Australia, and home language was the most important family

socioeconomic variable in Hong Kong. Among the 2 Latin American and the Caribbean countries, parental education was the most important family socioeconomic variable in both Chile and Colombia. Among the participating North American and Western European countries, home literacy was the most important family socioeconomic variable in 9 out of the 13 participating countries, and parental education was the most important family socioeconomic variable in the remaining 4 countries.

Overall, home literacy was the most important family socioeconomic variable that mattered the most to civic knowledge and engagement (in 18 participating countries), followed by parental education (in 9 participating countries). Home language was an isolated case only in Hong Kong.

Among the participating Central and Eastern European countries, parental education was the second important family socioeconomic variable in 6 out of the 11 participating countries, home literacy was the second important family socioeconomic variable in 4 out of the 11 participating countries (referring to having 11 to 100 books at home in 2 participating countries), and family size was the second important family socioeconomic variable in Czech Republic. Among the 2 East Asian and the Pacific countries, home literacy was the second important family socioeconomic variable in Australia and Hong Kong (referring to having 11 to 100 books at home in Hong Kong). Among the 2 Latin American and the Caribbean countries, home literacy (referring to having 11 to 100 books at home) was the second important family socioeconomic variable in both Chile and Colombia. Among the participating North American and Western European countries, home literacy was the second important family socioeconomic variable in 8 out of the 13 participating countries (referring to having 11 to 100 books at home in 4 participating countries), parental education was the second important family socioeconomic

variable in 3 out of the 13 participating countries, and home language was the second important family socioeconomic variable in Italy and Switzerland.

Overall, home literacy (referring to having 11 to 100 books at home in most cases) was the second important family socioeconomic variable (in 16 participating countries), followed by parental education (in 9 participating countries). Scattered among a couple of participating countries was home language (Italy and Switzerland) as the second important family socioeconomic variable. Family size was an isolated case only in Czech Republic. In summary, aspects of home literacy continued to be the second important family socioeconomic variable that mattered to civic knowledge and engagement.

Among the participating Central and Eastern European countries, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 6 out of the 11 participating countries, parental education was the third important family socioeconomic variable in 3 out of the 11 participating countries, home language was the third important family socioeconomic variable in Estonia, and family size was the third important family socioeconomic variable in Latvia. Among the 2 East Asian and the Pacific countries, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in Australia, and parental education was the third important family socioeconomic variable in Hong Kong. Among the 2 Latin American and the Caribbean countries, home literacy was the third important family socioeconomic variable in both Chile and Colombia. Among the participating North American and Western European countries, home literacy (referring to having 11 to 100 books at home) was the third important family socioeconomic variable in 6 out of the 13 participating countries, parental education was the

third important family socioeconomic variable in 6 out of the 13 participating countries, and home language was the third important family socioeconomic variable in Norway.

Overall, home literacy (referring to having 11 to 100 books at home in most cases) was the third important family socioeconomic variable (in 16 participating countries), followed by parental education (in 9 participating countries). Scattered among a couple of participating countries was home language (Estonia and Norway) as the third important family socioeconomic variable. Family size was an isolated case only in Latvia. In summary, aspects of home literacy continued to be the third important family socioeconomic variable that mattered to civic knowledge and engagement.

4.6 How Important Are Family Socioeconomic Variables to Civic Knowledge and Engagement?

Appendix E indicates that among the 11 participating Central and Eastern European countries, 4 had more variance in civic knowledge and engagement at the student than school level. Among the 2 participating East Asian and the Pacific countries, Australia had more variance at the student than school level. Among the 2 participating Latin American and the Caribbean countries, Colombia had more variance at the student than school level. Among the 13 participating North American and Western European countries, 10 had more variance at the student than school level. Therefore, schools were more responsible for variance in civic knowledge and engagement for the majority of the participating Central and Eastern European countries, whereas students were more responsible for variance in civic knowledge and engagement for the majority of the participating North American and Western European countries. Given that only 2 countries participated from both East Asia and the Pacific and Latin America and the Caribbean, it is too soon to discuss patterns in these two regions.

Appendix F presents the proportion of variance in civic knowledge and engagement accounted for by family socioeconomic variables. Family socioeconomic variables explained from 7% to 18% of the variance among the participating Central and Eastern European countries, 5% and 15% of the variance in Hong Kong and Australia (East Asian and the Pacific countries), 15% and 19% of the variance in Colombia and Chile (Latin American and the Caribbean countries), and from 8% to 19% of the variance among the participating North American and Western European countries. In general, family socioeconomic variables were responsible for less than one fifth of the variance in civic knowledge and engagement. Therefore, family socioeconomic variables were important marginally to academic achievement in civic knowledge and engagement.

5. Discussion

It comes with no surprise at all to parents, educators, researchers, and policymakers that socioeconomic gaps in educational attainments have persisted for a long history. This research seeks to illustrate challenges that international communities face in addressing socioeconomic equality in learning outcomes. This research essentially focuses on 2 critical issues related to 2 critical research questions. One is what family socioeconomic variables really matter to student learning outcomes; the other is how important these critical family socioeconomic variables actually are to student learning outcomes. Data analysis as shown in previous pages has been designed to provide empirical evidence to these 2 issues. This discussion serves to synthesize patterns from the massive data analysis to inform policy. It starts with an overview of current status of socioeconomic differences in learning outcomes. From there, this discussion moves to identify key family socioeconomic variables that matter the most to student learning outcomes. This goal is achieved by seeking multiple patterns regarding the top 3 important family

socioeconomic variables in each school subject. This discussion then moves to tackle the issue of how important these key family socioeconomic variables are to student learning outcomes. This goal is achieved by seeking multiple patterns regarding the partition of variance into student (family) and school components and the examination of the proportion of variance accounted for by key family socioeconomic variables. Finally, policy implication is made according to these syntheses based on analytical results of socioeconomic differences in student learning outcomes.

5.1. Current Status of Socioeconomic Differences in Learning Outcomes

With PISA providing the only relatively complete measure of SES constructed based on its conventional definition across international student assessments, this section focuses mainly on PISA data. A couple of patterns can be identified to address the current status of socioeconomic differences in student learning outcomes. First, the SES effects do exist and in fact exist in a comprehensive manner across all tested school subjects (reading, mathematics, and science) and across all participating countries (and thus across all participating regions).

Second, the SES effects are moderate in size in all tested school subjects across the majority of the participating countries from all participating regions except Arab States where the SES effects are small in size across all tested school subjects. PISA has a mean of 500 score points. When 2 students have SES one SD apart, moderate SES effects indicate a performance gap that could be as wide as 50 score points, whereas small SES effects indicate a performance gap that could be as wide as 30 score points.

Third, the SES effects are similar in size across tested school subjects in all participating countries (and thus in all participating regions). For example, the performance gaps are 28, 27, and 27 score points across reading, mathematics, and science in Jordan.

Therefore, in conclusion, the SES effects exist in a comprehensive way with the vast majority of the participating regions showing moderate effects that are quite consistent across tested school subjects (reading, mathematics, and science).

An examination of PISA tables reported earlier indicates another evident pattern. Among all participating regions in PISA, Arab States have participating countries with the smallest performance gaps associated with all family socioeconomic variables included in this research. TIMSS tables reported earlier lend further support to this claim. Therefore, small performance gaps associated with family socioeconomic variables are more likely to be found in participating Arab States countries across reading, mathematics, and science. On the other hand, both PISA and TIMSS indicate that large performance gaps associated with family socioeconomic variables are more likely to be found in relatively more developed regions such as Central and Eastern Europe as well as North America and Western Europe.

5.2. Critical Aspect of Socioeconomic Status That Matters the Most to Learning Outcomes

Conventionally, SES is defined as a composite of 3 components: parental occupation, parental education, and household income. In PISA, household income, a piece of information that is difficult to obtain, is measured through a sensitive indicator of family possession. These 3 components of SES are examined together to discern the most critical SES component that matters the most to student learning outcomes. One pattern is crystal clear from a global perspective that parental occupation is the most critical SES component that matters the most to student learning outcomes.

Regional variation, however, is too large in this case to ignore. Parental occupation becomes the most important SES component in relatively more developed regions such as Central and Eastern Europe as well as North America and Western Europe. On the other hand,

family possession becomes the most important SES component in relatively less developed regions such as East Asia and the Pacific as well as Latin America and the Caribbean.

It is speculated now that family possession is more of an issue of learning resources at home in relatively less developed regions; that is, students from families that are able to support their learning with resources outperform students from families that are unable to support their learning with resources. In contrast, parental occupation is more of an issue of social capital at home in relatively more developed regions where, thanks to more economic prosperity, variation in (essential) family possession is expected to be not as wide as that in relatively less developed regions. In this case, it is the social environment rather than the material environment (as in the case of relatively less developed regions) that matters to the learning of students. It is common sense that in homes where parents hold more prestigious occupations there is a stronger socially motivative and stimulative environment. In fact, the analytical results on the effects of home literacy to be discussed later on also strongly imply this notion of social capital.

What is the next critical SES component that matters to student learning outcomes? The answer is certain family possession globally. However, one more time, regional variation is noticeable. To some extent, there is a switch of pattern between relatively more and less developed regions. Family possession becomes the second important SES component in relatively more developed regions, whereas parental occupation becomes the second important SES component in relatively less developed regions. Although this regional variation is not as strong as that in the case of the most important SES component, it is, as reported, detectable particularly in reading and mathematics.

Therefore, it is reasonable to suggest that when it comes to student learning outcomes, social capital at home outweighs material resources at home in relative more developed regions,

whereas material resources at home outweighs social capital at home in relatively less developed regions. Overall, there is a certain degree of risk to speak about a global pattern of what aspect of SES matters the most to student learning outcomes because of the regional variation. It is a more sensible and appropriate strategy to approach this issue from a developmental perspective, taking into account regions that are relatively more or less developed economically.

Finally, parental education has been the “underdog” across all tested school subjects. It is understandable, however, to expect that parental education may not transform effortlessly into either material resources at home (in comparison with family possession) or social capital at home (in comparison with parental occupation). The key issue therefore is that parental education does not automatically equal to household income (note that social capital does need a material base to exist). Although parental education is the very foundation for parental occupation and household income, it is possible that parental education creates and sustains neither material environment nor social environment directly.

5.3. Beyond SES components Into Other Family Socioeconomic Variables

This research has explored 3 family socioeconomic variables other than SES and its components. They are home literacy, family size, and home language, with home literacy and home language common across PISA, TIMSS, and CivEd. Evidently, it is home literacy that draws the most attention (more discussion later on). With a focus on having 11 to 100 books at home, it is still possible to observe a few small effects of home literacy on student learning outcomes. With a focus on having more than 101 books at home, even moderate effects of home literacy are difficult to find. For example, the performance gap associated with having more than 101 books at home is as wide as 93 score points in mathematics in Tunisia (Arab States), as wide as 156 score points in reading in Czech Republic (Central and Eastern Europe), as wide as 107

score points in reading in Kyrgyzstan (Central Asia), as wide as 126 score points in mathematics in Korea (East Asia and the Pacific), as wide as 113 score points in reading in Argentina (Latin America and the Caribbean), and as wide as 154 score points in reading in Austria (North America and Western Europe). These examples indicate substantial effects of home literacy given that the PISA mean is 500 score points.

It should be emphasized that the substantial effects of home literacy remain true across all tested school subjects (reading, mathematics, science, and civic knowledge and engagement) and across all participating countries (and thus across all participating regions). More importantly, conclusions concerning mathematics and science have been cross-validated across international student assessments (between PISA and TIMSS).

What is the reason for such powerful effects on student learning outcomes associated with home literacy? Obviously, the counting of the number of books at home is not important. Again, it is more of an issue of social capital at home. Categories of books available at home strongly imply whether a family takes interest in intellectual pursuit of knowledge and understanding. As such, a higher category of books available at home is highly indicative of a more motivative and stimulative social environment that invites and encourages students to wonder and explore. The analytical results of international student assessments suggest that the resulting social capital for students has enormous impacts on their learning as shown through the family socioeconomic variable of home literacy.

In comparison to the effects of home literacy, family size and home language become truly secondary in their effects on student learning outcomes. Still, findings on these variables are synthesized. For family size, first, it has no effects on student learning outcomes in quite a few participating countries especially in reading, mathematics, and science. Second, the effects

of family size, when existing, are negative. Therefore, larger families do face bigger challenges for their children to fare well in school. Third, there is a caution against any overstatement of the importance of family size. The effects of family size are small in size, at most moderate in size even among the participating countries in CivEd that has shown a stronger pattern of the effects of family size compared with TIMSS. Finally, in some rare occasions (Japan in science as well as Ghana and Palestinian A. T. in mathematics), positive effects of family size are detected, which speaks against small families. These rare cases may be a result of family size being treated as a continuous variable. Often times, categorical treatment of family size (not possible in this research) may help understand or even avoid rare cases like these.

Home language is another secondary family socioeconomic variable to student learning outcomes compared with home literacy. This is also another family socioeconomic variable that shows regional variation too large to overlook. First, home language (speaking the language of the test or the official language) is relatively more important to civic knowledge and engagement (most participating countries in CivEd witness effects) than reading, mathematics, and science (quite a few participating countries in PISA and TIMSS do not witness effects). Second, the effects of home language are all large in the case of civic knowledge and engagement across all participating regions, but there are enough small effects in terms of reading, mathematics, and science across all participating regions (if taking into account null effects as well). Third, the effects of home language are overwhelmingly positive, indicating that speaking the language of the test or the official language does have advantages to the learning of various school subjects (considerable advantages in terms of civic education). A couple of countries show negative effects of home language, which speaks against speaking the language of the test or the official language (Azerbaijan and Kyrgyzstan in reading, mathematics, and science; Qatar and Tunisia in

mathematics; and Brazil in mathematics and science). These counterintuitive cases are likely due to the fact that the language of the test or the official language may not be the one that most people speak daily at home or even in school. Azerbaijan and Kyrgyzstan represent typical cases where language is a complex social issue that even contributes to social unrest.

5.4. Family Socioeconomic Variables That Matter the Most to Learning Outcomes

As far as student learning outcomes are concerned, not only does home literacy draw the most attention for its critical importance among family socioeconomic variables other than SES and its components, it actually turns out to be the most important family socioeconomic variable of all. Although this research does not profess to be inclusive of all family socioeconomic variables, it is difficult to imagine additional family socioeconomic variables that are more powerful for student learning outcomes than those already included in this research.

The importance of home literacy can be understood from a couple of perspectives. First, as already mentioned, home literacy is the most important family socioeconomic variable that matters the most to all tested school subjects (reading, mathematics, science, and civic knowledge and engagement). The case of civic knowledge and engagement is certainly tentative given that CivEd does not have as many family socioeconomic variables as PISA. Although TIMSS does not have as many family socioeconomic variables as PISA either, it provides supplementary evidence to PISA results in terms of mathematics and science literacy.

Second, it is difficult for the substantial effects of home literacy on student learning outcomes to fade away. What is the second important family socioeconomic variable that matters to the tested school subjects? It is home literacy again (referring to having 11 to 100 books at home) in 3 out of the 4 tested school subjects (reading, science, and civic knowledge and engagement). What is the third important family socioeconomic variable that matters to the

tested school subjects? Home literacy (referring to having 11 to 100 books at home) is either the solo answer or part of the answer for all tested school subjects across all participating countries.

Therefore, for each of the top 3 family socioeconomic variables, home literacy either gains an overwhelming majority or ties with a competing variable to gain a majority. As a matter of fact, the most certain finding from this research is the critical role of home literacy in student learning outcomes highly significant with both absolute and relative effects. As discussed earlier, the overwhelming importance of home literacy calls for an examination of social capital at home.

With home literacy overshadowing everything, there is indeed another important family socioeconomic variable that matters in an important way to student learning outcomes: parental occupation. Recall that parental occupation is the most important component of the 3 SES components. Among all family socioeconomic variables, parental occupation is the second important family socioeconomic variable in mathematics and science (tied with home literacy in the case of science), and it is the third important family socioeconomic variable in reading and science (tied with home literacy in both cases). Overall, this research indicates that home literacy and parental occupation in this order are clearly the most important family socioeconomic variables that matter the most to student learning outcome. Again, it is very likely that both home literacy and parental occupation are more of a matter of social capital at home.

5.5. Relative Importance of Family Socioeconomic Variables as a Whole

The emphasis on home literacy and to some extent parental occupation as the most important family socioeconomic variables that matter the most to student learning outcomes needs to be understood within context because family socioeconomic variables are not the only variables that affect student learning outcomes at the student level. Other variables, such as gender, attitude, and career aspiration, may also affect student learning outcomes. There are 2

ways to understand how important family socioeconomic variables are to student learning outcomes. One way is to partition variance in each student learning outcome into variance component for which students (families) are responsible and variance component for which schools are responsible. If there is more variance at the student (family) level than at the school level, family socioeconomic variables may play a key role in explaining this variance. The other way is to estimate the proportion of variance in each student learning outcome accounted for by family socioeconomic variables. If they explain a sizeable proportion of the variance, they are critical predictors of that student learning outcome.

Both ways indicate that family socioeconomic variables as a whole are at most moderately responsible for the variance in each student learning outcome. First, there are discrepancies between PISA and TIMSS in that students (families) are more responsible than schools for variance in reading, mathematics, and science for the majority of the participating countries in PISA but students (families) are less responsible than schools for variance in mathematics and science for the majority of the participating countries in TIMSS. Furthermore, in terms of CivEd, students (families) are more responsible than schools for variance in civic knowledge and engagement for the majority of the participating North American and Western European countries, whereas students (families) are less responsible than schools for variance in civic knowledge and engagement for the majority of the participating Central and Eastern European countries.

The regional inconsistency in civic education may not be surprising to many researchers because of the historical background of these 2 regions. Because both PISA and TIMSS measure mathematics and science literacy, the inconsistency between these 2 international student assessments regarding the partition of variance needs more investigation. A reasoned speculation

is that this inconsistency is due to the fact that PISA and TIMSS define mathematics and science literacy rather differently. TIMSS focuses on common core school curricula in mathematics and science. Very likely because of this focus on school curricula, students (families) are less responsible than schools for variance in mathematics and science for the majority of the participating countries in TIMSS. On the other hand, PISA focuses on mathematical and scientific survival skills that are largely independent of school mathematics and science curricula. Very likely because of this independence of school curricula, students (families) are more responsible than schools for variance in mathematics and science (and also reading) for the majority of the participating countries in PISA.

As one can see, family effects are not necessarily always more prevalent than school effects as the popular notion in the 1960s and 1970s indicated that “schools don’t make a difference.” As a result, family socioeconomic variables may not necessarily always play a key role in explaining student learning outcomes. In fact, family socioeconomic variables as a whole are responsible for less than one third of the variance in reading, mathematics, and science literacy in all participating country in PISA (with one country exceptional in both reading and science), and family socioeconomic variables as a whole are responsible for at most one fifth of the variance in mathematics and science literacy in TIMSS as well as civic knowledge and engagement in CivEd. All evidence leads to the conclusion that family socioeconomic variables as a whole are only moderately important to student learning outcomes in all tested school subjects in each and every participating country in PISA, TIMSS, and CivEd. Therefore, the impact of family socioeconomic variables may not be overly stated in any participating country regardless of school subjects (reading, mathematics, science, and civic knowledge and

engagement), regardless of the economic condition of the participating country, and regardless of the region from which the participating country comes.

5.6. Policy Implication

Although the SES differences in student learning outcomes are widespread across the tested school subjects and across the participating countries (and thus across the participating regions), family socioeconomic variables are only moderately or marginally important to student learning outcomes in all tested school subjects in each and every participating country. This fact indicates that policies and programs that aim to improve family socioeconomic conditions are not enough to improve student learning outcomes. Nevertheless, the worldwide existence of the SES differences in student learning outcomes is a social injustice and a social concern, even though analytical results of international student assessments indicate that the 21st century may not witness severe socioeconomic discrepancies in student learning outcomes (thanks to the progress that has already been made in combating poverty). This research suggests that any new policy or program that aims to reduce the socioeconomic gaps in student learning outcomes may want to seriously focus on the family socioeconomic variable that matters the most to student learning outcomes: home literacy.

Most policies and programs implemented in the past to reduce socioeconomic inequality in student learning outcomes often focused on providing financial support for socially disadvantaged families and communities. For example, the national free meal program in United States is a federal financial aid program that ensures that socially disadvantaged students do not come to school with a half-full stomach that distracts them from learning. Other programs provide school supplies and learning materials free of charge to socially disadvantaged students. All these programs eventually improve the material environment that surrounds socially

disadvantaged students. This research, however, shows that improving the material environment may not be the most effective strategy to combat socioeconomic inequality in student learning outcomes.

This research indicates that it is the social environment not the material environment that makes a noticeable difference in student learning outcomes. Although it does need a material base to function, social capital comes mainly from adequate education that parents receive. When parents improve their education (and thus their occupation), they generate more social capital at home. This fact implies that policies and programs that combat socioeconomic inequality in student learning outcomes in the 21st century may want to focus on improving the education level of socially disadvantaged parents. Instead of spending money overwhelmingly on students, there may need to be adequate financial support for parents to continue their education for upward social mobility. For example, reduced college tuition programs can be designed to help socially disadvantaged parents to improve their education. They in turn generate social capital at home to inspire their children. Overall, socially disadvantaged parents may no longer be left out of policies and programs that aim to narrow socioeconomic differences in student learning outcomes.

Note that the above policy implication does not necessarily contradict the finding from this research that parent education is not a major player that affects student learning outcomes. Parent education is the foundation of parent occupation and household income. As such, it is the very condition that warrants the effects of, say, parent occupation to exist on student learning outcomes. Therefore, the aforementioned finding does not address the same issue as the above policy implication. Once again, socially disadvantaged parents may need to be a part of the

equation for policies and programs that aim to reduce socioeconomic differences in student learning outcomes in the 21st century.

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Table 1

Effects of Socioeconomic Status on Reading, Mathematics, and Science Literacy in Participating Countries in PISA 2006

Country	Reading		Mathematics		Science	
	Effect	SE	Effect	SE	Effect	SE
<i>Arab States</i>						
Jordan	28.46*	2.31	26.98*	1.83	27.12*	1.92
Qatar	16.61*	4.46	21.17*	3.95	13.57*	3.46
Tunisia	20.76*	2.37	26.84*	2.48	18.65*	2.28
<i>Central and Eastern Europe</i>						
Bulgaria	55.00*	3.68	47.43*	3.34	51.60*	3.18
Croatia	32.22*	2.72	31.77*	2.38	34.27*	2.54
Czech Republic	51.11*	4.30	53.85*	3.67	50.47*	3.37
Estonia	28.83*	2.67	34.31*	2.40	31.38*	2.30
Hungary	44.80*	3.31	47.45*	3.13	43.97*	2.69
Latvia	30.28*	2.77	30.56*	2.27	28.56*	2.15
Lithuania	38.77*	2.37	40.56*	2.19	38.13*	2.24
Montenegro	24.33*	5.83	27.29*	4.41	24.37*	4.77
Poland	42.01*	1.88	38.07*	1.67	39.47*	1.80
Romania	31.76*	3.67	36.65*	3.77	34.59*	3.40
Russian Federation	33.75*	2.69	32.64*	2.47	32.08*	2.36
Serbia	36.19*	2.43	34.18*	2.37	32.57*	2.27
Slovak Republic	44.52*	4.08	45.68*	3.73	44.77*	3.21

Slovenia	39.08*	2.65	42.02*	2.97	45.85*	3.10
Turkey	30.58*	3.34	34.88*	3.87	30.88*	3.21
<i>Central Asia</i>						
Azerbaijan	18.05*	3.03	2.66	1.65	11.68*	2.19
Kyrgyzstan	36.67*	3.69	32.86*	3.20	27.51*	3.04
<i>East Asia and the Pacific</i>						
Australia	40.79*	1.75	37.88*	1.64	42.70*	1.77
Hong Kong, China	22.09*	2.27	26.13*	2.56	25.85*	2.34
Indonesia	22.82*	2.54	23.66*	2.77	20.85*	2.52
Japan	39.12*	3.61	39.58*	3.22	38.73*	3.45
Korea	27.85*	3.10	37.66*	3.36	31.53*	3.00
Macao, China	11.98*	3.98	14.32*	3.23	13.37*	3.52
New Zealand	48.03*	2.26	42.43*	1.84	51.46*	2.03
Taiwan, China	37.87*	2.30	46.25*	3.10	41.73*	2.47
Thailand	28.30*	2.27	28.11*	2.08	27.82*	2.00
<i>Latin America and the Caribbean</i>						
Argentina	38.74*	3.14	37.89*	2.83	37.84*	2.59
Brazil	30.05*	2.88	31.57*	2.56	29.36*	2.17
Chile	37.87*	2.61	37.61*	2.17	37.64*	2.17
Colombia	28.04*	2.41	26.21*	2.60	22.99*	2.01
Mexico	27.63*	1.61	25.79*	1.51	25.11*	1.29
Uruguay	37.54*	2.36	36.21*	2.04	33.83*	1.71

North America and Western Europe

Austria	46.50*	3.80	43.46*	3.37	46.02*	3.27
Belgium	47.38*	2.39	48.54*	2.41	47.54*	2.06
Canada	36.48*	1.77	29.57*	1.54	33.14*	1.60
Denmark	32.38*	1.94	33.98*	1.72	38.93*	1.84
Finland	28.54*	1.63	32.27*	1.66	31.11*	1.66
France	48.32*	3.05	50.66*	2.68	53.68*	2.69
Germany	47.31*	3.28	46.66*	2.67	46.48*	2.45
Greece	34.17*	2.93	37.13*	2.34	36.33*	2.30
Iceland	24.18*	1.99	28.46*	1.65	28.41*	1.87
Ireland	37.64*	2.30	35.21*	1.97	39.15*	2.15
Israel	40.17*	3.69	43.48*	3.17	42.90*	3.20
Italy	30.01*	2.03	28.72*	1.73	30.77*	1.69
Liechtenstein	44.29*	10.55	43.42*	9.96	48.66*	9.87
Luxembourg	41.23*	2.84	35.71*	2.80	40.99*	2.62
Netherlands	39.70*	3.42	38.83*	2.62	43.52*	2.71
Norway	38.29*	2.75	34.72*	2.23	36.03*	2.49
Portugal	32.66*	1.83	28.94*	1.57	28.25*	1.47
Spain	26.73*	1.56	29.77*	1.31	31.42*	1.37
Sweden	35.70*	4.04	38.34*	3.16	38.17*	3.36
Switzerland	39.37*	1.74	39.93*	1.89	44.17*	1.84
United Kingdom	43.02*	2.31	40.70*	2.07	48.44*	2.23
United States			41.97*	2.57	49.05*	2.71

Note. * $p < 0.05$. Socioeconomic status is used as a continuous index variable measuring economic, social, and cultural conditions of a family. This measure is unique to PISA 2006 (i.e., not available either in CivEd 1999 or in TIMSS 2003). Reading achievement is not available for the United States.

Table 2

Effects of Parental Occupation on Reading, Mathematics, and Science Literacy in Participating Countries in PISA 2006

Country	Reading		Mathematics		Science	
	Effect	SE	Effect	SE	Effect	SE
<i>Arab States</i>						
Jordan	1.42*	0.12	1.43*	0.11	1.47*	0.11
Qatar	1.39*	0.23	1.34*	0.21	1.18*	0.20
Tunisia	1.54*	0.17	2.00*	0.17	1.38*	0.15
<i>Central and Eastern Europe</i>						
Bulgaria	2.79*	0.20	2.43*	0.19	2.67*	0.19
Croatia	1.80*	0.14	1.77*	0.13	1.88*	0.14
Czech Republic	2.81*	0.22	2.77*	0.20	2.64*	0.18
Estonia	1.56*	0.13	1.68*	0.11	1.58*	0.11
Hungary	2.16*	0.18	2.33*	0.19	2.10*	0.17
Latvia	1.45*	0.13	1.33*	0.12	1.39*	0.12
Lithuania	1.61*	0.12	1.65*	0.11	1.59*	0.12
Montenegro	1.46*	0.30	1.40*	0.24	1.41*	0.26
Poland	2.07*	0.11	1.86*	0.09	1.98*	0.10
Romania	1.89*	0.22	2.06*	0.21	1.98*	0.21
Russian Federation	1.30*	0.11	1.30*	0.10	1.30*	0.10
Serbia	1.96*	0.13	1.80*	0.14	1.76*	0.13
Slovak Republic	2.12*	0.19	2.11*	0.18	2.17*	0.16

Slovenia	1.97*	0.15	2.11*	0.18	2.31*	0.18
Turkey	1.74*	0.21	1.92*	0.25	1.69*	0.21
<i>Central Asia</i>						
Azerbaijan	0.95*	0.14	0.13	0.08	0.57*	0.11
Kyrgyzstan	1.49*	0.17	1.34*	0.14	1.14*	0.13
<i>East Asia and the Pacific</i>						
Australia	1.68*	0.08	1.60*	0.07	1.78*	0.08
Hong Kong, China	1.06*	0.13	1.37*	0.16	1.27*	0.15
Indonesia	1.24*	0.16	1.32*	0.17	1.13*	0.16
Japan	1.21*	0.14	1.20*	0.13	1.10*	0.14
Korea	1.01*	0.15	1.25*	0.16	1.11*	0.15
Macao, China	0.45*	0.21	0.53*	0.19	0.51*	0.19
New Zealand	2.05*	0.12	1.79*	0.10	2.18*	0.11
Taiwan, China	1.35*	0.10	1.59*	0.13	1.48*	0.11
Thailand	1.68*	0.15	1.71*	0.15	1.67*	0.14
<i>Latin America and the Caribbean</i>						
Argentina	2.10*	0.26	1.91*	0.20	1.91*	0.21
Brazil	1.81*	0.18	1.81*	0.17	1.76*	0.14
Chile	2.37*	0.18	2.35*	0.16	2.30*	0.15
Colombia	1.49*	0.16	1.51*	0.18	1.32*	0.13
Mexico	1.62*	0.11	1.46*	0.10	1.50*	0.09
Uruguay	2.19*	0.16	1.89*	0.13	1.91*	0.11

North America and Western Europe

Austria	2.15*	0.18	1.90*	0.17	2.01*	0.16
Belgium	2.22*	0.12	2.29*	0.12	2.24*	0.11
Canada	1.56*	0.09	1.42*	0.07	1.56*	0.08
Denmark	1.42*	0.10	1.42*	0.09	1.63*	0.10
Finland	1.12*	0.08	1.23*	0.08	1.19*	0.08
France	2.22*	0.15	2.29*	0.14	2.47*	0.14
Germany	2.14*	0.17	2.25*	0.14	2.20*	0.14
Greece	1.96*	0.16	1.86*	0.13	1.89*	0.14
Iceland	1.10*	0.10	1.28*	0.08	1.32*	0.10
Ireland	1.60*	0.10	1.50*	0.10	1.63*	0.10
Israel	1.94*	0.19	2.03*	0.15	1.95*	0.16
Italy	1.65*	0.12	1.55*	0.10	1.63*	0.10
Liechtenstein	2.11*	0.50	1.96*	0.50	2.18*	0.55
Luxembourg	2.53*	0.19	2.31*	0.19	2.49*	0.19
Netherlands	2.10*	0.18	1.94*	0.14	2.24*	0.14
Norway	1.91*	0.13	1.70*	0.11	1.73*	0.12
Portugal	2.39*	0.14	2.14*	0.12	2.08*	0.11
Spain	1.43*	0.10	1.56*	0.09	1.68*	0.09
Sweden	1.71*	0.13	1.77*	0.11	1.82*	0.11
Switzerland	1.93*	0.09	1.86*	0.10	2.12*	0.10
United Kingdom	1.99*	0.11	1.94*	0.11	2.28*	0.12
United States			1.77*	0.13	2.11*	0.15

Note. * $p < 0.05$. Parental occupation is used as a continuous index variable measuring occupational prestige. This measure is unique to PISA 2006 (i.e., not available either in CivEd 1999 or in TIMSS 2003). Reading achievement is not available for the United States.

Table 3

Effects of Parental Education on Reading, Mathematics, and Science Literacy in Participating Countries in PISA 2006

Country	Reading		Mathematics		Science	
	Effect	SE	Effect	SE	Effect	SE
<i>Arab States</i>						
Jordan	6.30*	0.61	6.24*	0.48	6.03*	0.53
Qatar	3.72*	0.89	4.29*	0.73	3.08*	0.66
Tunisia	3.59*	0.68	5.16*	0.74	3.48*	0.64
<i>Central and Eastern Europe</i>						
Bulgaria	19.28*	1.88	16.18*	1.67	17.55*	1.67
Croatia	10.74*	1.13	10.95*	1.04	11.71*	1.09
Czech Republic	11.02*	1.85	13.90*	1.51	12.13*	1.40
Estonia	6.23*	1.32	9.29*	1.22	8.01*	1.13
Hungary	17.55*	1.37	19.36*	1.43	17.82*	1.25
Latvia	9.11*	1.39	10.13*	1.26	8.50*	1.07
Lithuania	15.24*	1.60	17.50*	1.53	15.30*	1.58
Montenegro	8.34*	2.10	8.61*	1.72	7.97*	1.73
Poland	18.02*	1.01	17.09*	0.83	18.42*	0.91
Romania	6.34*	1.65	7.96*	1.41	8.26*	1.29
Russian Federation	9.31*	1.28	9.20*	1.29	9.94*	1.14
Serbia	11.35*	1.17	10.87*	1.09	10.80*	1.08
Slovak Republic	18.57*	2.09	19.42*	2.01	18.76*	1.67

Slovenia	12.69*	1.20	14.70*	1.21	15.34*	1.36
Turkey	5.57*	0.79	7.09*	0.99	6.21*	0.82
<i>Central Asia</i>						
Azerbaijan	5.99*	1.19	1.31*	0.64	5.09*	0.79
Kyrgyzstan	7.61*	1.37	7.48*	1.12	6.26*	1.16
<i>East Asia and the Pacific</i>						
Australia	8.96*	0.51	8.44*	0.51	9.66*	0.54
Hong Kong, China	3.99*	0.53	4.93*	0.58	5.13*	0.53
Indonesia	3.94*	0.59	4.14*	0.62	3.79*	0.55
Japan	15.18*	1.54	15.69*	1.42	16.06*	1.42
Korea	5.70*	0.88	8.56*	1.03	7.38*	0.93
Macao, China	2.04*	0.75	2.80*	0.67	2.71*	0.68
New Zealand	8.04*	0.66	7.48*	0.59	8.93*	0.64
Taiwan, China	9.79*	0.68	12.07*	0.90	11.25*	0.73
Thailand	5.24*	0.64	5.74*	0.56	5.47*	0.58
<i>Latin America and the Caribbean</i>						
Argentina	6.33*	0.73	6.85*	0.64	6.91*	0.62
Brazil	5.31*	0.56	5.93*	0.55	5.25*	0.50
Chile	8.86*	0.86	8.90*	0.78	8.96*	0.76
Colombia	4.60*	0.59	4.50*	0.58	3.70*	0.48
Mexico	6.25*	0.45	5.72*	0.41	5.44*	0.33
Uruguay	8.32*	0.77	8.41*	0.58	7.59*	0.50

North America and Western Europe

Austria	12.14*	1.79	12.07*	1.39	13.62*	1.42
Belgium	11.11*	0.79	11.23*	0.89	11.07*	0.66
Canada	9.59*	0.69	7.47*	0.63	9.15*	0.64
Denmark	8.98*	0.75	8.64*	0.72	10.51*	0.76
Finland	6.30*	0.56	6.75*	0.65	7.09*	0.61
France	8.72*	0.89	9.54*	0.81	10.19*	0.83
Germany	10.75*	0.80	9.60*	0.73	10.37*	0.65
Greece	9.42*	0.93	10.44*	0.76	10.36*	0.73
Iceland	7.17*	0.72	8.04*	0.66	8.10*	0.70
Ireland	9.29*	0.83	8.85*	0.74	9.97*	0.82
Israel	8.19*	1.02	9.60*	0.93	9.53*	0.97
Italy	7.93*	0.72	7.49*	0.58	8.26*	0.57
Liechtenstein	10.84*	2.99	10.50*	3.12	12.89*	2.93
Luxembourg	7.24*	0.67	6.00*	0.66	7.61*	0.61
Netherlands	7.31*	0.78	6.97*	0.64	8.13*	0.70
Norway	7.64*	1.09	7.24*	0.89	8.18*	0.96
Portugal	5.21*	0.41	4.59*	0.36	4.58*	0.35
Spain	5.72*	0.39	6.07*	0.38	6.60*	0.39
Sweden	6.06*	0.91	5.83*	0.80	6.54*	0.78
Switzerland	8.33*	0.57	8.58*	0.58	9.56*	0.59
United Kingdom	8.31*	0.76	7.72*	0.68	9.54*	0.74
United States			10.53*	0.87	12.47*	0.97

Note. * $p < 0.05$. Parental education is used as a continuous variable measuring years of education. This is a common measure across CivEd 1999, PISA 2006, and TIMSS 2003. Reading achievement is not available for the United States.

Table 4

Effects of Family Possession on Reading, Mathematics, and Science Literacy in Participating Countries in PISA 2006

Country	Reading		Mathematics		Science	
	Effect	SE	Effect	SE	Effect	SE
<i>Arab States</i>						
Jordan	24.78*	2.49	21.13*	1.95	22.15*	1.94
Qatar	4.46	3.76	10.21*	3.44	3.12	3.01
Tunisia	22.70*	2.31	25.61*	2.41	18.76*	2.17
<i>Central and Eastern Europe</i>						
Bulgaria	46.50*	3.46	40.63*	3.10	43.61*	2.97
Croatia	25.58*	2.47	24.14*	2.20	26.26*	2.30
Czech Republic	35.55*	3.50	35.49*	3.20	34.39*	2.94
Estonia	16.40*	2.07	21.95*	1.93	19.53*	1.81
Hungary	32.25*	3.17	32.98*	2.80	31.42*	2.43
Latvia	26.45*	2.40	27.66*	2.25	24.61*	1.97
Lithuania	34.26*	2.14	34.75*	2.04	33.15*	1.99
Montenegro	12.17*	4.50	17.80*	3.48	13.11*	3.63
Poland	28.88*	1.77	25.54*	1.58	25.16*	1.54
Romania	22.34*	2.97	26.87*	3.24	24.13*	2.77
Russian Federation	24.26*	2.62	22.42*	2.27	20.87*	2.24
Serbia	29.64*	2.30	28.41*	2.25	25.63*	2.05
Slovak Republic	33.24*	4.25	35.08*	3.84	33.04*	3.24

Slovenia	25.54*	2.10	26.66*	2.14	29.71*	2.25
Turkey	26.50*	3.34	28.25*	3.29	25.24*	2.92
<i>Central Asia</i>						
Azerbaijan	12.86*	2.92	1.72	1.45	7.75*	2.08
Kyrgyzstan	26.23*	3.05	23.41*	2.74	19.86*	2.45
<i>East Asia and the Pacific</i>						
Australia	24.27*	1.67	21.61*	1.51	24.26*	1.70
Hong Kong, China	21.40*	2.61	22.39*	2.85	21.90*	2.77
Indonesia	21.12*	2.33	20.99*	2.67	18.28*	2.35
Japan	22.91*	2.94	24.09*	2.45	23.54*	2.80
Korea	26.18*	2.68	35.44*	2.73	28.21*	2.50
Macao, China	13.06*	3.16	14.93*	2.70	12.42*	3.03
New Zealand	34.10*	2.14	30.68*	1.77	36.89*	2.11
Taiwan, China	27.29*	2.39	35.25*	3.25	28.90*	2.56
Thailand	30.01*	2.54	26.83*	2.47	27.50*	2.21
<i>Latin America and the Caribbean</i>						
Argentina	42.26*	3.52	40.67*	3.23	39.72*	2.82
Brazil	37.90*	3.62	39.37*	2.96	36.49*	2.49
Chile	34.98*	2.64	34.64*	2.24	35.11*	2.39
Colombia	29.37*	2.49	25.80*	2.62	23.12*	2.10
Mexico	26.14*	1.65	25.16*	1.53	24.09*	1.36
Uruguay	35.57*	2.42	36.00*	2.36	32.73*	2.06

North America and Western Europe

Austria	36.12*	3.48	36.19 *	3.10	35.93 *	3.13
Belgium	42.05*	2.93	43.11*	3.07	40.48*	2.64
Canada	26.77*	1.67	18.49*	1.54	19.74*	1.49
Denmark	21.67*	1.85	26.44*	1.62	28.43*	1.69
Finland	16.41*	1.66	22.55*	1.62	19.58*	1.65
France	42.11*	3.27	43.50*	2.76	44.74*	2.87
Germany	38.79*	3.47	37.94*	2.98	36.25*	2.73
Greece	24.86*	3.06	30.39*	2.60	28.33*	2.57
Iceland	6.38*	2.11	9.50*	1.68	8.53*	1.98
Ireland	29.98*	2.55	27.27*	2.11	30.77*	2.34
Israel	25.42*	3.33	27.65*	2.86	28.44*	2.65
Italy	28.11*	2.08	27.66*	1.74	29.48*	1.79
Liechtenstein	28.00*	10.44	30.93*	9.68	31.37*	10.22
Luxembourg	35.96*	3.27	31.59*	2.87	34.66*	3.01
Netherlands	32.30*	3.75	34.11*	3.02	36.10*	3.15
Norway	19.57*	2.42	17.78*	1.90	17.89*	2.04
Portugal	36.93*	2.30	32.30*	2.00	30.74*	1.86
Spain	24.61*	1.94	29.55*	1.66	28.81*	1.87
Sweden	20.17*	3.97	24.89*	2.81	21.92*	3.29
Switzerland	26.39*	1.84	28.70*	1.93	30.16*	1.89
United Kingdom	30.07*	2.31	28.32*	2.12	33.45*	2.14
United States			32.61*	2.49	37.38*	2.65

Note. * $p < 0.05$. Family possession is used as a continuous index variable measuring the availability of following items at home: (a) desk, (b) own room, (c) study place, (d) computer, (e) software, (f) Internet, (g) calculator, (h) literature, (i) poetry, (j) art, (k) textbooks, (l) dictionary, (m) dishwasher, and (n) DVD (or VCR). This measure is unique to PISA 2006 (i.e., not available either in CivEd 1999 or in TIMSS 2003). Reading achievement is not available for the United States.

Table 5

Comparison of Standardized Effects Among Components of Socioeconomic Status on Reading, Mathematics, and Science Literacy in Participating Countries in PISA 2006

Country	First Important Component	Second Important Component	Third Important Component
<i>Arab States</i>			
Jordan			
Reading	Family possession (0.19)	Parental education (0.14)	Parental occupation (0.12)
Mathematics	Parental education (0.17)	Parental occupation (0.16)	Family possession (0.16)
Science	Family possession (0.16)	Parental occupation (0.16)	Parental education (0.15)
Qatar			
Reading	Parental education (0.15)	Parental occupation (0.12)	
Mathematics	Parental education (0.17)	Parental occupation (0.13)	
Science	Parental education (0.16)	Parental occupation (0.14)	
Tunisia			
Reading	Family possession (0.23)	Parental education (0.21)	
Mathematics	Parental education (0.31)	Family possession (0.21)	
Science	Parental education (0.23)	Family possession (0.19)	
<i>Central and Eastern Europe</i>			
Bulgaria			
Reading	Parental occupation (0.24)	Family possession (0.24)	Parental education (0.10)
Mathematics	Family possession (0.26)	Parental occupation (0.24)	Parental education (0.10)
Science	Family possession (0.26)	Parental occupation (0.25)	Parental education (0.10)

Croatia

Reading	Parental occupation (0.22)	Family possession (0.15)	Parental education (0.04)
Mathematics	Parental occupation (0.23)	Family possession (0.14)	Parental education (0.06)
Science	Parental occupation (0.24)	Family possession (0.15)	Parental education (0.07)

Czech Republic

Reading	Parental occupation (0.32)	Family possession (0.14)
Mathematics	Parental occupation (0.30)	Family possession (0.15)
Science	Parental occupation (0.31)	Family possession (0.15)

Estonia

Reading	Parental occupation (0.30)	Family possession (0.07)
Mathematics	Parental occupation (0.29)	Family possession (0.13)
Science	Parental occupation (0.28)	Family possession (0.10)

Hungary

Reading	Parental education (0.20)	Parental occupation (0.20)	Family possession (0.14)
Mathematics	Parental education (0.26)	Parental occupation (0.20)	Family possession (0.14)
Science	Parental education (0.24)	Parental occupation (0.18)	Family possession (0.15)

Latvia

Reading	Parental occupation (0.20)	Family possession (0.16)	
Mathematics	Family possession (0.21)	Parental occupation (0.16)	Parental education (0.08)
Science	Parental occupation (0.20)	Family possession (0.17)	

Lithuania

Reading	Family possession (0.23)	Parental occupation (0.18)	Parental education (0.05)
Mathematics	Family possession (0.24)	Parental occupation (0.18)	Parental education (0.10)
Science	Family possession (0.23)	Parental occupation (0.19)	Parental education (0.06)

Montenegro

Reading	Parental occupation (0.23)	Parental education (0.06)
Mathematics	Parental occupation (0.21)	Family possession (0.10)
Science	Parental occupation (0.25)	Parental education (0.05)

Poland

Reading	Family possession (0.17)	Parental occupation (0.15)	Parental education (0.14)
Mathematics	Parental education (0.17)	Family possession (0.17)	Parental occupation (0.14)
Science	Parental education (0.19)	Parental occupation (0.15)	Family possession (0.14)

Romania

Reading	Parental occupation (0.27)	Family possession (0.15)
Mathematics	Parental occupation (0.30)	Family possession (0.22)
Science	Parental occupation (0.30)	Family possession (0.19)

Russian Federation

Reading	Parental occupation (0.17)	Family possession (0.16)	
Mathematics	Parental occupation (0.18)	Family possession (0.15)	
Science	Parental occupation (0.18)	Family possession (0.13)	Parental education (0.05)

Serbia

Reading	Parental occupation (0.27)	Family possession (0.20)
Mathematics	Parental occupation (0.24)	Family possession (0.19)
Science	Parental occupation (0.26)	Family possession (0.17)

Slovak Republic

Reading	Parental occupation (0.20)	Parental education (0.13)	Family possession (0.12)
Mathematics	Parental occupation (0.20)	Parental education (0.17)	Family possession (0.16)
Science	Parental occupation (0.22)	Parental education (0.16)	Family possession (0.14)

Slovenia

Reading	Parental occupation (0.24)	Family possession (0.10)	Parental education (0.10)
Mathematics	Parental occupation (0.25)	Parental education (0.16)	Family possession (0.10)
Science	Parental occupation (0.26)	Parental education (0.13)	Family possession (0.11)

Turkey

Reading	Family possession (0.25)	Parental occupation (0.16)	
Mathematics	Family possession (0.22)	Parental occupation (0.16)	Parental education (0.13)
Science	Family possession (0.24)	Parental occupation (0.16)	Parental education (0.13)

Central Asia

Azerbaijan

Reading	Parental occupation (0.17)	Family possession (0.14)	
Mathematics			
Science	Parental education (0.11)	Parental occupation (0.10)	Family possession (0.09)

Kyrgyzstan

Reading	Family possession (0.23)	Parental occupation (0.19)
Mathematics	Family possession (0.23)	Parental occupation (0.20)
Science	Family possession (0.21)	Parental occupation (0.18)

East Asia and the Pacific

Australia

Reading	Parental occupation (0.21)	Parental education (0.12)	Family possession (0.11)
Mathematics	Parental occupation (0.21)	Parental education (0.13)	Family possession (0.09)
Science	Parental occupation (0.21)	Parental education (0.13)	Family possession (0.09)

Hong Kong, China

Reading	Family possession (0.17)	Parental occupation (0.07)	Parental education (0.06)
Mathematics	Family possession (0.13)	Parental occupation (0.11)	Parental education (0.08)
Science	Family possession (0.13)	Parental education (0.10)	Parental occupation (0.08)

Indonesia

Reading	Family possession (0.26)	Parental occupation (0.13)	Parental education (0.06)
Mathematics	Family possession (0.23)	Parental occupation (0.14)	Parental education (0.07)
Science	Family possession (0.23)	Parental occupation (0.13)	Parental education (0.08)

Japan

Reading	Parental education (0.19)	Parental occupation (0.09)	Family possession (0.08)
Mathematics	Parental education (0.23)	Family possession (0.11)	Parental occupation (0.09)
Science	Parental education (0.22)	Family possession (0.09)	Parental occupation (0.07)

Korea

Reading	Family possession (0.23)	Parental occupation (0.06)	Parental education (0.04)
Mathematics	Family possession (0.30)	Parental education (0.09)	Parental occupation (0.04)
Science	Family possession (0.23)	Parental education (0.09)	Parental occupation (0.05)

Macao, China

Reading	Family possession (0.12)		
Mathematics	Family possession (0.12)	Parental education (0.08)	
Science	Family possession (0.10)	Parental education (0.09)	

New Zealand

Reading	Parental occupation (0.22)	Family possession (0.18)	Parental education (0.09)
Mathematics	Parental occupation (0.21)	Family possession (0.19)	Parental education (0.10)
Science	Parental occupation (0.22)	Family possession (0.20)	Parental education (0.10)

Taiwan, China

Reading	Parental education (0.17)	Parental occupation (0.15)	Family possession (0.14)
Mathematics	Parental education (0.18)	Family possession (0.17)	Parental occupation (0.13)
Science	Parental education (0.19)	Parental occupation (0.14)	Family possession (0.13)

Thailand

Reading	Family possession (0.27)	Parental occupation (0.14)	Parental education (0.07)
Mathematics	Family possession (0.19)	Parental occupation (0.15)	Parental education (0.12)
Science	Family possession (0.22)	Parental occupation (0.15)	Parental education (0.11)

Latin America and the Caribbean

Argentina

Reading	Family possession (0.27)	Parental occupation (0.15)	Parental education (0.06)
Mathematics	Family possession (0.31)	Parental occupation (0.14)	Parental education (0.13)
Science	Family possession (0.30)	Parental education (0.14)	Parental occupation (0.14)

Brazil

Reading	Family possession (0.30)	Parental occupation (0.18)	
Mathematics	Family possession (0.33)	Parental occupation (0.17)	Parental education (0.07)
Science	Family possession (0.31)	Parental occupation (0.19)	Parental education (0.04)

Chile

Reading	Parental occupation (0.23)	Family possession (0.20)	Parental education (0.09)
Mathematics	Parental occupation (0.26)	Family possession (0.23)	Parental education (0.12)
Science	Parental occupation (0.23)	Family possession (0.23)	Parental education (0.12)

Colombia

Reading	Family possession (0.27)	Parental occupation (0.10)	
Mathematics	Family possession (0.27)	Parental occupation (0.14)	Parental education (0.06)
Science	Family possession (0.26)	Parental occupation (0.14)	

Mexico

Reading	Family possession (0.18)	Parental education (0.15)	Parental occupation (0.15)
Mathematics	Family possession (0.22)	Parental education (0.15)	Parental occupation (0.14)
Science	Family possession (0.20)	Parental occupation (0.18)	Parental education (0.12)

Uruguay

Reading	Parental occupation (0.20)	Family possession (0.18)	Parental education (0.09)
Mathematics	Family possession (0.24)	Parental occupation (0.16)	Parental education (0.14)
Science	Family possession (0.22)	Parental occupation (0.20)	Parental education (0.12)

North America and Western Europe

Austria

Reading	Parental occupation (0.25)	Family possession (0.17)	
Mathematics	Parental occupation (0.21)	Family possession (0.20)	Parental education (0.08)
Science	Parental occupation (0.22)	Family possession (0.19)	Parental education (0.11)

Belgium

Reading	Parental occupation (0.23)	Family possession (0.16)	Parental education (0.11)
Mathematics	Parental occupation (0.25)	Family possession (0.18)	Parental education (0.12)
Science	Parental occupation (0.26)	Family possession (0.17)	Parental education (0.12)

Canada

Reading	Parental occupation (0.17)	Family possession (0.13)	Parental education (0.08)
Mathematics	Parental occupation (0.21)	Family possession (0.08)	Parental education (0.06)
Science	Parental occupation (0.20)	Parental education (0.09)	Family possession (0.07)

Denmark

Reading	Parental occupation (0.19)	Parental education (0.12)	Family possession (0.11)
Mathematics	Parental occupation (0.19)	Family possession (0.18)	Parental education (0.11)
Science	Parental occupation (0.20)	Family possession (0.16)	Parental education (0.14)

Finland

Reading	Parental occupation (0.18)	Family possession (0.09)	Parental education (0.09)
Mathematics	Parental occupation (0.19)	Family possession (0.15)	Parental education (0.08)
Science	Parental occupation (0.17)	Family possession (0.12)	Parental education (0.09)

France

Reading	Parental occupation (0.24)	Family possession (0.18)	Parental education (0.08)
Mathematics	Parental occupation (0.26)	Family possession (0.21)	Parental education (0.11)
Science	Parental occupation (0.27)	Family possession (0.19)	Parental education (0.11)

Germany

Reading	Parental occupation (0.19)	Parental education (0.16)	Family possession (0.15)
Mathematics	Parental occupation (0.25)	Family possession (0.18)	Parental education (0.13)
Science	Parental occupation (0.23)	Parental education (0.16)	Family possession (0.16)

Greece

Reading	Parental occupation (0.23)	Parental education (0.11)	Family possession (0.07)
Mathematics	Parental occupation (0.20)	Parental education (0.16)	Family possession (0.14)
Science	Parental occupation (0.21)	Parental education (0.16)	Family possession (0.12)

Iceland

Reading	Parental education (0.15)	Parental occupation (0.14)
Mathematics	Parental education (0.17)	Parental occupation (0.17)
Science	Parental occupation (0.17)	Parental education (0.16)

Ireland

Reading	Parental occupation (0.19)	Family possession (0.16)	Parental education (0.09)
Mathematics	Parental occupation (0.19)	Family possession (0.16)	Parental education (0.10)
Science	Parental occupation (0.18)	Family possession (0.16)	Parental education (0.10)

Israel

Reading	Parental occupation (0.20)	Family possession (0.08)	Parental education (0.08)
Mathematics	Parental occupation (0.24)	Parental education (0.14)	Family possession (0.09)
Science	Parental occupation (0.19)	Family possession (0.13)	Parental education (0.13)

Italy

Reading	Parental occupation (0.14)	Family possession (0.12)	Parental education (0.06)
Mathematics	Parental occupation (0.17)	Family possession (0.14)	Parental education (0.07)
Science	Parental occupation (0.17)	Family possession (0.15)	Parental education (0.08)

Liechtenstein

Reading	Parental occupation (0.24)	Parental education (0.16)	Family possession (0.14)
Mathematics	Parental occupation (0.20)	Family possession (0.18)	Parental education (0.16)
Science	Parental education (0.23)	Parental occupation (0.20)	Family possession (0.16)

Luxembourg

Reading	Parental occupation (0.29)	Family possession (0.18)	Parental education (0.12)
Mathematics	Parental occupation (0.31)	Family possession (0.17)	Parental education (0.07)
Science	Parental occupation (0.29)	Family possession (0.17)	Parental education (0.15)

Netherlands

Reading	Parental occupation (0.28)	Family possession (0.13)	
Mathematics	Parental occupation (0.26)	Family possession (0.19)	Parental education (0.05)
Science	Parental occupation (0.28)	Family possession (0.16)	Parental education (0.06)

Norway

Reading	Parental occupation (0.25)	Family possession (0.08)
Mathematics	Parental occupation (0.25)	Family possession (0.09)
Science	Parental occupation (0.25)	Family possession (0.08)

Portugal

Reading	Family possession (0.26)	Parental occupation (0.24)	
Mathematics	Family possession (0.24)	Parental occupation (0.24)	
Science	Parental occupation (0.24)	Family possession (0.23)	Parental education (0.05)

Spain

Reading	Parental occupation (0.16)	Parental education (0.13)	Family possession (0.10)
Mathematics	Parental occupation (0.17)	Family possession (0.15)	Parental education (0.12)
Science	Parental occupation (0.19)	Parental education (0.14)	Family possession (0.13)

Sweden

Reading	Parental occupation (0.23)	Family possession (0.08)	Parental education (0.05)
Mathematics	Parental occupation (0.26)	Family possession (0.14)	
Science	Parental occupation (0.26)	Family possession (0.09)	Parental education (0.06)

Switzerland				
Reading	Parental occupation (0.25)	Parental education (0.14)	Family possession (0.09)	
Mathematics	Parental occupation (0.22)	Parental education (0.15)	Family possession (0.13)	
Science	Parental occupation (0.25)	Parental education (0.16)	Family possession (0.11)	
United Kingdom				
Reading	Parental occupation (0.24)	Family possession (0.14)	Parental education (0.06)	
Mathematics	Parental occupation (0.27)	Family possession (0.16)	Parental education (0.06)	
Science	Parental occupation (0.26)	Family possession (0.15)	Parental education (0.07)	
United States				
Mathematics	Family possession (0.23)	Parental occupation (0.19)	Parental education (0.12)	
Science	Family possession (0.21)	Parental occupation (0.20)	Parental education (0.12)	

Note. All standardized effects are statistically significant at the alpha level of 0.05. In some countries, some components do not have statistically significant effects.

Table 6

Effects of Restricted Family Possession on Reading, Mathematics, and Science Literacy in Participating Countries in PISA 2006

Country	Reading		Mathematics		Science	
	Effect	SE	Effect	SE	Effect	SE
<i>Arab States</i>						
Jordan	107.08*	8.29	91.87*	6.68	97.15*	6.58
Qatar	98.04*	14.21	97.77*	12.57	76.48*	10.80
Tunisia	114.91*	9.87	117.37*	10.17	94.00*	8.45
<i>Central and Eastern Europe</i>						
Bulgaria	199.08*	15.13	164.55*	12.87	176.35*	12.82
Croatia	184.23*	13.56	161.99*	11.81	167.28*	12.92
Czech Republic	260.15*	25.33	260.17*	20.70	251.06*	19.22
Estonia	46.83*	11.08	82.41*	9.05	56.23*	9.60
Hungary	184.22*	19.12	186.52*	16.42	173.26*	13.89
Latvia	136.64*	16.16	150.73*	13.50	130.13*	13.59
Lithuania	166.07*	11.95	183.68*	11.55	173.89*	10.98
Montenegro	102.50*	23.13	107.87*	20.05	98.46*	19.36
Poland	166.76*	10.64	138.21*	8.63	137.33*	8.90
Romania	90.30*	11.95	108.25*	12.68	98.03*	10.12
Russian Federation	135.52*	13.74	127.19*	11.28	128.73*	11.20
Serbia	158.28*	12.03	157.94*	11.86	136.38*	10.65
Slovak Republic	202.11*	25.41	206.76*	22.25	192.93*	19.19

Slovenia	173.62*	21.96	151.56*	19.00	170.45*	21.63
Turkey	119.83*	16.30	132.62*	15.53	115.47*	13.81
<i>Central Asia</i>						
Azerbaijan	52.36*	10.96	5.10	6.32	32.73*	8.52
Kyrgyzstan	105.44*	13.70	89.04*	11.23	80.90*	11.07
<i>East Asia and the Pacific</i>						
Australia	165.85*	11.53	151.94*	9.92	169.03*	11.02
Hong Kong, China	116.97*	15.57	99.13*	18.46	103.92*	17.34
Indonesia	80.02*	10.78	80.52*	12.31	73.52*	10.96
Japan	98.97*	10.32	84.22*	8.45	96.14*	10.05
Korea	80.57*	14.00	94.61*	14.53	75.38*	13.47
Macao, China	77.59*	12.85	86.11*	14.45	75.77*	12.80
New Zealand	167.12*	15.10	146.54*	11.77	166.36*	13.67
Taiwan, China	108.56*	8.68	136.29*	11.85	109.59*	9.67
Thailand	101.91*	8.89	82.79*	8.42	88.53*	7.68
<i>Latin America and the Caribbean</i>						
Argentina	168.83*	16.91	150.37*	16.07	153.24*	13.85
Brazil	134.91*	11.10	137.06*	9.90	133.46*	8.93
Chile	124.46*	11.87	129.02*	10.57	127.58*	10.97
Colombia	131.59*	13.28	115.81*	11.89	101.05*	10.62
Mexico	127.53*	9.65	115.38*	8.50	112.66*	8.08
Uruguay	159.26*	11.14	150.10*	11.09	137.77*	9.27

North America and Western Europe

Austria	263.49*	28.84	211.79*	22.90	199.19*	23.09
Belgium	278.54*	22.08	260.44*	21.42	245.97*	17.93
Canada	148.42*	9.84	120.65*	9.44	120.76*	8.61
Denmark	104.11*	16.80	126.98*	14.68	117.95*	15.53
Finland	78.50*	11.02	114.70*	10.20	100.36*	11.09
France	262.84*	20.59	251.55*	18.29	269.22*	18.49
Germany	304.39*	30.34	256.89*	21.69	238.48*	17.90
Greece	162.31*	12.80	156.56*	9.83	165.86*	10.05
Iceland	100.89*	22.42	140.32*	20.86	130.53*	20.68
Ireland	135.22*	12.56	111.77*	10.23	126.08*	11.83
Israel	170.62*	20.65	144.75*	20.81	154.54*	16.13
Italy	201.31*	14.54	177.46*	11.99	188.83*	10.76
Liechtenstein	139.78	91.04	152.50	77.11	150.72	87.19
Luxembourg	194.21*	25.33	174.25*	24.77	174.12*	22.80
Netherlands	237.04*	26.54	211.42*	17.27	217.64*	19.41
Norway	186.43*	17.44	127.87*	13.51	142.79*	13.21
Portugal	245.28*	15.00	217.69*	16.02	206.05*	13.53
Spain	205.16*	13.68	219.28*	12.01	212.38*	13.29
Sweden	121.41*	14.28	118.63*	11.73	107.66*	12.82
Switzerland	158.50*	15.36	151.11*	17.68	146.46*	16.25
United Kingdom	165.68*	12.20	138.57*	10.50	162.86*	12.01
United States			125.71*	14.15	147.97*	15.36

Note. * $p < 0.05$. Restricted family possession is used as a continuous index variable measuring the availability of following items at home: (a) desk, (b) computer, (c) calculator, and (d) dictionary. This measure is unique to PISA 2006 and TIMSS 2003 (i.e., not available in CivEd 1999). Reading achievement is not available for the United States.

Table 7

Effects of Home Literacy on Reading, Mathematics, and Science Literacy in Participating Countries in PISA 2006

Country	Reading				Mathematics				Science			
	11 to 100 Books		More Than 101 Books		11 to 100 Books		More Than 101 Books		11 to 100 Books		More Than 101 Books	
	Effect	SE	Effect	SE	Effect	SE	Effect	SE	Effect	SE	Effect	SE
<i>Arab States</i>												
Jordan	22.93*	3.37	42.81*	5.32	22.70*	3.00	44.77*	4.40	24.21*	3.12	48.90*	4.73
Qatar	28.77*	5.39	35.20*	8.01	36.86*	4.52	42.67*	7.34	23.26*	3.98	28.12*	6.31
Tunisia	36.60*	5.08	72.14*	10.09	36.20*	4.72	92.91*	10.31	29.83*	4.53	64.19*	8.82
<i>Central and Eastern Europe</i>												
Bulgaria	79.02*	7.78	131.38*	9.72	60.83*	5.81	117.15*	8.36	77.22*	6.27	134.74*	8.49
Croatia	52.75*	3.84	89.78*	6.67	40.83*	3.67	74.95*	6.30	47.63*	3.54	91.19*	6.23
Czech Republic	94.25*	13.08	156.49*	14.58	70.34*	9.00	128.18*	10.25	79.04*	8.64	137.33*	10.00
Estonia	49.59*	6.79	89.54*	7.55	32.74*	6.57	76.79*	6.99	42.21*	6.96	89.15*	7.04
Hungary	75.43*	8.63	134.73*	10.06	46.70*	8.15	112.51*	9.46	60.79*	7.02	122.76*	7.75
Latvia	47.31*	8.32	86.15*	7.96	48.08*	7.01	87.89*	7.56	43.42*	6.88	82.79*	7.05
Lithuania	44.24*	4.88	93.93*	6.34	49.74*	4.68	101.34*	5.80	47.50*	4.75	97.68*	5.93
Montenegro	35.85*	5.46	70.71*	13.58	34.63*	4.88	78.66*	10.38	33.01*	4.66	68.20*	11.67
Poland	50.32*	4.76	105.91*	5.72	41.68*	3.91	89.81*	4.58	44.42*	4.19	93.91*	4.98
Romania	53.84*	6.09	94.55*	9.33	50.31*	5.60	100.27*	8.70	48.69*	4.59	95.40*	7.78
Russian Federation	48.39*	6.89	93.45*	8.56	27.67*	6.20	71.14*	6.95	28.17*	6.75	71.77*	7.96

Serbia	53.32*	4.12	96.70*	6.24	51.43*	4.14	99.25*	5.92	43.40*	3.54	87.23*	5.61
Slovak Republic	86.63*	11.44	144.31*	12.75	91.54*	10.07	143.23*	11.01	82.44*	8.15	134.05*	9.49
Slovenia	61.09*	4.47	113.88*	6.55	47.64*	4.84	107.35*	7.33	62.97*	5.42	125.49*	7.93
Turkey	43.55*	6.63	83.09*	9.92	42.96*	5.23	86.60*	10.88	37.27*	4.78	81.58*	8.90
<i>Central Asia</i>												
Azerbaijan	12.92*	3.65	50.22*	7.00	2.75	2.68	14.53*	3.67	10.17*	3.16	36.46*	5.32
Kyrgyzstan	34.00*	4.37	106.75*	9.01	28.95*	3.74	91.59*	7.87	26.98*	3.45	86.42*	7.45
<i>East Asia and the Pacific</i>												
Australia	47.67*	3.80	93.30*	4.09	38.70*	3.67	82.84*	4.28	48.71*	3.82	102.79*	4.27
Hong Kong, China	44.08*	3.87	75.59*	5.67	42.32*	4.34	76.22*	6.53	48.58*	4.44	80.55*	6.05
Indonesia	15.10*	4.02	38.17*	7.43	10.16*	4.08	32.05*	7.78	9.17*	3.40	32.52*	6.62
Japan	54.51*	5.44	75.54*	6.36	46.50*	5.19	75.02*	6.14	57.50*	5.96	82.95*	6.51
Korea	68.47*	7.77	107.60*	8.83	76.17*	7.69	125.65*	9.27	67.48*	6.68	111.36*	8.01
Macao, China	20.09*	4.06	29.03*	6.32	17.85*	3.75	31.12*	6.20	18.60*	3.57	30.98*	5.78
New Zealand	44.46*	6.90	103.74*	7.07	45.35*	6.28	93.99*	6.59	53.56*	6.31	116.55*	6.97
Taiwan, China	56.86*	4.39	99.42*	5.56	76.67*	5.69	123.83*	7.13	66.49*	4.53	112.62*	5.74
Thailand	28.95*	3.93	64.79*	6.66	19.95*	3.61	59.21*	6.62	24.88*	3.32	64.26*	6.37
<i>Latin America and the Caribbean</i>												
Argentina	57.15*	6.83	113.19*	10.68	56.90*	5.73	110.56*	9.85	59.07*	5.55	108.00*	8.37
Brazil	32.99*	4.84	74.03*	11.59	30.43*	3.78	77.77*	11.96	28.95*	3.55	78.07*	10.19
Chile	50.59*	5.97	100.73*	8.53	48.51*	4.76	103.30*	7.24	47.39*	4.95	104.85*	7.86
Colombia	56.81*	5.85	88.68*	8.39	43.39*	4.99	77.83*	9.16	38.19*	4.91	79.76*	7.01
Mexico	33.02*	3.39	66.51*	5.51	32.37*	3.20	68.27*	5.60	29.70*	2.75	66.59*	5.55

Uruguay	47.27*	5.23	96.64*	8.42	46.45*	5.28	93.39*	7.21	39.84*	4.00	89.95*	6.69
<i>North America and Western Europe</i>												
Austria	85.23*	6.61	153.75*	8.02	71.13*	6.50	131.37*	7.41	71.22*	5.94	138.10*	6.96
Belgium	63.23*	5.72	109.64*	6.84	56.92*	5.09	105.53*	6.04	56.78*	4.90	108.25*	5.95
Canada	63.10*	4.69	105.01*	4.75	37.81*	4.34	71.55*	4.58	49.31*	4.49	91.35*	4.70
Denmark	34.32*	5.00	77.92*	5.44	40.65*	4.21	83.63*	4.83	44.91*	4.46	99.15*	4.84
Finland	33.67*	5.94	79.95*	5.81	30.57*	6.01	75.25*	5.75	32.87*	6.07	79.16*	5.77
France	60.31*	5.67	122.80*	7.00	55.95*	5.38	119.54*	6.55	66.44*	5.32	133.87*	6.36
Germany	96.83*	8.92	159.33*	10.56	67.54*	6.83	134.22*	8.32	74.03*	6.69	137.49*	7.95
Greece	37.58*	7.08	80.27*	8.46	38.68*	5.46	83.51*	6.80	38.85*	5.54	86.58*	6.85
Iceland	36.51*	11.21	83.51*	10.62	51.69*	7.87	94.74*	7.25	61.13*	8.62	111.40*	7.78
Ireland	55.29*	5.51	103.87*	6.20	47.33*	4.56	92.15*	5.43	55.80*	4.95	112.23*	5.58
Israel	48.15*	7.85	93.60*	9.69	46.29*	6.80	92.38*	8.29	45.74*	6.62	92.70*	8.69
Italy	55.16*	4.87	103.70*	5.73	38.21*	4.77	86.34*	5.70	39.90*	4.55	94.28*	5.48
Liechtenstein	27.96	25.88	75.12*	35.06	24.24	23.14	83.20*	30.19	33.54	24.57	96.55*	32.04
Luxembourg	61.72*	6.46	131.14*	8.31	49.49*	6.08	111.33*	8.56	54.55*	5.76	122.91*	8.00
Netherlands	48.13*	6.20	97.23*	8.45	47.12*	5.07	100.97*	7.03	55.23*	5.53	112.87*	7.25
Norway	56.06*	8.15	112.52*	8.44	42.62*	6.40	89.05*	6.56	43.23*	7.93	95.39*	8.08
Portugal	56.99*	5.21	104.44*	7.12	40.42*	4.46	90.49*	6.41	43.24*	4.24	90.31*	5.97
Spain	68.78*	5.70	110.39*	6.08	65.88*	5.21	116.67*	5.46	61.46*	5.31	115.37*	5.63
Sweden	64.71*	7.13	120.51*	7.61	50.33*	5.75	104.23*	6.37	58.38*	6.41	113.37*	7.08
Switzerland	64.44*	5.24	114.66*	5.90	62.46*	4.42	115.71*	5.19	70.51*	4.51	129.45*	5.35
United Kingdom	52.92*	4.37	114.80*	5.30	40.24*	3.92	94.65*	4.83	58.43*	4.62	124.25*	5.33

United States	43.16*	5.33	98.36*	7.17	58.51*	5.62	123.63*	7.41
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Note. * $p < 0.05$. Home literacy is used as a categorical variables measuring (a) having 11 to 100 books versus having 0 to 10 books at home and (b) having more than 101 books versus having 0 to 10 books at home. This is a common measure across CivEd 1999, PISA 2006, and TIMSS 2003. Reading achievement is not available for the United States.

Table 8

Effects of Home Language on Reading, Mathematics, and Science Literacy in Participating Countries in PISA 2006

Country	Reading		Mathematics		Science	
	Effect	SE	Effect	SE	Effect	SE
<i>Arab States</i>						
Jordan	6.31	10.31	5.18	9.23	-2.27	8.86
Qatar	20.55	17.37	-32.78*	15.42	-0.21	13.59
Tunisia	-18.19	9.47	-19.88*	9.00	-4.25	7.77
<i>Central and Eastern Europe</i>						
Bulgaria	95.55*	11.30	80.56*	9.15	95.55*	9.14
Croatia	53.98*	10.52	46.30*	11.35	41.80*	10.58
Czech Republic	84.53*	20.98	48.77*	15.49	56.96*	16.34
Estonia	16.92*	6.34	12.51*	5.58	15.12*	6.93
Hungary	72.10*	16.72	61.70*	15.55	73.50*	17.42
Latvia	13.15	7.64	17.52*	7.07	27.53*	7.00
Lithuania	27.59*	7.77	27.34*	7.30	28.73*	8.84
Montenegro	25.52*	10.90	23.45*	11.17	20.36*	9.89
Poland	65.29*	27.28	36.38	20.72	24.78	23.14
Romania	24.56*	11.77	16.70	9.87	15.78	9.23
Russian Federation	69.35*	9.25	34.67*	10.49	56.99*	8.37
Serbia	24.40	15.08	4.20	15.43	-4.28	13.89
Slovak Republic	54.93*	14.53	54.78*	11.23	52.91*	11.42

Slovenia	44.68*	7.21	49.66*	7.28	72.03*	7.86
Turkey	32.16*	13.03	36.95*	12.70	29.30*	12.44
<i>Central Asia</i>						
Azerbaijan	-37.43*	8.02	-13.92*	5.18	-22.85*	5.32
Kyrgyzstan	-32.08*	9.06	-34.36*	7.75	-17.88*	7.15
<i>East Asia and the Pacific</i>						
Australia	19.97*	6.77	-2.31	6.98	22.70*	7.06
Hong Kong, China	28.31*	10.00	49.90*	10.27	49.86*	12.62
Indonesia	24.14*	9.77	16.89	11.58	16.77	10.51
Japan	100.86*	31.22	101.87*	29.46	121.44*	34.26
Korea	116.10*	29.88	90.82*	15.44	38.63	31.01
Macao, China	30.30	15.31	5.06	21.59	25.38	20.04
New Zealand	43.96*	9.32	4.24	7.98	41.57*	9.14
Taiwan, China	45.02*	4.65	50.11*	6.14	45.97*	5.41
Thailand	25.52*	6.12	25.10*	5.88	25.35*	5.35
<i>Latin America and the Caribbean</i>						
Argentina	124.17*	41.78	63.50	41.38	75.82	48.69
Brazil	-55.57	29.98	-67.18*	20.19	-47.93*	21.80
Chile	51.29	36.06	-28.36	31.87	-3.57	32.98
Colombia	-23.16	27.50	22.31	21.31	5.96	16.90
Mexico	92.63*	14.56	62.74*	11.29	65.83*	12.13
Uruguay	47.58*	16.98	31.51*	15.45	27.29	16.23

North America and Western Europe

Austria	63.66*	17.73	73.05*	12.92	94.02*	13.51
Belgium	20.98*	7.34	14.63*	6.42	19.71*	6.44
Canada	30.13*	4.39	9.09*	4.31	25.42*	4.63
Denmark	78.75*	8.77	78.20*	7.10	86.32*	8.45
Finland	29.96*	12.33	56.74*	10.37	71.30*	12.12
France	47.85*	10.00	60.42*	10.02	59.08*	9.10
Germany	87.30*	9.43	80.29*	7.68	90.03*	8.17
Greece	71.16*	12.44	54.38*	9.25	79.49*	10.93
Iceland	86.65*	14.95	55.64*	13.43	74.89*	14.36
Ireland	34.51	17.43	33.81*	15.60	49.15*	15.32
Israel	20.71*	7.79	3.55	6.83	10.65	6.46
Italy	49.55*	4.93	28.22*	4.53	35.80*	4.44
Liechtenstein	98.23*	25.77	88.22*	21.82	100.15*	21.88
Luxembourg	27.12	14.85	31.20	15.85	28.87	17.02
Netherlands	74.96*	12.99	64.33*	10.52	82.28*	11.46
Norway	60.11*	8.33	45.04*	6.78	57.74*	7.43
Portugal	59.40*	17.23	23.58	15.10	44.07*	13.67
Spain	7.71	5.81	12.73*	4.65	17.37*	4.89
Sweden	53.05*	6.88	50.89*	8.66	62.85*	8.47
Switzerland	73.08*	4.88	73.15*	4.76	84.54*	5.01
United Kingdom	49.71*	11.09	41.44*	8.44	57.37*	10.23
United States			40.25*	6.14	63.80*	6.71

Note. * $p < 0.05$. Home language is used as a dichotomous variables measuring speaking language of test versus not speaking language of test at home. This is a common measure across CivEd 1999, PISA 2006, and TIMSS 2003. Reading achievement is not available for the United States.

Table 9

Most Important Standardized Family Socioeconomic Effects on Reading, Mathematics, and Science Literacy in Participating Countries in PISA 2006

Country	First Important Variable	Second Important Variable	Third Important Variable
<i>Arab States</i>			
Jordan			
Reading	Family possession (0.19)	Parental education (0.15)	Parental occupation (0.12)
Mathematics	Parental education (0.18)	Parental occupation (0.16)	Family possession (0.13)
Science	Parental occupation (0.16)	Parental education (0.15)	Family possession (0.13)
Qatar			
Reading	More than 101 books (0.14)	Parental education (0.14)	Parental occupation (0.12)
Mathematics	11 to 100 books (0.16)	Parental education (0.15)	More than 101 books (0.15)
Science	Parental education (0.15)	More than 101 books (0.14)	Parental occupation (0.13)
Tunisia			
Reading	Family possession (0.21)	Parental occupation (0.18)	11 to 100 books (0.06)
Mathematics	Parental occupation (0.29)	Family possession (0.18)	More than 101 books (0.10)
Science	Parental occupation (0.20)	Family possession (0.17)	More than 101 books (0.08)
<i>Central and Eastern Europe</i>			
Bulgaria			
Reading	More than 101 books (0.25)	Parental occupation (0.22)	11 to 100 books (0.16)
Mathematics	More than 101 books (0.29)	Parental occupation (0.21)	11 to 100 books (0.14)
Science	More than 101 books (0.35)	Parental occupation (0.22)	11 to 100 books (0.20)

Croatia

Reading	More than 101 books (0.26)	11 to 100 books (0.22)	Parental occupation (0.19)
Mathematics	Parental occupation (0.21)	More than 101 books (0.18)	11 to 100 books (0.15)
Science	More than 101 books (0.27)	Parental occupation (0.20)	11 to 100 books (0.19)

Czech Republic

Reading	More than 101 books (0.49)	Parental occupation (0.29)	11 to 100 books (0.29)
Mathematics	More than 101 books (0.37)	Parental occupation (0.27)	11 to 100 books (0.20)
Science	More than 101 books (0.45)	Parental occupation (0.28)	11 to 100 books (0.26)

Estonia

Reading	More than 101 books (0.47)	Parental occupation (0.29)	11 to 100 books (0.27)
Mathematics	More than 101 books (0.36)	Parental occupation (0.28)	11 to 100 books (0.15)
Science	More than 101 books (0.45)	Parental occupation (0.27)	11 to 100 books (0.22)

Hungary

Reading	More than 101 books (0.49)	11 to 100 books (0.28)	Parental occupation (0.17)
Mathematics	More than 101 books (0.36)	Parental education (0.23)	Parental occupation (0.18)
Science	More than 101 books (0.47)	11 to 100 books (0.24)	Parental education (0.20)

Latvia

Reading	More than 101 books (0.31)	Parental occupation (0.18)	11 to 100 books (0.17)
Mathematics	More than 101 books (0.39)	11 to 100 books (0.23)	Parental occupation (0.15)
Science	More than 101 books (0.36)	11 to 100 books (0.20)	Parental occupation (0.19)

Lithuania

Reading	More than 101 books (0.26)	Parental occupation (0.16)	Family possession (0.14)
Mathematics	More than 101 books (0.34)	11 to 100 books (0.19)	Parental occupation (0.16)
Science	More than 101 books (0.33)	11 to 100 books (0.18)	Parental occupation (0.17)

Montenegro

Reading	More than 101 books (0.29)	11 to 100 books (0.17)	Parental occupation (0.17)
Mathematics	More than 101 books (0.33)	11 to 100 books (0.17)	Parental occupation (0.15)
Science	More than 101 books (0.31)	Parental occupation (0.20)	11 to 100 books (0.18)

Poland

Reading	More than 101 books (0.32)	11 to 100 books (0.18)	Parental occupation (0.13)
Mathematics	More than 101 books (0.30)	11 to 100 books (0.17)	Parental education (0.15)
Science	More than 101 books (0.32)	11 to 100 books (0.18)	Parental education (0.17)

Romania

Reading	More than 101 books (0.34)	Parental occupation (0.25)	11 to 100 books (0.24)
Mathematics	More than 101 books (0.35)	Parental occupation (0.27)	11 to 100 books (0.20)
Science	More than 101 books (0.37)	Parental occupation (0.27)	11 to 100 books (0.22)

Russian Federation

Reading	More than 101 books (0.34)	11 to 100 books (0.18)	Parental occupation (0.16)
Mathematics	More than 101 books (0.35)	Parental occupation (0.17)	11 to 100 books (0.08)
Science	More than 101 books (0.25)	Parental occupation (0.17)	Home language (0.13)

Serbia

Reading	More than 101 books (0.27)	Parental occupation (0.24)	11 to 100 books (0.20)
Mathematics	More than 101 books (0.31)	11 to 100 books (0.20)	Parental occupation (0.20)
Science	More than 101 books (0.27)	Parental occupation (0.22)	11 to 100 books (0.18)

Slovak Republic

Reading	More than 101 books (0.48)	11 to 100 books (0.29)	Parental occupation (0.18)
Mathematics	More than 101 books (0.50)	11 to 100 books (0.32)	Parental occupation (0.18)
Science	More than 101 books (0.45)	11 to 100 books (0.28)	Parental occupation (0.20)

Slovenia

Reading	More than 101 books (0.42)	11 to 100 books (0.26)	Parental occupation (0.20)
Mathematics	More than 101 books (0.38)	Parental occupation (0.21)	11 to 100 books (0.19)
Science	More than 101 books (0.41)	11 to 100 books (0.23)	Parental occupation (0.22)

Turkey

Reading	Family possession (0.18)	More than 101 books (0.16)	Parental occupation (0.15)
Mathematics	Family possession (0.15)	More than 101 books (0.15)	Parental occupation (0.15)
Science	More than 101 books (0.17)	Family possession (0.16)	Parental occupation (0.14)

Central Asia

Azerbaijan

Reading	Parental occupation (0.14)	More than 101 books (0.14)	Family possession (0.10)
Mathematics	More than 101 books (0.10)	Home language (-0.07)	Parental education (0.04)
Science	More than 101 books (0.16)	Parental education (0.10)	Parental occupation (0.08)

Kyrgyzstan

Reading	More than 101 books (0.25)	Parental occupation (0.16)	Family possession (0.13)
Mathematics	More than 101 books (0.24)	Parental occupation (0.16)	Family possession (0.13)
Science	More than 101 books (0.27)	Parental occupation (0.14)	11 to 100 books (0.10)

East Asia and the Pacific

Australia

Reading	More than 101 books (0.35)	Parental occupation (0.18)	11 to 100 books (0.18)
Mathematics	More than 101 books (0.34)	Parental occupation (0.19)	11 to 100 books (0.16)
Science	More than 101 books (0.39)	11 to 100 books (0.18)	Parental occupation (0.18)

Hong Kong, China

Reading	More than 101 books (0.28)	11 to 100 books (0.21)	Parental occupation (0.06)
Mathematics	More than 101 books (0.23)	11 to 100 books (0.17)	Home language (0.10)
Science	More than 101 books (0.27)	11 to 100 books (0.21)	Home language (0.10)

Indonesia

Reading	Family possession (0.25)	Parental occupation (0.12)	Parental education (0.06)
Mathematics	Family possession (0.24)	Parental occupation (0.14)	Parental education (0.07)
Science	Family possession (0.24)	Parental occupation (0.12)	Parental education (0.09)

Japan

Reading	More than 101 books (0.24)	11 to 100 books (0.18)	Parental education (0.17)
Mathematics	More than 101 books (0.27)	Parental education (0.21)	11 to 100 books (0.17)
Science	More than 101 books (0.28)	11 to 100 books (0.21)	Parental education (0.20)

Korea

Reading	More than 101 books (0.45)	11 to 100 books (0.30)	Family possession (0.13)
Mathematics	More than 101 books (0.44)	11 to 100 books (0.28)	Family possession (0.19)
Science	More than 101 books (0.45)	11 to 100 books (0.28)	Family possession (0.13)

Macao, China

Reading	11 to 100 books (0.10)	Family possession (0.09)	More than 101 books (0.08)
Mathematics	Family possession (0.09)	More than 101 books (0.07)	Parental education (0.07)
Science	More than 101 books (0.09)	11 to 100 books (0.08)	Parental education (0.08)

New Zealand

Reading	More than 101 books (0.31)	Parental occupation (0.20)	11 to 100 books (0.13)
Mathematics	More than 101 books (0.32)	Parental occupation (0.19)	11 to 100 books (0.15)
Science	More than 101 books (0.36)	Parental occupation (0.20)	11 to 100 books (0.17)

Taiwan, China

Reading	More than 101 books (0.39)	11 to 100 books (0.24)	Home language (0.12)
Mathematics	More than 101 books (0.41)	11 to 100 books (0.29)	Parental education (0.12)
Science	More than 101 books (0.43)	11 to 100 books (0.28)	Parental education (0.13)

Thailand

Reading	Family possession (0.24)	Parental occupation (0.14)	More than 101 books (0.07)
Mathematics	Family possession (0.16)	Parental occupation (0.15)	Parental education (0.12)
Science	Family possession (0.18)	Parental occupation (0.15)	Parental education (0.10)

Latin America and the Caribbean

Argentina

Reading	Family possession (0.21)	Parental occupation (0.15)	More than 101 books (0.14)
Mathematics	Family possession (0.24)	More than 101 books (0.16)	Parental occupation (0.13)
Science	Family possession (0.22)	More than 101 books (0.17)	11 to 100 books (0.15)

Brazil

Reading	Family possession (0.28)	More than 101 books (0.19)	Parental occupation (0.19)
Mathematics	Family possession (0.32)	Parental occupation (0.18)	Parental education (0.07)
Science	Family possession (0.30)	Parental occupation (0.19)	Parental education (0.04)

Chile

Reading	Parental occupation (0.22)	Family possession (0.14)	More than 101 books (0.13)
Mathematics	Parental occupation (0.25)	More than 101 books (0.18)	Family possession (0.16)
Science	Parental occupation (0.22)	More than 101 books (0.18)	Family possession (0.15)

Colombia

Reading	Family possession (0.18)	11 to 100 books (0.15)	More than 101 books (0.12)
Mathematics	Family possession (0.20)	Parental occupation (0.14)	11 to 100 books (0.12)
Science	Family possession (0.17)	More than 101 books (0.15)	Parental occupation (0.13)

Mexico

Reading	Family possession (0.15)	Parental occupation (0.14)	Parental education (0.14)
Mathematics	Family possession (0.18)	Parental education (0.14)	Parental occupation (0.13)
Science	Parental occupation (0.17)	Family possession (0.16)	Parental education (0.11)

Uruguay

Reading	Parental occupation (0.19)	More than 101 books (0.13)	Family possession (0.12)
Mathematics	Family possession (0.19)	Parental occupation (0.14)	More than 101 books (0.14)
Science	Parental occupation (0.19)	Family possession (0.16)	More than 101 books (0.16)

North America and Western Europe

Austria

Reading	More than 101 books (0.55)	11 to 100 books (0.32)	Parental occupation (0.18)
Mathematics	More than 101 books (0.46)	11 to 100 books (0.27)	Parental occupation (0.15)
Science	More than 101 books (0.49)	11 to 100 books (0.26)	Home language (0.16)

Belgium

Reading	More than 101 books (0.26)	Parental occupation (0.19)	11 to 100 books (0.18)
Mathematics	More than 101 books (0.24)	Parental occupation (0.21)	11 to 100 books (0.11)
Science	More than 101 books (0.29)	Parental occupation (0.22)	11 to 100 books (0.18)

Canada

Reading	More than 101 books (0.39)	11 to 100 books (0.25)	Parental occupation (0.16)
Mathematics	More than 101 books (0.30)	Parental occupation (0.20)	11 to 100 books (0.16)
Science	More than 101 books (0.38)	11 to 100 books (0.21)	Parental occupation (0.19)

Denmark

Reading	More than 101 books (0.28)	11 to 100 books (0.16)	Home language (0.12)
Mathematics	More than 101 books (0.29)	Parental occupation (0.16)	11 to 100 books (0.13)
Science	More than 101 books (0.35)	Parental occupation (0.16)	11 to 100 books (0.14)

Finland

Reading	More than 101 books (0.43)	11 to 100 books (0.19)	Parental occupation (0.15)
Mathematics	More than 101 books (0.33)	Parental occupation (0.17)	11 to 100 books (0.14)
Science	More than 101 books (0.36)	11 to 100 books (0.15)	Parental occupation (0.15)

France

Reading	More than 101 books (0.37)	11 to 100 books (0.20)	Parental occupation (0.19)
Mathematics	More than 101 books (0.36)	Parental occupation (0.21)	11 to 100 books (0.20)
Science	More than 101 books (0.42)	11 to 100 books (0.24)	Parental occupation (0.22)

Germany

Reading	More than 101 books (0.47)	11 to 100 books (0.30)	Parental occupation (0.14)
Mathematics	More than 101 books (0.42)	11 to 100 books (0.21)	Parental occupation (0.20)
Science	More than 101 books (0.42)	11 to 100 books (0.22)	Parental occupation (0.18)

Greece

Reading	More than 101 books (0.21)	Parental occupation (0.21)	11 to 100 books (0.11)
Mathematics	More than 101 books (0.23)	Parental occupation (0.17)	Parental education (0.16)
Science	More than 101 books (0.26)	Parental occupation (0.18)	Parental education (0.16)

Iceland

Reading	More than 101 books (0.36)	Parental education (0.13)	11 to 100 books (0.13)
Mathematics	More than 101 books (0.44)	11 to 100 books (0.23)	Parental education (0.16)
Science	More than 101 books (0.50)	11 to 100 books (0.26)	Parental education (0.14)

Ireland

Reading	More than 101 books (0.41)	11 to 100 books (0.23)	Parental occupation (0.17)
Mathematics	More than 101 books (0.39)	11 to 100 books (0.21)	Parental occupation (0.18)
Science	More than 101 books (0.46)	11 to 100 books (0.24)	Parental occupation (0.16)

Israel

Reading	More than 101 books (0.24)	Parental occupation (0.17)	11 to 100 books (0.14)
Mathematics	More than 101 books (0.24)	Parental occupation (0.19)	11 to 100 books (0.13)
Science	More than 101 books (0.24)	Parental occupation (0.16)	11 to 100 books (0.12)

Italy

Reading	More than 101 books (0.34)	11 to 100 books (0.18)	Parental occupation (0.15)
Mathematics	More than 101 books (0.31)	Parental occupation (0.16)	11 to 100 books (0.14)
Science	More than 101 books (0.33)	11 to 100 books (0.14)	Parental occupation (0.12)

Liechtenstein

Reading	Home language (0.20)	Parental occupation (0.19)	Parental education (0.09)
Mathematics	Home language (0.16)	More than 101 books (0.16)	Parental occupation (0.15)
Science	More than 101 books (0.22)	Home language (0.17)	Parental education (0.15)

Luxembourg

Reading	More than 101 books (0.44)	11 to 100 books (0.24)	Parental occupation (0.23)
Mathematics	More than 101 books (0.39)	Parental occupation (0.25)	11 to 100 books (0.20)
Science	More than 101 books (0.42)	Parental occupation (0.23)	11 to 100 books (0.22)

Netherlands

Reading	More than 101 books (0.31)	Parental occupation (0.26)	11 to 100 books (0.16)
Mathematics	More than 101 books (0.36)	Parental occupation (0.22)	11 to 100 books (0.17)
Science	More than 101 books (0.38)	Parental occupation (0.25)	11 to 100 books (0.19)

Norway

Reading	More than 101 books (0.43)	Parental occupation (0.22)	11 to 100 books (0.20)
Mathematics	More than 101 books (0.36)	Parental occupation (0.22)	11 to 100 books (0.17)
Science	More than 101 books (0.39)	Parental occupation (0.21)	11 to 100 books (0.17)

Portugal

Reading	Parental occupation (0.23)	More than 101 books (0.21)	Family possession (0.18)
Mathematics	Parental occupation (0.22)	More than 101 books (0.19)	Family possession (0.17)
Science	Parental occupation (0.22)	More than 101 books (0.22)	Family possession (0.14)

Spain

Reading	More than 101 books (0.48)	11 to 100 books (0.32)	Parental occupation (0.13)
Mathematics	More than 101 books (0.49)	11 to 100 books (0.29)	Parental occupation (0.14)
Science	More than 101 books (0.49)	11 to 100 books (0.28)	Parental occupation (0.16)

Sweden

Reading	More than 101 books (0.47)	11 to 100 books (0.23)	Parental occupation (0.19)
Mathematics	More than 101 books (0.38)	Parental occupation (0.22)	11 to 100 books (0.16)
Science	More than 101 books (0.42)	Parental occupation (0.22)	11 to 100 books (0.19)

Switzerland			
Reading	More than 101 books (0.39)	11 to 100 books (0.23)	Parental occupation (0.18)
Mathematics	More than 101 books (0.38)	11 to 100 books (0.21)	Parental occupation (0.14)
Science	More than 101 books (0.42)	11 to 100 books (0.24)	Parental occupation (0.17)
United Kingdom			
Reading	More than 101 books (0.42)	Parental occupation (0.20)	11 to 100 books (0.19)
Mathematics	More than 101 books (0.35)	Parental occupation (0.24)	11 to 100 books (0.14)
Science	More than 101 books (0.41)	Parental occupation (0.23)	11 to 100 books (0.20)
United States			
Mathematics	More than 101 books (0.34)	Parental occupation (0.17)	11 to 100 books (0.14)
Science	More than 101 books (0.38)	Parental occupation (0.17)	11 to 100 books (0.17)

Note. All standardized effects are statistically significant at the alpha level of 0.05. Some countries show fewer than three statistically significant effects.

Table 10

Effects of Parental Education on Mathematics and Science Literacy in Participating Countries in TIMSS 2003

Country	Mathematics		Science	
	Effect	SE	Effect	SE
<i>Arab States</i>				
Bahrain	4.85*	0.45	4.61*	0.45
Egypt	7.99*	0.31	7.87*	0.31
Jordan	7.74*	0.50	8.11*	0.50
Lebanon	7.48*	0.45	7.12*	0.45
Morocco	2.82*	0.52	1.78*	0.53
Palestinian A. T.	7.73*	0.48	7.23*	0.48
Saudi Arabia	4.37*	0.38	4.14*	0.38
Syria	5.56*	0.39	4.98*	0.40
Tunisia	5.76*	0.40	4.04*	0.41
<i>Central and Eastern Europe</i>				
Bulgaria	12.07*	0.75	2.79*	0.78
Estonia	12.89*	0.96	12.77*	0.97
Hungary	16.26*	0.71	15.09*	0.72
Latvia	5.64*	0.67	5.02*	0.66
Lithuania	16.22*	0.80	12.45*	0.82
Macedonia	12.25*	0.61	12.77*	0.60
Moldova	6.37*	0.51	6.16*	0.51

Romania	11.76*	0.60	9.34*	0.61
Russia	11.68*	0.70	10.76*	0.70
Serbia	13.63*	0.76	12.56*	0.77
Slovak Republic	14.51*	0.83	13.47*	0.83
Slovenia	11.77*	0.85	10.91*	0.86
<i>Central Asia</i>				
Armenia	7.48*	0.70	6.30*	0.70

<i>East Asia and the Pacific</i>				
Australia	10.53*	0.61	11.16*	0.61
Hong Kong, China	3.64*	0.49	3.53*	0.49
Indonesia	4.51*	0.42	4.91*	0.42
Japan	14.71*	0.82	12.33*	0.83
Korea	10.45*	0.56	9.35*	0.56
Malaysia	7.15*	0.45	6.89*	0.45
New Zealand	9.63*	0.95	11.39*	0.95
Philippines	8.15*	0.39	8.89*	0.38
Singapore	8.44*	0.45	10.80*	0.44
Taiwan, China	10.99*	0.50	10.41*	0.50
<i>Latin America and the Caribbean</i>				
Chile	13.22*	0.39	11.47*	0.40
<i>North America and Western Europe</i>				
Belgium (Flemish)	11.64*	0.59	10.31*	0.59
Cyprus	7.91*	0.55	8.59*	0.55
England	12.56*	1.43	12.66*	1.44
Israel	10.44*	0.59	8.68*	0.60
Italy	8.40*	0.54	7.71*	0.54
Netherlands	12.89*	1.03	13.42*	1.03
Norway	9.82*	0.91	9.39*	0.92
Scotland	11.70*	1.39	12.26*	1.38

Sweden	9.86*	0.76	9.18*	0.76
United States	11.02*	0.43	11.32*	0.43
<i>South and West Asia</i>				
Iran	6.81*	0.39	5.94*	0.40
<i>Sub-Saharan Africa</i>				
Botswana	3.98*	0.40	4.71*	0.40
Ghana	3.94*	0.49	4.87*	0.49
South Africa	7.11*	0.35	7.20*	0.35

Note. * $p < 0.05$. Parental education is used as a continuous variable measuring years of education. This is a common measure across CivEd 1999, PISA 2006, and TIMSS 2003.

Table 11

Effects of Restricted Family Possession on Mathematics and Science Literacy in Participating Countries in TIMSS 2003

Country	Mathematics		Science	
	Effect	SE	Effect	SE
<i>Arab States</i>				
Bahrain	78.76*	8.41	69.41*	8.43
Egypt	123.48*	4.99	117.00*	5.02
Jordan	105.68*	5.30	112.22*	5.27
Lebanon	101.11*	7.65	107.44*	7.62
Morocco	32.74*	7.39	33.17*	7.38
Palestinian A. T.	70.75*	5.13	78.24*	5.11
Saudi Arabia	59.46*	5.22	75.15*	5.17
Syria	59.97*	5.34	56.58*	5.41
Tunisia	71.14*	5.51	51.96*	5.55
<i>Central and Eastern Europe</i>				
Bulgaria	82.59*	6.37	15.28*	6.53
Estonia	85.98*	9.93	92.03*	9.94
Hungary	195.87*	10.91	174.12*	11.04
Latvia	96.58*	9.41	90.93*	9.35
Lithuania	150.92*	8.24	115.43*	8.37
Macedonia	94.30*	7.07	93.57*	7.07
Moldova	61.44*	6.50	49.38*	6.53

Romania	109.80*	4.82	90.72*	4.93
Russia	127.27*	7.60	110.74*	7.64
Serbia	111.81*	7.45	102.05*	7.48
Slovak Republic	143.64*	8.91	129.43*	8.97
Slovenia	141.93*	11.27	126.63*	11.32
<i>Central Asia</i>				
Armenia	75.36*	4.95	68.78*	4.95

<i>East Asia and the Pacific</i>				
Australia	127.89*	12.50	113.09*	12.60
Hong Kong, China	75.13*	10.73	53.62*	10.76
Indonesia	71.38*	5.16	68.56*	5.16
Japan	131.99*	11.65	126.61*	11.64
Korea	200.56*	14.45	151.15*	14.57
Malaysia	137.96*	7.28	100.65*	7.40
New Zealand	123.30*	10.86	154.84*	10.78
Philippines	94.39*	5.34	96.56*	5.33
Singapore	187.87*	11.02	192.84*	11.01
Taiwan, China	213.96*	11.28	186.79*	11.37
<i>Latin America and the Caribbean</i>				
Chile	133.26*	5.35	112.87*	5.44
<i>North America and Western Europe</i>				
Belgium (Flemish)	218.20*	15.09	210.84*	15.14
Cyprus	163.26*	8.76	130.41*	8.93
England	139.99*	13.13	128.08*	13.32
Israel	145.77*	14.08	147.53*	14.12
Italy	118.92*	10.37	102.63*	10.41
Netherlands	177.51*	22.05	172.32*	22.12
Norway	95.76*	12.32	117.02*	12.35
Scotland	120.52*	9.83	123.91*	9.78

Sweden	123.88*	15.75	101.91*	15.79
United States	111.20*	5.86	110.37*	5.85
<i>South and West Asia</i>				
Iran	74.99*	4.73	63.76*	4.76
<i>Sub-Saharan Africa</i>				
Botswana	53.57*	4.94	56.74*	4.92
Ghana	46.15*	4.61	33.87*	4.63
South Africa	88.83*	3.66	89.92*	3.66

Note. * $p < 0.05$. Restricted family possession is used as a continuous index variable measuring the availability of following items at home: (a) desk, (b) computer, (c) calculator, and (d) dictionary. This measure is unique to PISA 2006 and TIMSS 2003 (i.e., not available in CivEd 1999).

Table 12

Effects of Home Literacy on Mathematics and Science Literacy in Participating Countries in TIMSS 2003

Country	Mathematics				Science			
	11 to 100 Books		More Than 101 Books		11 to 100 Books		More Than 101 Books	
	Effect	SE	Effect	SE	Effect	SE	Effect	SE
<i>Arab States</i>								
Bahrain	19.66*	5.03	43.34*	5.35	11.13*	5.04	34.07*	5.37
Egypt	17.69*	2.66	36.52*	4.16	14.09*	2.67	29.51*	4.17
Jordan	28.82*	3.62	59.15*	4.78	35.00*	3.62	58.83*	4.78
Lebanon	35.46*	3.96	58.87*	5.25	39.45*	3.91	77.06*	5.19
Morocco	1.80	4.09	13.43	7.31	-2.22	4.08	11.09	7.29
Palestinian A. T.	24.14*	3.20	39.36*	4.66	19.93*	3.20	32.27*	4.67
Saudi Arabia	14.26*	3.79	31.01*	4.76	22.35*	3.78	40.68*	4.74
Syria	20.09*	3.51	35.18*	5.07	15.80*	3.56	26.00*	5.14
Tunisia	13.98*	3.42	59.29*	5.39	12.37*	3.44	43.41*	5.42
<i>Central and Eastern Europe</i>								
Bulgaria	26.41*	4.79	62.69*	4.72	16.50*	4.94	23.02*	4.86
Estonia	40.26*	9.64	80.26*	9.47	27.56*	9.72	62.99*	9.55
Hungary	74.41*	7.89	135.32*	7.81	57.98*	8.03	114.90*	7.95
Latvia	52.01*	8.62	81.06*	8.55	28.44*	8.61	55.50*	8.54
Lithuania	41.66*	4.90	89.77*	5.36	34.91*	4.97	71.43*	5.44
Macedonia	53.18*	4.30	76.45*	5.56	48.49*	4.31	74.52*	5.57

Moldova	28.14*	3.81	54.89*	5.00	22.48*	3.82	52.93*	5.01
Romania	38.22*	3.90	91.43*	4.50	25.59*	3.99	70.98*	4.60
Russia	43.13*	7.29	81.54*	7.30	45.62*	7.32	77.91*	7.33
Serbia	44.07*	3.73	96.35*	5.00	40.59*	3.76	87.22*	5.05
Slovak Republic	70.80*	6.83	129.64*	7.10	54.85*	6.89	112.66*	7.16
Slovenia	53.56*	6.29	88.31*	6.70	54.16*	6.27	91.74*	6.68
<i>Central Asia</i>								
Armenia	34.15*	3.85	59.41*	4.09	25.01*	3.87	43.47*	4.11
<i>East Asia and the Pacific</i>								
Australia	44.45*	6.57	73.37*	6.47	51.89*	6.47	96.02*	6.38
Hong Kong, China	28.90*	3.24	54.37*	4.27	30.63*	3.24	53.66*	4.26
Indonesia	4.80	2.87	37.64*	6.95	5.69*	2.87	37.43*	6.94
Japan	34.31*	4.27	71.61*	4.52	34.28*	4.27	68.51*	4.52
Korea	46.35*	3.86	93.28*	3.89	47.74*	3.86	93.38*	3.89
Malaysia	38.10*	3.59	86.15*	4.78	38.91*	3.59	85.77*	4.79
New Zealand	38.23*	6.00	82.04*	5.98	55.48*	5.87	108.75*	5.85
Philippines	31.61*	2.49	33.52*	4.81	29.39*	2.49	40.68*	4.81
Singapore	52.73*	3.93	90.74*	4.22	59.03*	3.85	108.15*	4.14
Taiwan, China	62.88*	3.56	109.16*	3.91	60.71*	3.56	108.66*	3.91
<i>Latin America and the Caribbean</i>								
Chile	43.59*	2.88	106.21*	4.22	37.91*	2.92	93.09*	4.28
<i>North America and Western Europe</i>								
Belgium (Flemish)	47.78*	4.16	76.73*	4.61	42.13*	4.18	72.04*	4.63

Cyprus	50.11*	5.03	77.78*	5.53	51.30*	5.06	76.30*	5.55
England	44.99*	5.68	96.30*	5.71	47.13*	5.68	103.45*	5.71
Israel	19.48*	6.54	56.20*	6.59	24.37*	6.58	56.37*	6.63
Italy	31.04*	4.64	66.93*	4.91	33.87*	4.64	68.77*	4.91
Netherlands	45.30*	6.18	94.39*	6.32	40.80*	6.18	94.49*	6.31
Norway	45.54*	6.31	81.82*	6.27	44.91*	6.36	78.77*	6.32
Scotland	44.18*	4.59	99.57*	4.85	44.35*	4.52	105.21*	4.79
Sweden	32.40*	6.30	91.62*	6.21	32.61*	6.30	91.57*	6.21
United States	44.01*	3.17	92.75*	3.21	46.27*	3.12	101.86*	3.16
<hr/> <i>South and West Asia</i>								
Iran	32.29*	2.98	75.64*	4.52	29.09*	3.00	66.68*	4.56
<hr/> <i>Sub-Saharan Africa</i>								
Botswana	16.82*	2.92	51.63*	5.07	22.15*	2.91	53.64*	5.05
Ghana	14.77*	3.19	13.15*	4.35	14.85*	3.18	16.05*	4.34
South Africa	22.37*	2.25	75.37*	3.62	21.45*	2.25	75.17*	3.62

Note. * $p < 0.05$. Home literacy is used as a categorical variables measuring (a) having 11 to 100 books versus having 0 to 10 books at home and (b) having more than 101 books versus having 0 to 10 books at home. This is a common measure across CivEd 1999, PISA 2006, and TIMSS 2003.

Table 13

Effects of Family Size on Mathematics and Science Literacy in Participating Countries in TIMSS 2003

Country	Mathematics		Science	
	Effect	SE	Effect	SE
<i>Arab States</i>				
Bahrain	0.81	1.14	-0.20	1.14
Egypt	-3.81*	0.77	-4.17*	0.77
Jordan	-3.56*	1.20	-2.58*	1.20
Lebanon	-11.38*	1.13	-11.11*	1.13
Morocco	-1.25*	1.15	0.15	1.15
Palestinian A. T.	2.00*	0.97	0.06	0.97
Saudi Arabia	0.69	1.20	-0.03	1.20
Syria	-3.17*	0.98	-4.19*	0.99
Tunisia	-6.12*	0.94	-4.90*	0.94
<i>Central and Eastern Europe</i>				
Bulgaria	-4.31*	1.41	1.12	1.41
Estonia	-1.27	1.27	0.50	1.27
Hungary	-9.00*	1.53	-9.21*	1.53
Latvia	-5.92*	1.28	-3.31*	1.27
Lithuania	-6.75*	1.22	-5.83*	1.22
Macedonia	-12.36*	1.17	-14.71*	1.16
Moldova	-9.67*	1.27	-5.61*	1.28

Romania	-12.13*	1.13	-12.70*	1.13
Russia	-8.41*	1.37	-7.14*	1.37
Serbia	-8.34*	1.22	-8.63*	1.22
Slovak Republic	-1.65	1.18	-4.22*	1.18
Slovenia	0.84	1.27	-0.47	1.27
<i>Central Asia</i>				
Armenia	-4.90*	1.05	-4.15*	1.05

<i>East Asia and the Pacific</i>				
Australia	-2.28*	1.15	-5.28*	1.15
Hong Kong, China	-5.03*	1.25	-6.72*	1.25
Indonesia	0.14	0.87	-1.62	0.87
Japan	1.57	0.98	3.03*	0.98
Korea	-2.81*	1.47	-1.65	1.47
Malaysia	-6.55*	0.90	-5.01*	0.90
New Zealand	-7.19*	1.17	-6.54*	1.17
Philippines	0.42	0.74	-1.22	0.74
Singapore	-2.32*	1.02	-2.81*	1.02
Taiwan, China	-6.35*	1.02	-6.33*	1.02
<i>Latin America and the Caribbean</i>				
Chile	-4.96*	0.84	-6.06*	0.84
<i>North America and Western Europe</i>				
Belgium (Flemish)	-6.09*	1.19	-8.02*	1.19
Cyprus	-2.59*	1.37	-6.58*	1.37
England	-4.18*	1.54	-5.47*	1.56
Israel	-4.68*	1.07	-5.53*	1.07
Italy	-6.56*	1.42	-7.46*	1.42
Netherlands	1.01	1.65	-3.58*	1.65
Norway	-0.46	1.25	-4.15*	1.25
Scotland	-2.09	1.45	-0.58	1.44

Sweden	-3.26*	1.32	-4.32*	1.32
United States	-5.04*	0.79	-7.40*	0.78
<i>South and West Asia</i>				
Iran	-12.59*	0.96	-13.18*	0.96
<i>Sub-Saharan Africa</i>				
Botswana	-3.58*	0.84	-3.12*	0.83
Ghana	1.60*	0.83	-0.25	0.83
South Africa	-7.52*	0.62	-7.96*	0.62

Note. * $p < 0.05$. Family size is used as a continuous variable measuring how many people live with a student at home. This measure is unique to CivEd 1999 and TIMSS 2003 (i.e., not available in PISA 2006).

Table 14

Effects of Home Language on Mathematics and Science Literacy in Participating Countries in TIMSS 2003

Country	Mathematics		Science	
	Effect	SE	Effect	SE
<i>Arab States</i>				
Bahrain	7.25	3.95	12.99*	3.95
Egypt	-6.90*	2.80	0.16	2.80
Jordan	5.70	4.24	9.36*	4.24
Lebanon	10.69*	4.40	15.12*	4.39
Morocco	-6.71	3.75	-4.25	3.74
Palestinian A. T.	8.34*	3.77	11.59*	3.77
Saudi Arabia				
Syria	-3.24	3.19	-1.49	3.23
Tunisia	4.86	2.98	-0.80	2.98
<i>Central and Eastern Europe</i>				
Bulgaria	28.92*	5.44	26.71*	5.47
Estonia	35.97*	10.41	42.31*	10.43
Hungary	39.73*	20.31	19.41	20.35
Latvia	21.73*	5.99	30.00*	5.94
Lithuania	15.31	9.93	16.05	9.93
Macedonia	32.75*	6.38	27.20*	6.38
Moldova	13.71*	4.56	10.65*	4.57

Romania	16.74*	6.37	5.27	6.39
Russia	20.32*	7.25	54.04*	7.20
Serbia	36.65*	11.43	30.73*	11.44
Slovak Republic	26.06*	5.36	42.68*	5.34
Slovenia	42.68*	5.91	43.62*	5.90
<i>Central Asia</i>				
Armenia	20.00*	6.87	20.11*	6.84

<i>East Asia and the Pacific</i>				
Australia	-39.59*	5.25	7.03	5.31
Hong Kong, China	65.80*	5.20	56.88*	5.22
Indonesia	1.76	2.81	7.09*	2.81
Japan	36.80*	11.36	38.05*	11.33
Korea	70.07*	12.13	68.34*	12.14
Malaysia	-50.55*	2.80	-19.54*	2.87
New Zealand	-21.81*	6.15	25.83*	6.16
Philippines	0.70	5.02	-8.16	5.02
Singapore	33.95*	2.57	53.08*	2.51
Taiwan, China	58.00*	3.33	59.29*	3.33
<i>Latin America and the Caribbean</i>				
Chile	48.38*	5.97	53.89*	5.98
<i>North America and Western Europe</i>				
Belgium (Flemish)	58.01*	4.29	63.69*	4.28
Cyprus	24.55*	5.90	23.52*	5.92
England	8.16	11.21	24.12*	11.32
Israel	11.96*	6.09	13.64*	6.11
Italy	53.18*	8.20	59.30*	8.19
Netherlands	60.07*	8.56	65.62*	8.56
Norway	37.29*	7.35	66.46*	7.34
Scotland	47.57*	9.37	47.53*	9.35

Sweden	48.47*	6.17	69.54*	6.12
United States	50.28*	4.27	64.56*	4.24
<i>South and West Asia</i>				
Iran	32.59*	2.94	33.36*	2.94
<i>Sub-Saharan Africa</i>				
Botswana	30.15*	4.42	35.38*	4.41
Ghana	1.79	3.04	5.59	3.04
South Africa	73.07*	2.29	72.65*	2.28

Note. * $p < 0.05$. Home language is used as a dichotomous variables measuring speaking language of test versus not speaking language of test at home. This is a common measure across CivEd 1999, PISA 2006, and TIMSS 2003.

Table 15

Most Important Standardized Family Socioeconomic Effects on Mathematics and Science Literacy in Participating Countries in TIMSS 2003

Country	First Important Variable	Second Important Variable	Third Important Variable
<i>Arab States</i>			
Bahrain			
Mathematics	Parental education (0.14)	More than 101 books (0.10)	Restricted family possession (0.07)
Science	Parental education (0.14)	More than 101 books (0.06)	Restricted family possession (0.06)
Egypt			
Mathematics	Parental education (0.24)	Restricted family possession (0.20)	
Science	Parental education (0.24)	Restricted family possession (0.19)	
Jordan			
Mathematics	Restricted family possession (0.21)	Parental education (0.13)	More than 101 books (0.10)
Science	Restricted family possession (0.23)	Parental education (0.14)	More than 101 books (0.09)
Lebanon			
Mathematics	Parental education (0.19)	More than 101 books (0.11)	Restricted family possession (0.10)
Science	More than 101 books (0.18)	Parental education (0.16)	Restricted family possession (0.11)
Morocco			
Mathematics	Parental education (0.09)	Restricted family possession (0.06)	
Science	Restricted family possession (0.08)	Parental education (0.05)	

Palestinian A. T.

Mathematics	Parental education (0.18)	Restricted family possession (0.13)	Family size (0.14)
Science	Parental education (0.16)	Restricted family possession (0.16)	Home language (0.04)

Saudi Arabia

Mathematics	Parental education (0.13)	Restricted family possession (0.11)	
Science	Restricted family possession (0.16)	Parental education (0.10)	More than 101 books (0.06)

Syria

Mathematics	Parental education (0.18)	Restricted family possession (0.10)	11 to 100 books (0.04)
Science	Parental education (0.16)	Restricted family possession (0.10)	

Tunisia

Mathematics	Parental education (0.14)	Restricted family possession (0.10)	More than 101 books (0.08)
Science	Parental education (0.09)	Restricted family possession (0.07)	More than 101 books (0.06)

Central and Eastern Europe

Bulgaria

Mathematics	Parental education (0.17)	More than 101 books (0.15)	Restricted family possession (0.09)
Science	More than 101 books (0.07)	Home language (0.06)	

Estonia

Mathematics	More than 101 books (0.31)	Parental education (0.16)	11 to 100 books (0.16)
Science	More than 101 books (0.22)	Parental education (0.17)	11 to 100 books (0.08)

Hungary

Mathematics	More than 101 books (0.37)	Parental education (0.26)	11 to 100 books (0.19)
Science	More than 101 books (0.29)	Parental education (0.25)	11 to 100 books (0.12)

Latvia

Mathematics	More than 101 books (0.32)	11 to 100 books (0.21)	Restricted family possession (0.10)
Science	More than 101 books (0.19)	Restricted family possession (0.10)	11 to 100 books (0.09)

Lithuania

Mathematics	More than 101 books (0.22)	Parental education (0.21)	Restricted family possession (0.14)
Science	More than 101 books (0.18)	Parental education (0.16)	Restricted family possession (0.11)

Macedonia

Mathematics	Parental education (0.23)	11 to 100 books (0.15)	More than 101 books (0.13)
Science	Parental education (0.25)	Family size (-0.12)	11 to 100 books (0.12)

Moldova

Mathematics	Parental education (0.15)	More than 101 books (0.11)	Family size (-0.08)
Science	Parental education (0.16)	More than 101 books (0.11)	11 to 100 books (0.06)

Romania

Mathematics	Restricted family possession (0.18)	More than 101 books (0.17)	Parental education (0.16)
Science	Restricted family possession (0.16)	More than 101 books (0.12)	Parental education (0.11)

Russia

Mathematics	More than 101 books (0.23)	Parental education (0.16)	Restricted family possession (0.14)
Science	More than 101 books (0.22)	Parental education (0.15)	11 to 100 books (0.14)

Serbia

Mathematics	More than 101 books (0.24)	Parental education (0.17)	11 to 100 books (0.13)
Science	More than 101 books (0.21)	Parental education (0.16)	11 to 100 books (0.12)

Slovak Republic

Mathematics	More than 101 books (0.46)	11 to 100 books (0.26)	Parental education (0.18)
Science	More than 101 books (0.38)	11 to 100 books (0.19)	Parental education (0.16)

Slovenia

Mathematics	More than 101 books (0.24)	Parental education (0.17)	11 to 100 books (0.16)
Science	More than 101 books (0.28)	11 to 100 books (0.18)	Parental education (0.15)

Central Asia

Armenia

Mathematics	More than 101 books (0.19)	Restricted family possession (0.14)	11 to 100 books (0.12)
Science	Restricted family possession (0.14)	More than 101 books (0.11)	11 to 100 books (0.08)

East Asia and the Pacific

Australia

Mathematics	More than 101 books (0.26)	Parental education (0.23)	11 to 100 books (0.16)
Science	More than 101 books (0.35)	Parental education (0.23)	11 to 100 books (0.19)

Hong Kong, China

Mathematics	More than 101 books (0.17)	Home language (0.17)	11 to 100 books (0.12)
Science	More than 101 books (0.18)	Home language (0.15)	11 to 100 books (0.13)

Indonesia

Mathematics	Restricted family possession (0.15)	Parental education (0.11)	Home language (-0.06)
Science	Restricted family possession (0.13)	Parental education (0.12)	More than 101 books (0.04)

Japan				
Mathematics	More than 101 books (0.24)	Parental education (0.23)	11 to 100 books (0.12)	
Science	More than 101 books (0.24)	Parental education (0.19)	11 to 100 books (0.13)	
Korea				
Mathematics	More than 101 books (0.37)	11 to 100 books (0.19)	Parental education (0.16)	
Science	More than 101 books (0.39)	11 to 100 books (0.21)	Parental education (0.14)	
Malaysia				
Mathematics	More than 101 books (0.19)	Parental education (0.15)	Restricted family possession (0.13)	
Science	More than 101 books (0.21)	Parental education (0.15)	11 to 100 books (0.13)	
New Zealand				
Mathematics	More than 101 books (0.31)	Parental education (0.14)	11 to 100 books (0.13)	
Science	More than 101 books (0.41)	11 to 100 books (0.19)	Parental education (0.17)	
Philippines				
Mathematics	Parental education (0.20)	Restricted family possession (0.13)	11 to 100 books (0.08)	
Science	Parental education (0.23)	Restricted family possession (0.12)	11 to 100 books (0.07)	
Singapore				
Mathematics	More than 101 books (0.30)	11 to 100 books (0.20)	Parental education (0.16)	
Science	More than 101 books (0.34)	11 to 100 books (0.21)	Parental education (0.20)	
Taiwan, China				
Mathematics	More than 101 books (0.34)	11 to 100 books (0.22)	Parental education (0.15)	
Science	More than 101 books (0.36)	11 to 100 books (0.22)	Parental education (0.13)	

Latin America and the Caribbean

Chile

Mathematics	Parental education (0.29)	More than 101 books (0.17)	Restricted family possession (0.11)
Science	Parental education (0.25)	More than 101 books (0.15)	Restricted family possession (0.08)

North America and Western Europe

Belgium (Flemish)

Mathematics	Parental education (0.24)	More than 101 books (0.20)	11 to 100 books (0.14)
Science	Parental education (0.20)	More than 101 books (0.19)	Home language (0.14)

Cyprus

Mathematics	Restricted family possession (0.21)	More than 101 books (0.20)	Parental education (0.16)
Science	More than 101 books (0.22)	Parental education (0.19)	11 to 100 books (0.17)

England

Mathematics	More than 101 books (0.38)	11 to 100 books (0.20)	Parental education (0.17)
Science	More than 101 books (0.43)	11 to 100 books (0.22)	Parental education (0.17)

Israel

Mathematics	Parental education (0.23)	More than 101 books (0.15)	Restricted family possession (0.07)
Science	Parental education (0.17)	More than 101 books (0.17)	Restricted family possession (0.08)

Italy

Mathematics	More than 101 books (0.21)	Parental education (0.16)	11 to 100 books (0.11)
Science	More than 101 books (0.23)	Parental education (0.14)	11 to 100 books (0.12)

Netherlands				
Mathematics	More than 101 books (0.35)	Parental education (0.17)	11 to 100 books (0.17)	
Science	More than 101 books (0.34)	Parental education (0.18)	11 to 100 books (0.15)	
Norway				
Mathematics	More than 101 books (0.31)	Parental education (0.16)	11 to 100 books (0.16)	
Science	More than 101 books (0.27)	Parental education (0.14)	11 to 100 books (0.13)	
Scotland				
Mathematics	More than 101 books (0.38)	11 to 100 books (0.17)	Parental education (0.12)	
Science	More than 101 books (0.40)	11 to 100 books (0.17)	Parental education (0.12)	
Sweden				
Mathematics	More than 101 books (0.34)	Parental education (0.16)	11 to 100 books (0.11)	
Science	More than 101 books (0.34)	Parental education (0.15)	Home language (0.12)	
United States				
Mathematics	More than 101 books (0.33)	Parental education (0.18)	11 to 100 books (0.14)	
Science	More than 101 books (0.37)	Parental education (0.17)	11 to 100 books (0.15)	
<hr/> <i>South and West Asia</i>				
Iran				
Mathematics	More than 101 books (0.15)	Parental education (0.10)	Family size (-0.09)	
Science	More than 101 books (0.14)	Family size (-0.11)	Home language (0.08)	
<hr/>				

Sub-Saharan Africa

Botswana

Mathematics	Restricted family possession (0.09)	More than 101 books (0.09)	Parental education (0.07)
Science	Parental education (0.09)	Restricted family possession (0.09)	More than 101 books (0.08)

Ghana

Mathematics	Restricted family possession (0.11)	Parental education (0.09)	Family size (0.04)
Science	Parental education (0.13)	Restricted family possession (0.06)	

South Africa

Mathematics	Home language (0.25)	Parental education (0.14)	Restricted family possession (0.13)
Science	Home language (0.25)	Parental education (0.14)	Restricted family possession (0.13)

Note. All standardized effects are statistically significant at the alpha level of 0.05. Some countries show fewer than three statistically significant effects.

Table 16

Effects of Parental Education on Civic Knowledge in Participating Countries in CivEd 1999

Country	Effect	SE
<i>Central and Eastern Europe</i>		
Bulgaria	7.66*	0.58
Czech Republic	6.42*	1.02
Estonia	7.76*	0.54
Hungary	9.81*	0.50
Latvia	6.68*	0.65
Lithuania	8.86*	0.60
Poland	15.23*	0.76
Romania	4.44*	0.44
Russian Federation	12.08*	0.99
Slovak Republic	8.84*	0.57
Slovenia	9.05*	0.55
<i>East Asia and the Pacific</i>		
Australia	11.52*	0.63
Hong Kong, China	2.10*	0.44
<i>Latin America and the Caribbean</i>		
Chile	5.20*	0.19
Colombia	4.62*	0.21
<i>North America and Western Europe</i>		

Belgium (French)	9.47*	0.69
Cyprus	8.51*	0.52
Denmark	7.61*	0.51
England	9.49*	0.83
Finland	4.22*	0.52
Germany	7.09*	0.50
Greece	10.75*	0.50
Italy	10.04*	0.55
Norway	9.08*	0.69
Portugal	9.09*	0.42
Sweden	6.42*	0.61
Switzerland	4.81*	0.47
United States	14.60*	0.80

Note. * $p < 0.05$. Parental education is used as a continuous variable measuring years of education. This is a common measure across CivEd 1999, PISA 2006, and TIMSS 2003.

Table 17

Effects of Home Literacy on Civic Knowledge in Participating Countries in CivEd 1999

Country	11 to 100 Books		More Than 101 Books	
	Effect	SE	Effect	SE
<i>Central and Eastern Europe</i>				
Bulgaria	37.55*	5.61	81.95*	5.41
Czech Republic	11.67	10.11	51.54*	10.06
Estonia	25.47*	11.37	58.31*	11.15
Hungary	44.09*	6.95	97.19*	6.75
Latvia	15.25	9.25	48.41*	9.04
Lithuania	33.19*	4.69	65.39*	4.81
Poland	89.12*	10.50	138.60*	10.34
Romania	18.98*	3.33	50.39*	3.94
Russian Federation	67.40*	8.18	113.02*	8.18
Slovak Republic	60.64*	7.05	95.50*	7.11
Slovenia	47.12*	6.16	82.52*	6.41
<i>East Asia and the Pacific</i>				
Australia	50.88*	9.85	87.65*	9.64
Hong Kong, China	29.05*	3.67	11.61*	4.83
<i>Latin America and the Caribbean</i>				
Chile	48.24*	2.13	65.24*	3.33
Colombia	39.74*	2.43	55.85*	3.28

<i>North America and Western Europe</i>				
Belgium (French)	52.63*	7.02	90.14*	6.82
Cyprus	54.40*	6.31	79.66*	6.59
Denmark	35.59*	7.77	73.02*	7.64
England	45.71*	6.15	100.48*	6.06
Finland	50.17*	9.03	80.38*	9.13
Germany	41.67*	5.87	97.15*	5.85
Greece	59.09*	6.46	101.99*	6.85
Italy	46.96*	4.31	80.96*	4.69
Norway	25.64*	8.80	70.95*	8.59
Portugal	28.56*	3.51	72.33*	4.25
Sweden	65.17*	8.84	99.33*	8.74
Switzerland	42.32*	6.49	86.78*	6.56
United States	51.98*	8.07	115.85*	7.99

Note. * $p < 0.05$. Home literacy is used as a categorical variables measuring (a) having 11 to 100 books versus having 0 to 10 books at home and (b) having more than 101 books versus having 0 to 10 books at home. This is a common measure across CivEd 1999, PISA 2006, and TIMSS 2003.

Table 18

Effects of Family Size on Civic Knowledge in Participating Countries in CivEd 1999

Country	Effect	SE
<i>Central and Eastern Europe</i>		
Bulgaria	-4.06*	0.87
Czech Republic	-7.86*	1.31
Estonia	-1.56*	0.66
Hungary	-8.61*	1.17
Latvia	-5.54*	0.91
Lithuania	-2.53*	0.70
Poland	-14.64*	1.19
Romania	-1.44*	0.55
Russian Federation	-10.94*	2.10
Slovak Republic	-9.73*	1.06
Slovenia	-8.58*	1.25
<i>East Asia and the Pacific</i>		
Australia	-7.19*	1.25
Hong Kong, China	-4.02*	0.92
<i>Latin America and the Caribbean</i>		
Chile	-4.25*	0.40
Colombia	-3.64*	0.37
<i>North America and Western Europe</i>		

Belgium (French)	-7.96*	1.64
Cyprus	-3.37*	0.81
Denmark	-7.76*	1.52
England	-6.39*	1.35
Finland	-1.96	1.31
Germany	-4.77*	0.95
Greece	-14.06*	1.60
Italy	-12.81*	1.38
Norway	-2.25*	1.11
Portugal	-3.05*	0.61
Sweden	-2.28	1.40
Switzerland	-1.45*	0.47
United States	-3.83*	0.92

Note. * $p < 0.05$. Family size is used as a continuous variable measuring how many people live with a student at home. This measure is unique to CivEd 1999 and TIMSS 2003 (i.e., not available in PISA 2006).

Table 19

Effects of Home Language on Civic Knowledge in Participating Countries in CivEd 1999

Country	Effect	SE
<i>Central and Eastern Europe</i>		
Bulgaria	31.65*	4.81
Czech Republic	10.83	10.54
Estonia	27.19*	8.37
Hungary	62.05*	17.27
Latvia	30.22*	6.11
Lithuania	4.53	4.06
Poland	155.75*	18.93
Romania	10.53	6.71
Russian Federation	33.29*	9.46
Slovak Republic	50.00*	4.66
Slovenia	42.90*	5.85
<i>East Asia and the Pacific</i>		
Australia	48.69*	6.94
Hong Kong, China	70.15*	6.13
<i>Latin America and the Caribbean</i>		
Chile	42.31*	4.10
Colombia	49.82*	5.65
<i>North America and Western Europe</i>		

Belgium (French)	51.84*	6.69
Cyprus	40.64*	5.73
Denmark	72.09*	8.13
England	32.22*	8.71
Finland	70.13*	10.27
Germany	54.04*	5.71
Greece	35.28*	13.25
Italy	61.51*	3.66
Norway	60.37*	8.14
Portugal	30.68*	8.76
Sweden	65.47*	6.78
Switzerland	48.48*	4.09
United States	84.99*	7.83

Note. * $p < 0.05$. Home language is used as a dichotomous variables measuring speaking language of test versus not speaking language of test at home. This is a common measure across CivEd 1999, PISA 2006, and TIMSS 2003.

Table 20

Most Important Standardized Family Socioeconomic Effects on Civic Knowledge in Participating Countries in CivEd 1999

Country	First Important Variable	Second Important Variable	Third Important Variable
<i>Central and Eastern Europe</i>			
Bulgaria	More than 101 books (0.34)	Parental education (0.13)	11 to 100 books (0.12)
Czech Republic	More than 101 books (0.28)	Family size (-0.12)	Parental education (0.09)
Estonia	Parental education (0.22)	More than 101 books (0.17)	Home language (0.06)
Hungary	More than 101 books (0.36)	Parental education (0.23)	11 to 100 books (0.15)
Latvia	Parental education (0.17)	More than 101 books (0.16)	Family size (-0.09)
Lithuania	More than 101 books (0.30)	Parental education (0.20)	11 to 100 books (0.17)
Poland	More than 101 books (0.38)	Parental education (0.26)	11 to 100 books (0.26)
Romania	More than 101 books (0.21)	Parental education (0.12)	11 to 100 books (0.09)
Russian Federation	More than 101 books (0.39)	11 to 100 books (0.23)	Parental education (0.18)
Slovak Republic	More than 101 books (0.40)	11 to 100 books (0.25)	Parental education (0.17)
Slovenia	More than 101 books (0.28)	Parental education (0.21)	11 to 100 books (0.16)
<i>East Asia and the Pacific</i>			
Australia	Parental education (0.29)	More than 101 books (0.25)	11 to 100 books (0.13)
Hong Kong, China	Home language (0.16)	11 to 100 books (0.12)	Parental education (0.07)
<i>Latin America and the Caribbean</i>			
Chile	Parental education (0.26)	11 to 100 books (0.21)	More than 101 books (0.17)
Colombia	Parental education (0.24)	11 to 100 books (0.17)	More than 101 books (0.16)

North America and Western Europe

Belgium (French)	More than 101 books (0.33)	Parental education (0.22)	11 to 100 books (0.19)
Cyprus	More than 101 books (0.28)	Parental education (0.24)	11 to 100 books (0.22)
Denmark	Parental education (0.27)	More than 101 books (0.23)	11 to 100 books (0.12)
England	More than 101 books (0.47)	11 to 100 books (0.21)	Parental education (0.15)
Finland	More than 101 books (0.36)	11 to 100 books (0.23)	Parental education (0.15)
Germany	More than 101 books (0.41)	11 to 100 books (0.16)	Parental education (0.14)
Greece	Parental education (0.28)	More than 101 books (0.26)	11 to 100 books (0.18)
Italy	More than 101 books (0.27)	Home language (0.22)	Parental education (0.20)
Norway	Parental education (0.21)	More than 101 books (0.20)	Home language (0.11)
Portugal	Parental education (0.28)	More than 101 books (0.20)	11 to 100 books (0.10)
Sweden	More than 101 books (0.41)	11 to 100 books (0.30)	Parental education (0.21)
Switzerland	More than 101 books (0.35)	Home language (0.14)	Parental education (0.13)
United States	More than 101 books (0.32)	Parental education (0.26)	11 to 100 books (0.11)

Note. All standardized effects are statistically significant at the alpha level of 0.05.

Appendix A

Partition of Variance in Reading, Mathematics, and Science Literacy Within and Between Schools Among Participating Countries in PISA 2006

Country	Reading		Mathematics		Science	
	Within Schools	Between Schools	Within Schools	Between Schools	Within Schools	Between Schools
<i>Arab States</i>						
Jordan	0.67	0.33	0.73	0.27	0.76	0.24
Qatar	0.45	0.55	0.46	0.54	0.45	0.55
Tunisia	0.47	0.53	0.51	0.49	0.56	0.44
<i>Central and Eastern Europe</i>						
Bulgaria	0.44	0.56	0.49	0.51	0.45	0.55
Croatia	0.52	0.48	0.61	0.39	0.59	0.41
Czech Republic	0.45	0.55	0.48	0.52	0.50	0.50
Estonia	0.67	0.33	0.74	0.26	0.79	0.21
Hungary	0.31	0.69	0.34	0.66	0.39	0.61
Latvia	0.74	0.26	0.79	0.21	0.83	0.17
Lithuania	0.71	0.29	0.67	0.33	0.72	0.28
Montenegro	0.66	0.34	0.74	0.26	0.70	0.30
Poland	0.83	0.17	0.84	0.16	0.85	0.15
Romania	0.49	0.51	0.50	0.50	0.53	0.47
Russian Federation	0.64	0.36	0.73	0.27	0.74	0.26

Serbia	0.53	0.47	0.57	0.43	0.57	0.43
Slovak Republic	0.50	0.50	0.51	0.49	0.58	0.42
Slovenia	0.30	0.70	0.38	0.62	0.37	0.63
Turkey	0.45	0.55	0.45	0.55	0.45	0.55
<i>Central Asia</i>						
Azerbaijan	0.56	0.44	0.31	0.69	0.52	0.48
Kyrgyzstan	0.58	0.42	0.56	0.44	0.59	0.41
<i>East Asia and the Pacific</i>						
Australia	0.79	0.21	0.78	0.22	0.82	0.18
Hong Kong, China	0.60	0.40	0.60	0.40	0.62	0.38
Indonesia	0.43	0.57	0.43	0.57	0.47	0.53
Japan	0.50	0.50	0.46	0.54	0.52	0.48
Korea	0.60	0.40	0.60	0.40	0.66	0.34
Macao, China	0.75	0.25	0.78	0.22	0.75	0.25
New Zealand	0.81	0.19	0.84	0.16	0.83	0.17
Taiwan, China	0.52	0.48	0.48	0.52	0.52	0.48
Thailand	0.58	0.42	0.66	0.34	0.66	0.34
<i>Latin America and the Caribbean</i>						
Argentina	0.49	0.51	0.44	0.56	0.47	0.53
Brazil	0.49	0.51	0.45	0.55	0.53	0.47
Chile	0.49	0.51	0.43	0.57	0.49	0.51
Colombia	0.67	0.33	0.63	0.37	0.71	0.29
Mexico	0.48	0.52	0.45	0.55	0.52	0.48

Uruguay	0.59	0.41	0.60	0.40	0.61	0.39
<i>North America and Western Europe</i>						
Austria	0.41	0.59	0.42	0.58	0.44	0.56
Belgium	0.43	0.57	0.43	0.57	0.46	0.54
Canada	0.75	0.25	0.79	0.21	0.80	0.20
Denmark	0.81	0.19	0.83	0.17	0.85	0.15
Finland	0.90	0.10	0.92	0.08	0.94	0.06
France	0.42	0.58	0.43	0.57	0.45	0.55
Germany	0.32	0.68	0.39	0.61	0.43	0.57
Greece	0.52	0.48	0.58	0.42	0.53	0.47
Iceland	0.88	0.12	0.91	0.09	0.91	0.09
Ireland	0.76	0.24	0.80	0.20	0.82	0.18
Israel	0.61	0.39	0.59	0.41	0.69	0.31
Italy	0.45	0.55	0.44	0.56	0.47	0.53
Liechtenstein	0.51	0.49	0.58	0.42	0.55	0.45
Luxembourg	0.70	0.30	0.67	0.33	0.70	0.30
Netherlands	0.36	0.64	0.35	0.65	0.39	0.61
Norway	0.88	0.12	0.89	0.11	0.90	0.10
Portugal	0.63	0.37	0.65	0.35	0.66	0.34
Spain	0.79	0.21	0.82	0.18	0.82	0.18
Sweden	0.82	0.18	0.86	0.14	0.88	0.12
Switzerland	0.59	0.41	0.60	0.40	0.60	0.40
United Kingdom	0.74	0.26	0.74	0.26	0.77	0.23

United States	0.71	0.29	0.75	0.25
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Note. Variance in reading, mathematics, and science literacy is partitioned into components due to students (within school variance) and due to schools (between school variance). Numerical values indicate percentages. Reading achievement is not available for the United States.

Appendix B

Proportion of Variance in Reading, Mathematics, and Science Literacy Explained
by Family Socioeconomic Background Among Participating Countries in PISA 2006

Country	Reading	Mathematics	Science
<i>Arab States</i>			
Jordan	0.28	0.26	0.22
Qatar	0.04	0.06	0.00
Tunisia	0.14	0.20	0.12
<i>Central and Eastern Europe</i>			
Bulgaria	0.32	0.30	0.33
Croatia	0.19	0.17	0.20
Czech Republic	0.26	0.25	0.25
Estonia	0.17	0.20	0.18
Hungary	0.28	0.30	0.27
Latvia	0.16	0.18	0.16
Lithuania	0.20	0.24	0.21
Montenegro	0.16	0.17	0.17
Poland	0.19	0.18	0.19
Romania	0.19	0.25	0.23
Russian Federation	0.16	0.12	0.14
Serbia	0.22	0.20	0.19
Slovak Republic	0.24	0.29	0.27

Slovenia	0.24	0.25	0.25
Turkey	0.17	0.20	0.18
<i>Central Asia</i>			
Azerbaijan	0.08	0.00	0.07
Kyrgyzstan	0.18	0.19	0.16
<i>East Asia and the Pacific</i>			
Australia	0.20	0.19	0.20
Hong Kong, China	0.15	0.15	0.15
Indonesia	0.14	0.11	0.11
Japan	0.15	0.16	0.15
Korea	0.12	0.18	0.14
Macao, China	0.05	0.04	0.05
New Zealand	0.26	0.22	0.26
Taiwan, China	0.25	0.23	0.23
Thailand	0.21	0.18	0.20
<i>Latin America and the Caribbean</i>			
Argentina	0.21	0.26	0.27
Brazil	0.19	0.23	0.22
Chile	0.21	0.28	0.26
Colombia	0.15	0.17	0.14
Mexico	0.19	0.20	0.20
Uruguay	0.17	0.22	0.21

North America and Western Europe

Austria	0.26	0.23	0.29
Belgium	0.29	0.31	0.30
Canada	0.19	0.14	0.16
Denmark	0.19	0.19	0.22
Finland	0.15	0.16	0.15
France	0.29	0.31	0.33
Germany	0.35	0.32	0.34
Greece	0.17	0.20	0.21
Iceland	0.15	0.16	0.17
Ireland	0.21	0.21	0.22
Israel	0.20	0.24	0.19
Italy	0.18	0.18	0.20
Liechtenstein	0.24	0.24	0.27
Luxembourg	0.31	0.27	0.31
Netherlands	0.23	0.24	0.27
Norway	0.22	0.18	0.19
Portugal	0.25	0.23	0.22
Spain	0.19	0.21	0.22
Sweden	0.21	0.22	0.22
Switzerland	0.28	0.25	0.31
United Kingdom	0.27	0.25	0.28
United States		0.25	0.26

Note. Reading achievement is not available for the United States. In PISA 2006, family socioeconomic background includes (a) parental occupation, (b) parental education, (c) family possession, (d) home literacy, and (e) home language.

Appendix C

Partition of Variance in Mathematics and Science Literacy Within and Between Schools

Among Participating Countries in TIMSS 2003

Country	Mathematics		Science	
	Within Schools	Between Schools	Within Schools	Between Schools
<i>Arab States</i>				
Bahrain	0.51	0.49	0.69	0.31
Egypt	0.22	0.78	0.23	0.77
Jordan	0.37	0.63	0.40	0.60
Lebanon	0.37	0.63	0.44	0.56
Morocco	0.80	0.20	0.72	0.28
Palestinian A. T.	0.42	0.58	0.39	0.61
Saudi Arabia	0.64	0.36	0.51	0.49
Syria	0.47	0.53	0.46	0.54
Tunisia	0.43	0.57	0.58	0.42
<i>Central and Eastern Europe</i>				
Bulgaria	0.18	0.82	0.11	0.89
Estonia	0.35	0.65	0.42	0.58
Hungary	0.29	0.71	0.37	0.63
Latvia	0.21	0.79	0.27	0.73
Lithuania	0.40	0.60	0.50	0.50
Macedonia	0.26	0.74	0.25	0.75

Moldova	0.27	0.73	0.29	0.71
Romania	0.22	0.78	0.23	0.77
Russia	0.21	0.79	0.23	0.77
Serbia	0.49	0.51	0.51	0.49
Slovak Republic	0.22	0.78	0.28	0.72
Slovenia	0.66	0.34	0.74	0.26
<i>Central Asia</i>				
Armenia	0.27	0.73	0.23	0.77
<i>East Asia and the Pacific</i>				
Australia	0.13	0.87	0.20	0.80
Hong Kong, China	0.11	0.89	0.17	0.83
Indonesia	0.11	0.89	0.16	0.84
Japan	0.44	0.56	0.53	0.47
Korea	0.55	0.45	0.61	0.39
Malaysia	0.11	0.89	0.13	0.87
New Zealand	0.18	0.82	0.20	0.80
Philippines	0.10	0.90	0.13	0.87
Singapore	0.14	0.86	0.13	0.87
Taiwan, China	0.22	0.78	0.27	0.73
<i>Latin America and the Caribbean</i>				
Chile	0.12	0.88	0.21	0.79
<i>North America and Western Europe</i>				
Belgium (Flemish)	0.10	0.90	0.17	0.83

Cyprus	0.77	0.23	0.71	0.29
England	0.16	0.84	0.24	0.76
Israel	0.24	0.76	0.33	0.67
Italy	0.29	0.71	0.32	0.68
Netherlands	0.11	0.89	0.17	0.83
Norway	0.64	0.36	0.68	0.32
Scotland	0.15	0.85	0.22	0.78
Sweden	0.32	0.68	0.40	0.60
United States	0.11	0.89	0.11	0.89
<i>South and West Asia</i>				
Iran	0.25	0.75	0.31	0.69
<i>Sub-Saharan Africa</i>				
Botswana	0.48	0.52	0.44	0.56
Ghana	0.46	0.54	0.40	0.60
South Africa	0.07	0.93	0.08	0.92

Note. Variance in mathematics and science literacy is partitioned into components due to students (within school variance) and due to schools (between school variance). Numerical values indicate percentages.

Appendix D

Proportion of Variance in Mathematics and Science Literacy Explained
by Family Socioeconomic Background Among Participating Countries in TIMSS 2003

Country	Mathematics	Science
<i>Arab States</i>		
Bahrain	0.05	0.04
Egypt	0.13	0.12
Jordan	0.11	0.12
Lebanon	0.11	0.12
Morocco	0.02	0.01
Palestinian A. T.	0.07	0.07
Saudi Arabia	0.05	0.06
Syria	0.06	0.05
Tunisia	0.06	0.03
<i>Central and Eastern Europe</i>		
Bulgaria	0.09	0.01
Estonia	0.08	0.08
Hungary	0.22	0.19
Latvia	0.07	0.05
Lithuania	0.15	0.00
Macedonia	0.14	0.15
Moldova	0.07	0.06

Romania	0.16	0.11
Russia	0.10	0.09
Serbia	0.13	0.11
Slovak Republic	0.16	0.14
Slovenia	0.10	0.10
<i>Central Asia</i>		
Armenia	0.05	0.07
<i>East Asia and the Pacific</i>		
Australia	0.12	0.14
Hong Kong, China	0.07	0.06
Indonesia	0.05	0.05
Japan	0.12	0.10
Korea	0.16	0.14
Malaysia	0.17	0.10
New Zealand	0.12	0.17
Philippines	0.09	0.10
Singapore	0.13	0.20
Taiwan, China	0.20	0.19
<i>Latin America and the Caribbean</i>		
Chile	0.20	0.16
<i>North America and Western Europe</i>		
Belgium (Flemish)	0.16	0.14
Cyprus	0.13	0.12

England	0.16	0.17
Israel	0.10	0.08
Italy	0.10	0.09
Netherlands	0.14	0.15
Norway	0.09	0.09
Scotland	0.15	0.16
Sweden	0.14	0.14
United States	0.15	0.18
<i>South and West Asia</i>		
Iran	0.10	0.09
<i>Sub-Saharan Africa</i>		
Botswana	0.04	0.05
Ghana	0.03	0.03
South Africa	0.18	0.19

Note. In TIMSS 2003, family socioeconomic background includes (a) parental education, (b) restricted family possession, (c) home literacy, (d) family size, and (e) home language.

Appendix E

Partition of Variance in Civic Knowledge Within and Between Schools

Among Participating Countries in CivEd 1999

Country	Within Schools	Between Schools
<i>Central and Eastern Europe</i>		
Bulgaria	0.38	0.62
Czech Republic	0.72	0.28
Estonia	0.54	0.46
Hungary	0.47	0.53
Latvia	0.42	0.58
Lithuania	0.49	0.51
Poland	0.63	0.37
Romania	0.39	0.61
Russian Federation	0.44	0.56
Slovak Republic	0.49	0.51
Slovenia	0.71	0.29
<i>East Asia and the Pacific</i>		
Australia	0.58	0.42
Hong Kong, China	0.30	0.70
<i>Latin America and the Caribbean</i>		
Chile	0.43	0.57
Colombia	0.51	0.49

<i>North America and Western Europe</i>		
Belgium (French)	0.56	0.44
Cyprus	0.82	0.18
Denmark	0.76	0.24
England	0.55	0.45
Finland	0.82	0.18
Germany	0.33	0.67
Greece	0.59	0.41
Italy	0.29	0.71
Norway	0.83	0.17
Portugal	0.55	0.45
Sweden	0.87	0.13
Switzerland	0.41	0.59
United States	0.52	0.48

Note. Variance in civic knowledge is partitioned into components due to students (within school variance) and due to schools (between school variance). Numerical values indicate percentages.

Appendix F

Proportion of Variance in Civic Knowledge Explained
by Family Socioeconomic Background Among Participating Countries in CivEd 1999

Country	Proportion
<i>Central and Eastern Europe</i>	
Bulgaria	0.12
Czech Republic	0.08
Estonia	0.09
Hungary	0.17
Latvia	0.09
Lithuania	0.10
Poland	0.18
Romania	0.07
Russian Federation	0.13
Slovak Republic	0.13
Slovenia	0.12
<i>East Asia and the Pacific</i>	
Australia	0.15
Hong Kong, China	0.05
<i>Latin America and the Caribbean</i>	
Chile	0.19
Colombia	0.15

<i>North America and Western Europe</i>	
Belgium (French)	0.16
Cyprus	0.12
Denmark	0.14
England	0.15
Finland	0.08
Germany	0.15
Greece	0.16
Italy	0.18
Norway	0.11
Portugal	0.16
Sweden	0.13
Switzerland	0.13
United States	0.19

Note. In CivEd 1999, family socioeconomic background includes (a) parental education, (b) home literacy, (c) family size, and (d) home language.