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Variation in the Relationship Between Nonschool Factors and Student Achievement on International Assessments

Introduction

Over the past 20 years, findings from international assessment studies have influenced U.S. educational policy debates.[1] Each wave of results has received significant media attention, public interest, and criticism. The critics have argued that methodological incompatibilities[2] and school organizational differences between countries prevent fair comparisons of achievement outcomes across the countries participating in the assessments (Bracey 1998; Rotberg 1990, 1995, 1998). In addition, it has been suggested that systems of education are bound by countries' national cultures (Purves 1987), and this has implications for the interpretation of achievement cross nationally.[3]

A number of researchers have attempted to address these concerns (Baker 1993, 1997; Boe and Shin 2005; National Research Council 2002; Stedman 1994; Suter 2000; Westbury 1992, 1993). However, their response has centered exclusively on the methodological issues concerning the design of these assessments and school-related factors (e.g., curriculum, school funding, and teacher qualifications) between countries, while differences in nonschool factors (e.g., students' socioeconomic and immigrant status)

[1] The first item of evidence presented in *A Nation at Risk* (U.S. Department of Education 1983), a landmark report that became a key catalyst for nation-wide education reform, was that "on 19 academic tests American students were never first or second and, in comparison with other industrialized nations, were last seven times."

[2] Methodological incompatibilities include sampling and test bias. See the National Research Council (2002) for a comprehensive overview of the methodological advances in international student assessment.

[3] It is important to recognize that policy environments have a salient role in shaping the economic and social contexts of students who reside in a particular country. For example, countries differ significantly in their policies toward immigration. Policy environments can significantly influence the economic and social milieu of a country, which in turn can have implications for the relationship between economic and social contextual factors and educational achievement. However, while it is essential to consider the policy environments that may influence these factors when interpreting achievement scores, it is beyond the scope of this brief to analyze the influence of different policy environments on the relationship between macro policy decisions and student achievement.

between countries have received less attention (for exception, see Buchmann 2002).

As is well known, students' nonschool factors are key predictors of children's educational achievement. *Equality of Educational Opportunity* and *Children and Their Primary Schools* (Coleman et al. 1966; Plowden 1967), both published in the 1960s, showed that much, but not all, of the variation in achievement scores between students could be accounted for by nonschool factors. Since this time, a substantial amount of research has reinforced this finding (Blau and Duncan 1967; Entwisle and Alexander 1993; Hout 1988; Jencks et al. 1979). The main purpose of this *Statistics in Brief* is to use NCES data to describe differences in nonschool factors that are related to achievement, which can inform the discussion about the concern that differences between countries on nonschool factors hinder cross-national comparisons of achievement outcomes.

To accomplish this objective, this report considers six nonschool factors that are related to student achievement. These are the highest level of education attained by either of the students' parents; the highest occupational status of either of the students' parents; the number of books that students have access to in the home; whether students speak the native language of the country at home; students' immigrant status; and students' family structure.[4] These six nonschool factors can be categorized into two distinct groups: the first three factors (parents' educational level, parents' occupational status, and number of books in the home) are used to represent students' *socioeconomic status (SES) characteristics;* the last three factors (students' language at home, students' immigrant status, and students' family structure) represent students' *family characteristics.*

[4] For further information on the variables used for this study, see the technical notes at the end of this report.

Data

The data used for this study are from the Program for International Student Assessment (PISA), which is one of several international assessments the United States has participated in over the years. PISA was first implemented in 2000 and is carried out by the Organization for Economic Cooperation and Development (OECD). PISA measures 15-year-olds' capabilities in reading literacy, mathematics literacy, and science literacy every 3 years. Each PISA data-collection effort assesses one area in depth, even as all three are assessed in each cycle so that participating countries have an ongoing source of achievement data in every subject. In addition to the major subject areas, PISA also measures general or cross-curricular competencies such as learning strategies and problem solving. In 2003, mathematics literacy was the subject area assessed in depth. The average U.S. score in mathematics literacy was 483 on a scale of 0-1,000 with an average of 500 scale points.[5] On average, students in 15 of the 20 countries included in this report outperformed U.S. students (Lemke et al. 2004).

Due to the large number of countries that participated in the PISA 2003 survey, and in an attempt to compare countries at similar levels of economic development, the study was restricted to 20 countries belonging to the World Bank high-income group (World Bank Country Classification 2005).[6] The international average referred to in this report is the average of the national averages of the 20 countries included in the study.

[5] The mathematics literacy scale was constructed to have an average, across the OECD countries, of 500 points and a standard deviation of 100 points, with two-thirds of the students scoring between 400 and 600 points.

[6] Japan and Korea both participated in PISA and are members of the World Bank high-income group. However, they both withheld key socioeconomic and family variables. Therefore, they were excluded from the study. In addition, due to low response rates, the United Kingdom is also excluded from this study. See technical notes at the end of this report for more information on the classification of economies by the World Bank.

Objectives and Analytic Strategy

This report has three objectives. The first is to describe how the population of 15-year olds in the United States differs from the same population in other countries on the six nonschool factors that are associated with student achievement. For instance, how does the percentage of students who are foreign-born in the United States compare to the percentage of foreign-born students in 19 other countries? To meet this objective, this report examines the distributions of SES and family characteristics within countries.

The second objective is to describe variation in the nature of the relationships between student achievement and these factors cross-nationally. For example, does being a foreign-born student have the same educational implications in the United States as in other countries? To accomplish this objective, the mean achievement scores were calculated for each country and the achievement gaps by SES and family characteristics were compared.

The third objective is to identify any interactions between SES and family characteristics and, in turn, determine if these relationships are associated with student achievement. For example, after SES is taken into account, how do foreign-born students perform compared to their native-born counterparts?[7]

The third objective was addressed by using an ordinary least squares regression in order to describe predict achievement gaps before and after controlling for SES and then comparing the gaps. This was done for language spoken at home, immigrant status, and family structure.

[7] As immigrant status is, on average, correlated with language spoken in the home (r = .543), language in the home is possibly measuring the same construct as immigrant status.

Findings

Socioeconomic Status Characteristics

Blau and Duncan's (1967) seminal work established a relationship between parent education and occupational status with children's educational outcomes. Research has linked children's academic achievement with their parents' educational attainment and parents' occupational status (Heyneman and Loxley 1983; Shavit and Blossfield 1993). Parental income, parental education, and parental occupation are considered the three main indicators of SES (Gottfried 1985; Hauser 1994; Mueller and Parcel 1981). Studies have examined the relationship between these variables and moderate correlations have been found, indicating that these three components are unique and measure different aspects of SES (Bollen, Glanville, Stecklov 2001; Hauser and Huang 1997).

A fourth indicator of SES is often used. Researchers have highlighted the significance of various home resources as measures of SES (Coleman 1988; Duncan and Brooks-Gunn 1997; Entwisle and Astone 1994). These home resource measures include household possessions such as the availability of books and computers in the home. Large-scale international studies such as the Trends in International Mathematics and Science Study (TIMSS), the Progress in International Reading Literacy Study (PIRLS), and PISA do not collect parental income variables. In the absence of this measure, the number of books in a student's home, which been shown to be an important predictor of student achievement (Wößmann 2003), was used in this study.

Parent education. Forty-eight percent of 15-year-old students in the United States reported having at least one parent who had a college degree or a postsecondary vocational qualification (table 1).[8] Comparing the United States to the other 19 countries in this study, 7 countries had a higher percentage of 15-year-old students who reported

[8] Student reports of parents' educational attainment may be inaccurate as some students either do not know or exaggerate parent education (Williams et al. 2000).

that at least one of their parents was educated to the postsecondary level (Australia, Belgium, Canada, Denmark, Finland, Norway, and Sweden). Eleven countries had a smaller percentage of students with postsecondary-educated parents when compared to the United States. The international average of the 20 countries, which was 46 percent, was not significantly different from the U.S. average of 48 percent.

On average, in all 20 countries, 15-year-old students with at least one postsecondary-educated parent performed better than students whose parents were educated to the secondary level or below (figure 1.1). The mathematics literacy achievement gap between students with postsecondary-educated parents and students who did not have postsecondary-educated parents ranged from 19 score points in Austria to 52 score points in Germany (tables 2 and 3).
The United States had a larger achievement gap than six countries (Austria, Canada, Finland, Iceland, Italy, and Sweden; table 3). Germany had a larger achievement gap than the United States (52 versus 41 score points). No measurable differences were found between the United States and the other 12 countries. The United States did not differ significantly from the international average score gap of 40 score points.

Parent occupational status. Parent occupational status is based on either the student's father's or mother's occupation (whichever is higher) as reported by the student.[9] Occupations were coded to the International Standard Classification of Occupations 1988 (ISCO-88) and then grouped into major occupational groups.[10] For the purposes of this study, the variable was transformed into quarters with the "high" occupational status group representing the upper 25 percent of the distribution.

Thirty-three percent of 15-year-old U.S. students reported having at least one parent whose occupational status was in the upper quarter (high occupational status; table 1). The United States had a higher percentage of 15-year-old students with one or both parents of high occupational status than 17 of the other 19 countries. Only Iceland had a measurably higher percentage of 15-year-old students with one or both parents from the upper occupational status group than the United States (37 versus 33 percent). The U.S. percentage was higher than the 20-country average of 27 percent.

As shown in figure 1.2, having parents of high occupational status is associated with higher student mathematics literacy performance on average in all 20 countries included in the study. The estimated difference in performance between 15-year-old students with parents of high occupational status versus middle and low occupational status on the mathematics literacy assessment ranged from 29 points (Iceland) to 75 points (Portugal) on the PISA 2003 score scale (tables 2 and 3).

The United States had a larger achievement gap between students with parents of high occupational status and students with parents of mid and low occupational status than Canada, Finland, and Iceland, but a smaller gap than Belgium, Germany, and Portugal (table 3). There was no measurable difference between the size of the achievement gap in the United States and the other 13 countries. Furthermore, the international average score gap of 55 points was not measurably different from the performance gap in the United States, which was 54 score points.

Books in the home. Twenty-two percent of 15-year-old U.S. students reported having more than 200 books in their home (table 1). The United States had a higher percentage of 15-year-old students who reported having more than 200 books in the home than Greece and Portugal. In contrast, the percentage of U.S. students reporting

[9] Values on the index range from 16 to 90; low values represent low socio-economic status and high values represent high socio-economic status.
[10] See Ganzeboom, DeGraaf, and Treiman (1992) for details of this methodology. For more details concerning this variable, see the technical notes at the end of this report.

more than 200 books in the home was less than in nine other countries. No discernable difference was found between the United States and the 20-country average (22 versus 24 percent).

As shown in figure 1.3, having more books in the home is associated with higher student mathematics literacy performance on average in all 20 countries in the study. The estimated difference in performance between students from homes with more than 200 books versus 200 or fewer books ranged from 40 points (Canada) to 74 points (Austria) on the PISA score scale (tables 2 and 3).

Compared to Australia, Belgium, Canada, Denmark, Finland, Iceland, Ireland, and Norway, the United States had a larger achievement gap between students who reported more than 200 books versus those with 200 or fewer books (table 3). The U.S. achievement gap was not found to be measurably different from those in the remaining 11 countries. No measurable difference was found between the 20-country average achievement gap of 66 score points and the U.S. achievement gap of 68 score points.

Figure 1. Percentage of 15-year-old students and average mathematics literacy scores, by students' socioeconomic status (SES) characteristics and country: 2003

Figure 1.1 Percentage of students with postsecondary-educated parents (left scale) and average mathematics literacy performance of students with postsecondary-educated and non-postsecondary-educated parents (right scale), by country: 2003

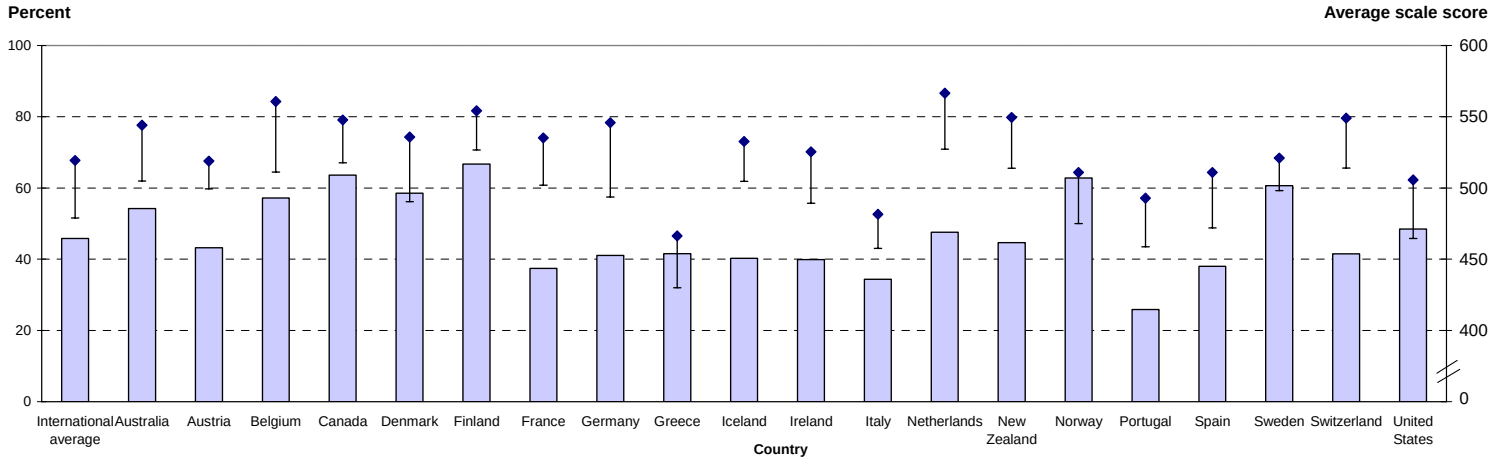


Figure 1.2 Percentage of students with parents of high occupational status (left scale) and average mathematics literacy performance of students with parents of high occupational status and students with parents of middle and low occupational status (right scale), by country: 2003

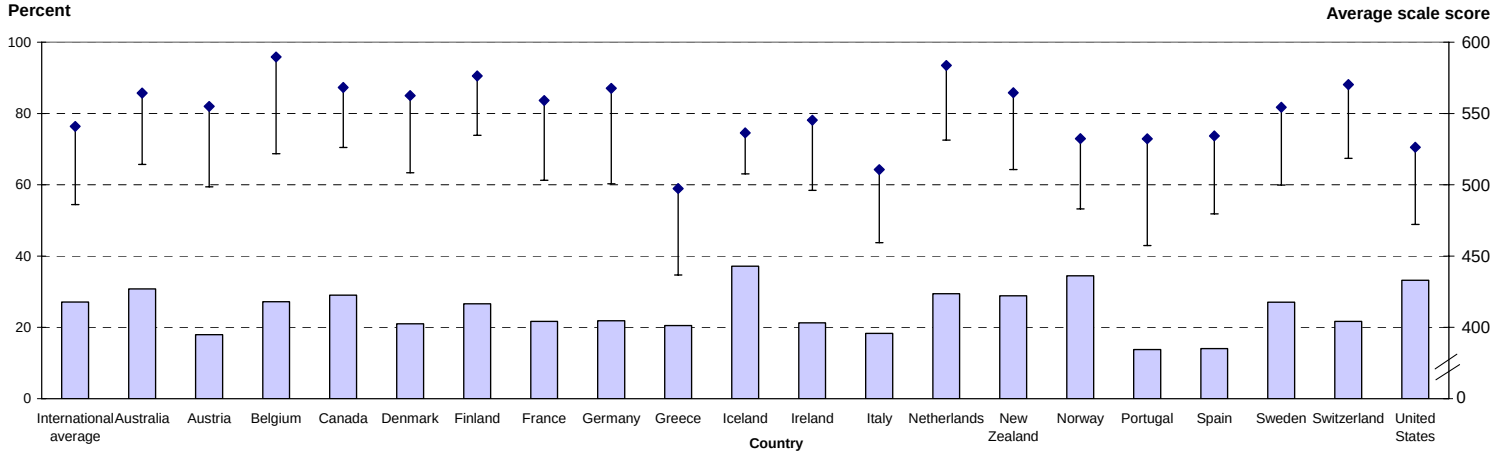
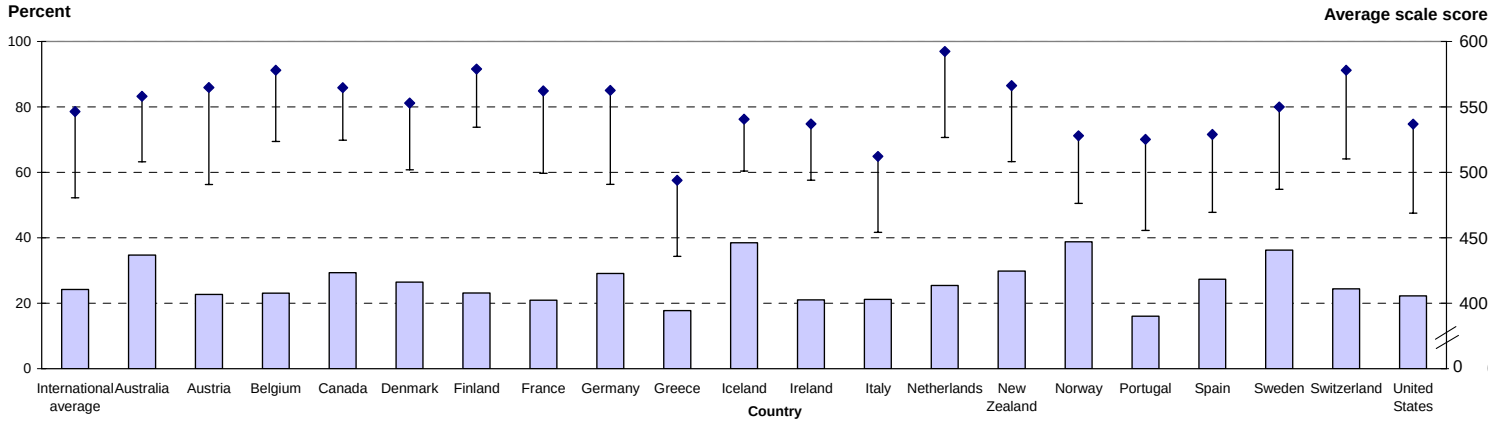


Figure 1.3 Percentage of students with more than 200 books in the home (left scale) and average mathematics literacy performance of students with more than 200 books in the home and students with 200 or fewer books in the home (right scale), by country: 2003



Mean mathematics literacy score of students with at least one parent educated to the postsecondary level, with parents of high occupational status, or with more than 200 books in the home

Mean achievement gap

Mean mathematics literacy score of students with parents educated to the secondary school level and below, with parents of middle or low occupational status, or with 200 or fewer books in the home

NOTE: The solid bars represent the percentage of students in each country that indicated having parents educated at the postsecondary level (figure 1.1), of high occupational status (figure 1.2), or from a household with more than 200 books (figure 1.3). The scale on the left side indicates the percentage of students. The extended lines represent the differences between the average scores for students whose parents are educated at the postsecondary level and students whose parents are educated at the secondary level or below (figure 1.1), of high and middle or low occupational status (figure 1.2), or from a household with more than 200 books and 200 or fewer books (figure 1.3). The scale on the right side indicates the average scale score. The achievement gap is the achievement score point difference between the two mean achievement estimates. The international average is the weighted mean of the data values for the 20 countries included in the study and reflects the value for a given variable when the 20 countries are considered as a whole (i.e., one single entity). The individual country estimates were calculated using the final student weight. The SES characteristics—parent education, parent occupational status, and number of books in the home—are based on students' reports. If either of a student's parents completed a bachelor's, master's, or postgraduate degree (corresponding to the International Standard Classification of Education (ISCED) levels 5A, 5B, or 6), the student was considered as having postsecondary-educated parents. Parent occupational status is based on either of the student's parents' occupation (whichever is higher), and the variable was transformed into quarters with "high" occupational status representing the upper quarter. The response rate in New Zealand for parent occupational status was below 85 percent.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

Family Characteristics

Migration patterns across many of the countries in the World Bank high-income group have resulted in a significant population of students whose home language is not the language of instruction in the schools they attend. The United States is no exception. The last two decades have seen a significant rise in the percentage of students in the United States speaking a language other than English at home (Shin and Bruno 2003). There are clear educational achievement disadvantages to receiving instruction in a language that is different from the one spoken at home (Schmid 2001).

Students who are foreign-born face a number of challenges, especially as they adjust to a new country. Immigrant students often encounter difficulties in their new environment because educational systems, culture, and language of instruction may differ from those in their country of origin. A number of studies have documented significant educational achievement disadvantages associated with immigrant status.(Eldering and Kloprogge 1989; Lollock 2001). Research conducted in the United States indicates that many of the educational achievement disadvantages of immigrant children are associated with the lower economic status of immigrant families (Schmid 2001).

In recent years, dynamic changes have occurred in the structure and composition of families. Around the world, the two-parent household has become an ever-shrinking phenomenon with many children living in single-parent, step, and guardian families (Bradshaw and Finch 2002). Research findings, both in the United States and abroad, have shown that alternative family structures are associated with lower educational achievement (Downey 1994; Hampden-Thompson and Pong 2005; McLanahan and Sandefur 1994; Pong, Dronkers, and Hampden-Thompson 2003). Research indicates that much of the educational achievement disadvantage of residing in a single-parent, step, or guardian family can be attributed to socioeconomic factors (Duncan and Brooks-Gunn 1997; Haverman, Wolfe, and Spaulding 1991; McLanahan and Sandefur 1994).

Language spoken at home. Nine percent of the 15-year-old students in the United States reported that they spoke a language other than the test language at home always or most of the time (table 1). The United States had a higher percentage of 15-year-old students reporting that they were non-test-language speakers at home than eight other countries. In contrast, Belgium, Canada, Italy, the Netherlands, Spain, and Switzerland reported higher percentages of non-test-language speaking students compared to the United States. The 20-country average of 10 percent was not measurably different from the U.S. average (9 percent).

In the majority of countries included in the study, 15-year old students who spoke the language of the test at home had higher mathematics literacy achievement scores, on average, than students who did not speak the language of the test at home (figure 2.1). The exceptions were Ireland and Spain, where achievement between test-language speakers and non-test-language speakers was not measurably different. Non-test-language speakers did not perform measurably better than test-language speakers in any of the 20 countries (tables 2 and 3).

Of the countries with a significant achievement gap between non-test-language speakers and test-language speakers, the United States had a larger gap than Belgium, Canada, the Netherlands, and New Zealand and a smaller gap than Germany and Switzerland (table 3). In the United States, test-language speakers performed an estimated 46 score points better than non-test-language speakers. This was not measurably different from the international average of 42 score points.

The OLS regression estimates of achievement showed that on average in the United States, students who spoke the language of the test at home outperformed students who spoke a language other than the test language at home (figure 3). This was also the case in the

remaining countries included in the study, with the exception of Ireland and Spain.
After taking SES into account, the estimated achievement gap between test-language-speaking students and non-test-language-speaking students was significantly reduced, though not eliminated, in the United States and Switzerland. Thus, some of the educational achievement disadvantage of being a non-test-language-speaking student can be explained by students' SES.[11] In the remaining 18 countries, the inclusion of the SES variables did not significantly reduce the achievement gap.

[11] See table 4 for coefficients and standard errors from the ordinary least squares (OLS) regression analysis.

Figure 2. Percentage of 15-year-old students and average mathematics literacy scores, by students' family characteristics and country: 2003

Figure 2.1 Percentage of non-test-language-speaking students (left scale) and average achievement of non-test-language-speaking students and test-language-speaking students on PISA 2003 (right scale), by country: 2003

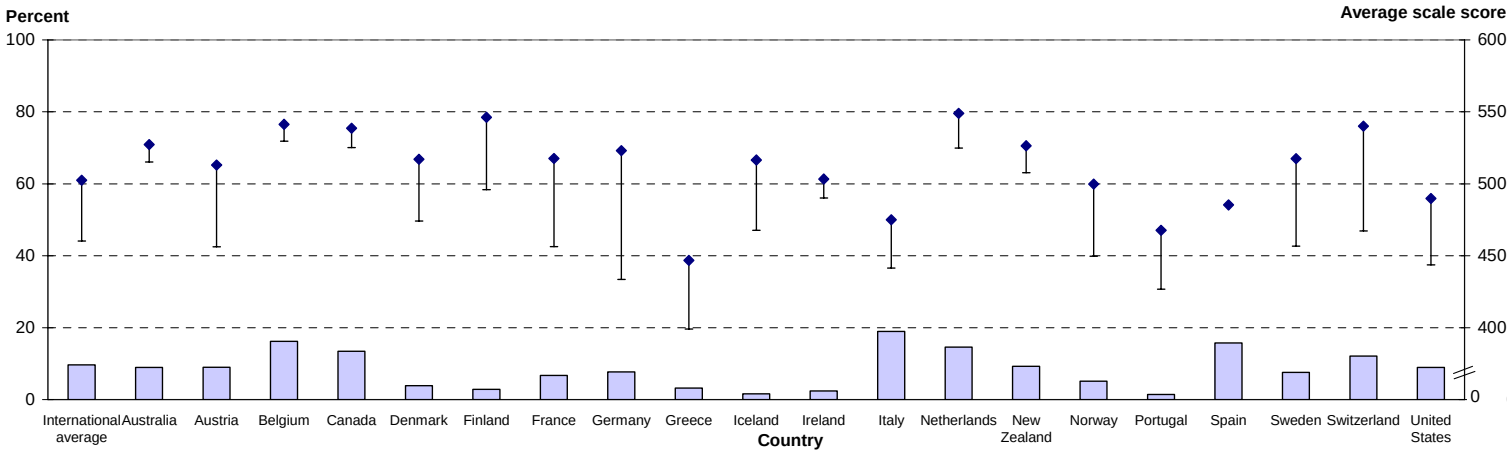


Figure 2.2 Percentage of foreign-born students (left scale) and average mathematics literacy performance of foreign-born students and native-born students (right scale), by country: 2003

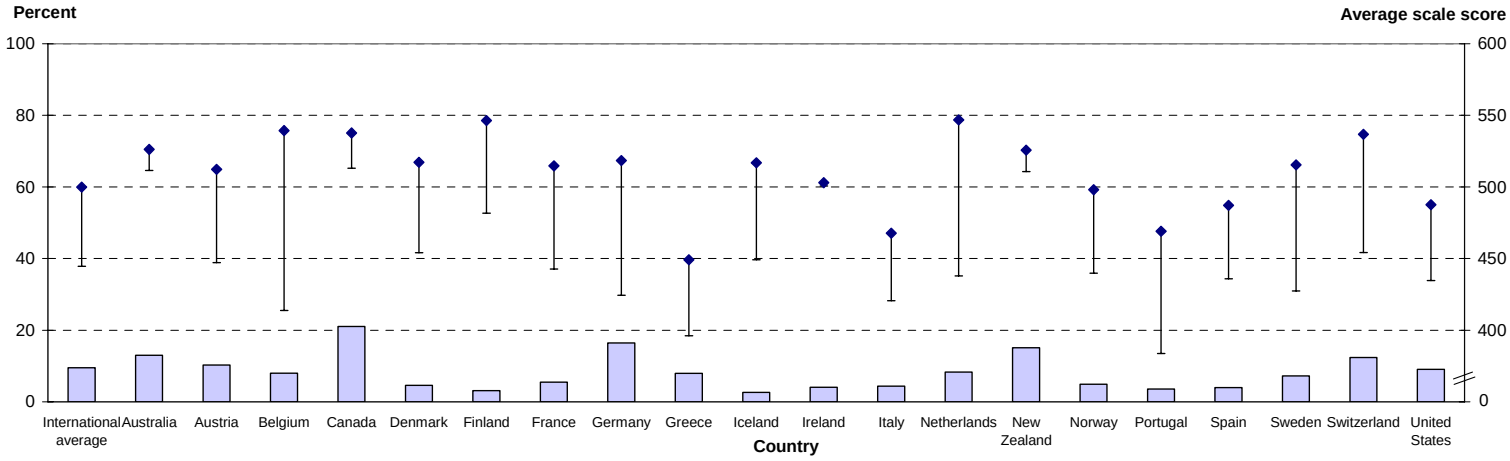
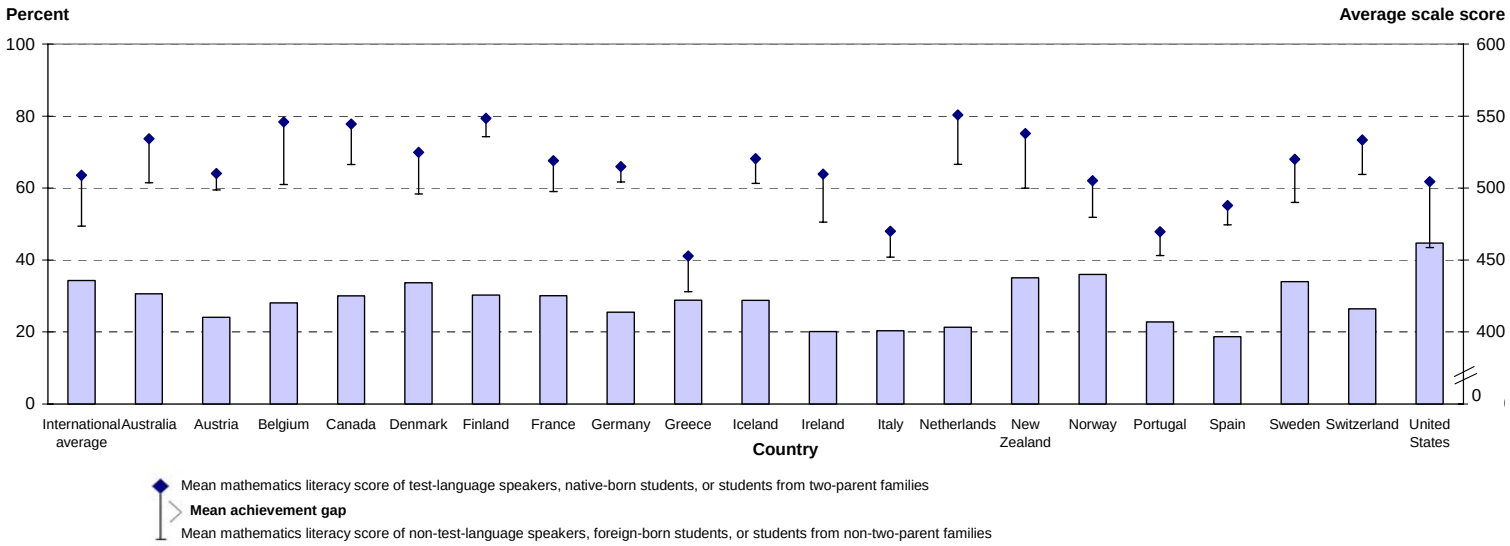
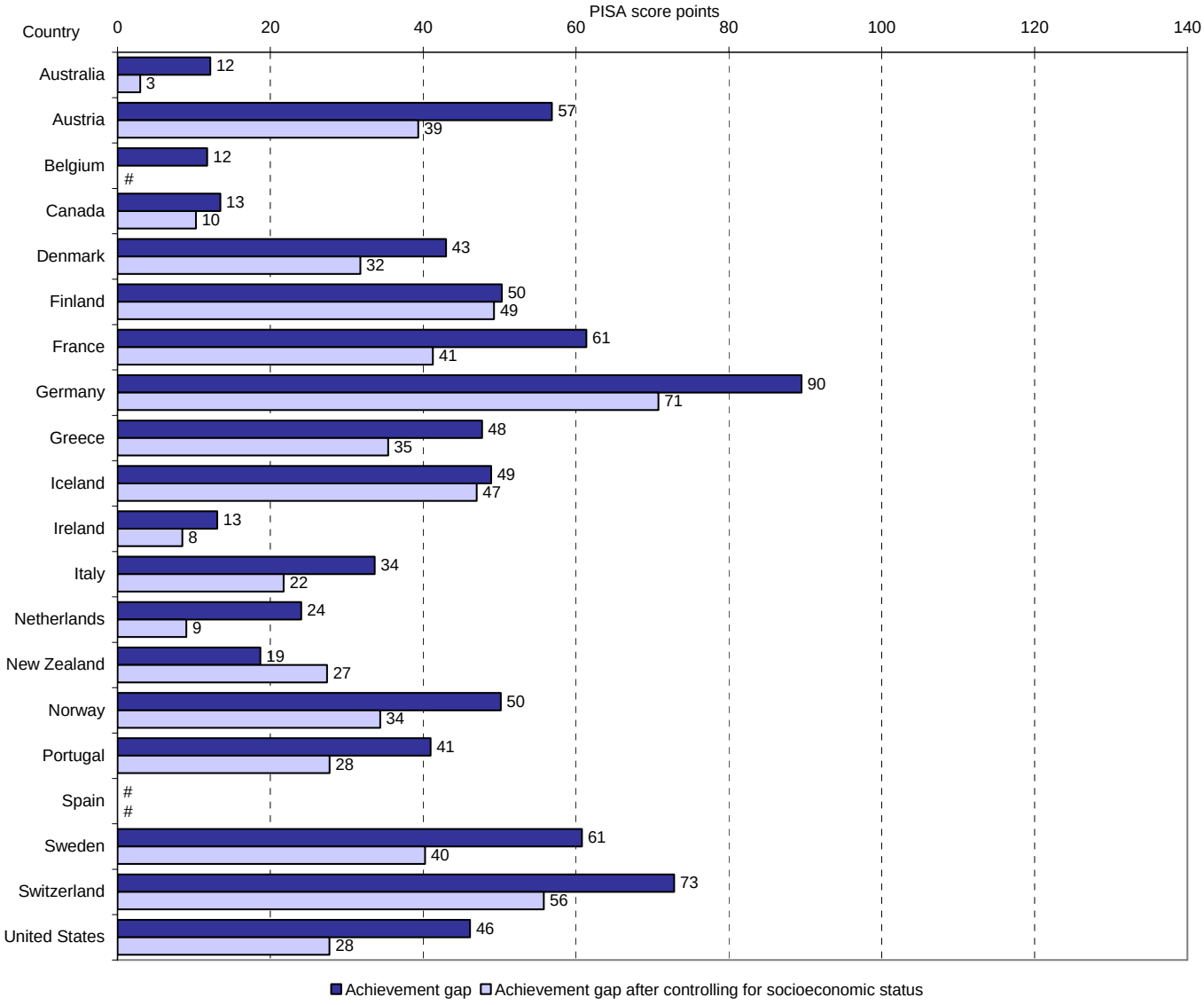


Figure 2.3 Percentage of students from non-two-parent homes (left scale) and average mathematics literacy performance of students from non-two-parent and two-parent homes on PISA 2003 (right scale), by country: 2003



NOTE: The solid bars represent the percentage of students in each country that indicated being a non-test-language speaker (figure 2.1), foreign-born (figure 2.2), or from a non-two-parent home (figure 2.3). The scale on the left side indicates the percentage of students. The extended lines represent the differences between the average scores for students who speak the test language and do not speak the test language (figure 2.1), are native- and foreign-born students (figure 2.2), or are from two-parent and non-two-parent homes (figure 2.3). The scale on the right side indicates the average scale score. The achievement gap is the achievement score point difference between the two mean achievement estimates. The international average is the weighted mean of the data values for the 20 countries included in the study and reflects the value for a given variable when the 20 countries are considered as a whole (i.e., one single entity). The individual country estimates were calculated using the final student weight. The family characteristics—language spoken at home, immigrant status, and family structure—are based on students' reports. "Test-language" students reported speaking the language in which the test was administered always or most of the time at home while "non-test-language" students reported using another language always or most of the time at home. Students from a "two-parent family" reported living with both their mother and father. The category "non-two-parent family" encompasses all other responses. The response rate in New Zealand for parent occupational status was below 85 percent.
SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

Figure 3. Estimated achievement gap of 15-year-old test-language-speaking students versus 15-year-old non-test-language-speaking students on the PISA mathematics literacy assessment, by country: 2003



Rounds to zero.

NOTE: Each bar represents the predicted achievement gap between native-born students and their foreign-born counterparts. Language spoken at home is based on students' reports. Students were asked to report what language they spoke at home always or almost always. The responses were then grouped into two categories: 1) test-language-speaking students (students who speak the language of the test at home always or almost always) and 2) non-test-language-speaking students (students who speak another language always or most of the time at home). The socioeconomic status controls are parent education, parent occupational status, and number of books in the home. The response rate in New Zealand for parent occupational status was below 85 percent.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

Immigrant status. Nine percent of 15-year-old U.S. students reported that they were foreign born (table 1). Compared to the other 19 countries in this study, the United States had more foreign-born students than 10 of them. In contrast, Australia, Canada, Germany, New Zealand, and Switzerland all had significantly larger foreign-born populations. The U.S. average did not differ significantly from the international average of 10 percent.

On average, with the exception of Ireland, foreign-born 15-year old students in the remaining 19 countries fared worse on the mathematics literacy tests than their native-born counterparts (figure 2.2). In these 19 countries, the achievement gap ranged from 15 score points in both Australia and New Zealand to 126 score points in Belgium (tables 2 and 3).

Of the countries with a significant achievement gap between foreign-born and native-born students, the United States gap was larger than those of Australia, Canada, and New Zealand (table 3). Five countries had larger achievement gaps than that of the United States, and the gaps in 10 countries were not measurably different. The international average of 55 score points was not significantly different from the U.S. achievement gap of 53 score points.

These family factors, in addition, are interrelated with SES factors. For example, it has been shown that students from immigrant families in the United States are at a disadvantage due, in part, to the association between SES and immigrant status (Schmid 2001). However, this may not be the case in other nations. In order to quantify this relationship, OLS regression was used to describe predicted achievement gaps between immigrant and non-immigrant status both before and after controlling for SES and then comparing gaps.

The OLS regression estimates showed that on average in the United States, native-born students outperform foreign-born students. With the exception of Ireland, this result appears consistent across the other countries included in the study (figure 4). In 19 of the 20 countries, on average, 15-year-olds who were native born outperformed their foreign-born counterparts.

After taking into account SES, the predicted achievement gap between native- and foreign-born 15-year-olds was significantly reduced, though not eliminated, in the United States, as well as Belgium, Canada, Germany, the Netherlands, Sweden, and Switzerland. Thus, some of the educational achievement disadvantage for a foreign-born student, in these seven countries, can be explained by students' SES.[12] In the other countries, the inclusion of the SES variables did not significantly reduce the achievement gap.

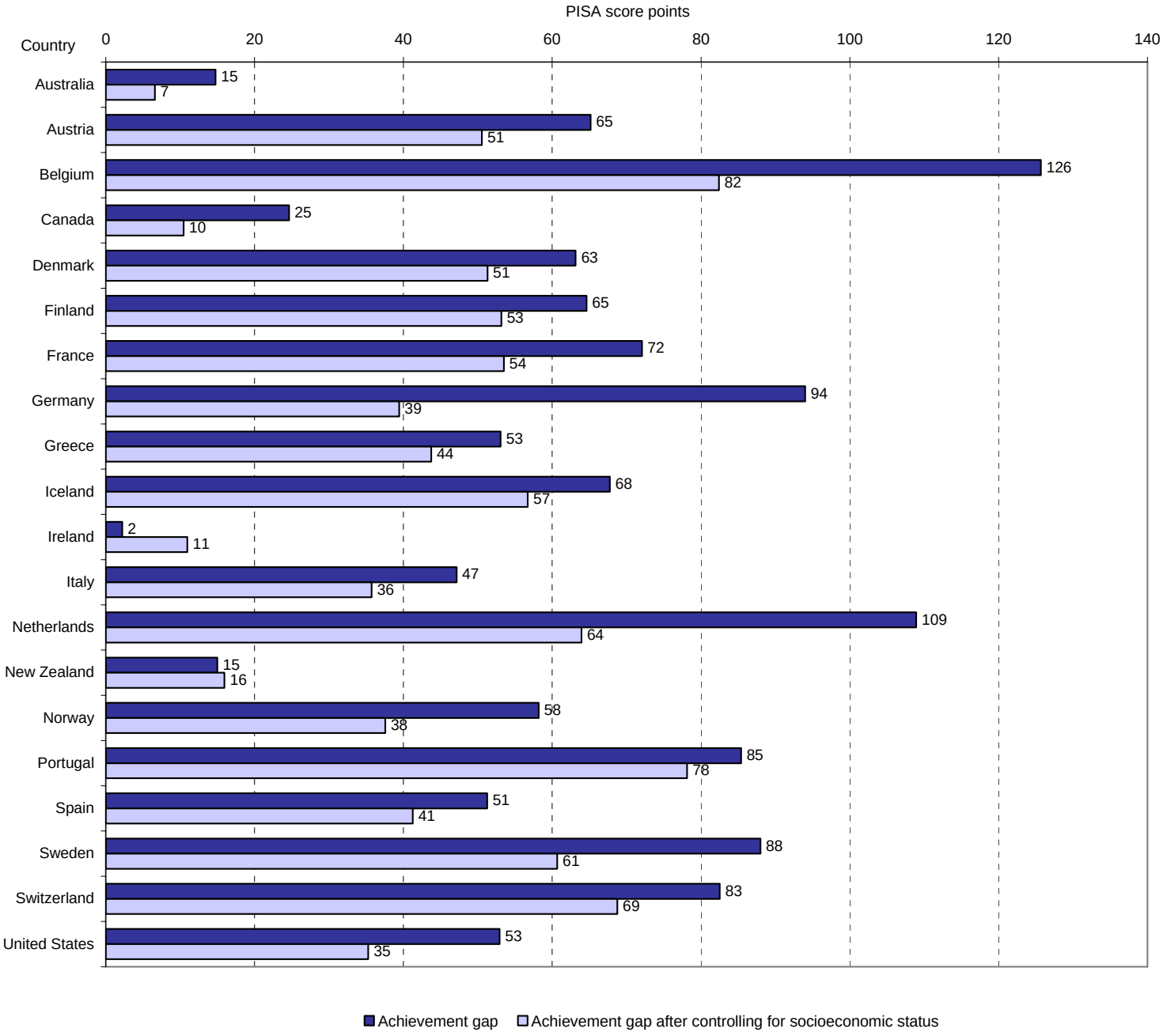
Family structure. In the United States, 45 percent of 15-year-old students reported living in non-two-parent households, including single-parent households, step-families, and guardian families (table 1). This percentage was higher than the percentage of students from non-two-parent households in all of the remaining 19 countries in this study and higher than the international average of 34 percent.

As shown in figure 2.3, on average in all 20 countries students from two-parent homes (live with a mother and father) performed better on the PISA mathematics literacy assessment than students from other homes. The achievement gap ranged from 12 score points in Austria to 46 score points in the United States (tables 2 and 3).

The United States had a larger achievement gap between 15-year-olds from two-parent homes and other homes than 17 other countries (table 3). The two exceptions were Belgium and New Zealand, where the achievement gaps were not measurably different from the U.S. achievement gap. The achievement gap in the United States was significantly different from the international average (46 versus 35 score points).

[12] See table 5 for coefficients and standard errors from the OLS regression analysis.

Figure 4. Estimated achievement gap of native-born 15-year-old students versus foreign-born 15-year-old students on the PISA mathematics literacy assessment, by country: 2003



NOTE: Each bar represents the predicted achievement gap between native-born students and their foreign-born counterparts. Immigrant status is based on students' reports. Students were asked to report whether or not they and their parents were born in the country of assessment or in another country. The responses were then grouped into two categories: 1) native-born students (those students born in the country of assessment regardless of parent birthplace) and 2) foreign-born students (those students born outside the country of assessment and whose parents were also born outside of the country). The socioeconomic status controls are parent education, parent occupational status, and number of books in the home. The response rate in New Zealand for parent occupational status was below 85 percent.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

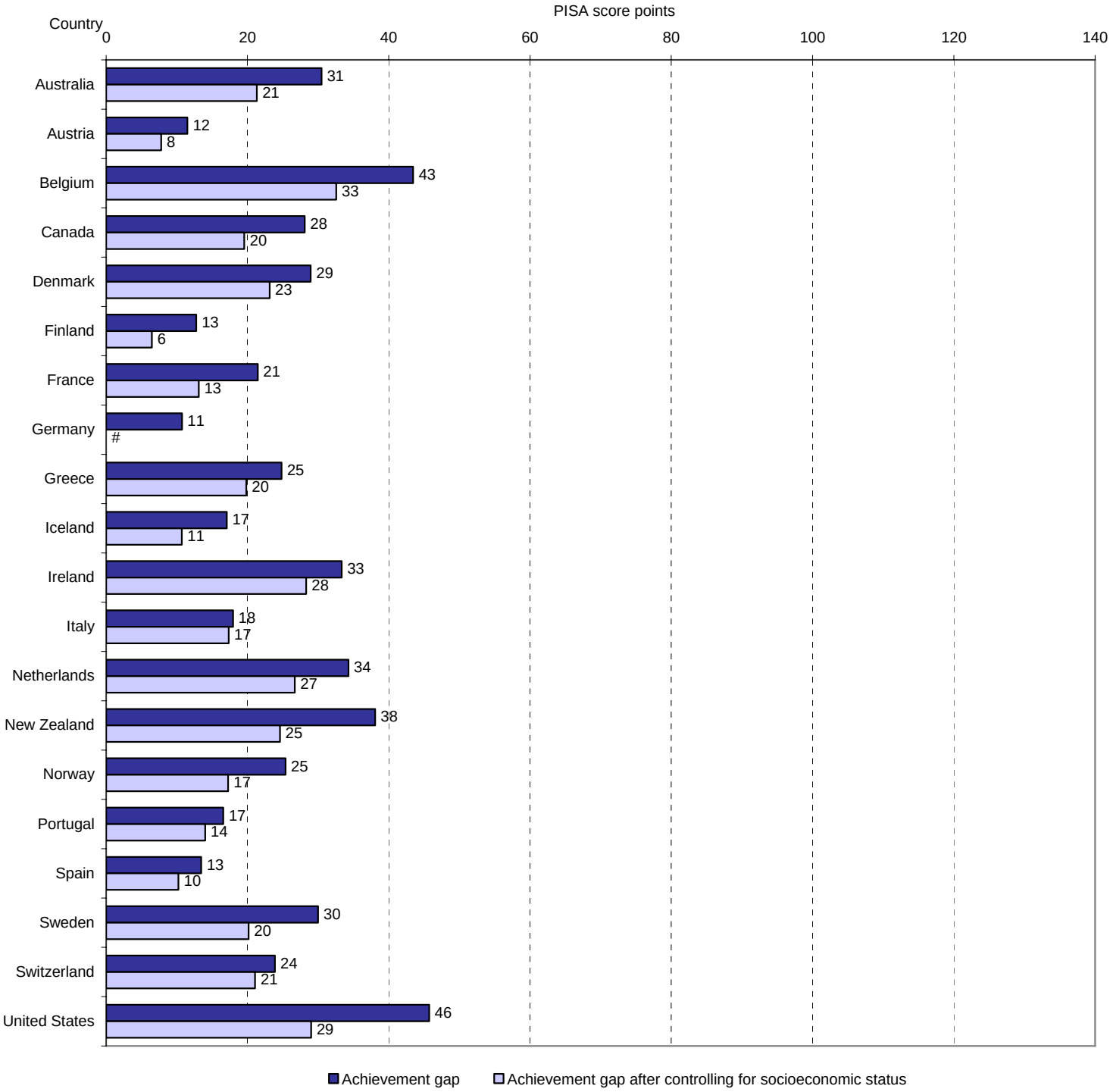
Some research indicates that much of the educational achievement disadvantage of residing in an alternative family structure to the two-parent household can be attributed to economic factors (McLanahan and Sandefur 1994). In order to quantify this relationship, OLS regression was used to describe predicted achievement gaps between 15-year-olds from two-parent homes and those from non-two-parent homes both before and after controlling for SES and then comparing gaps.

The regression estimates showed that in the United States and the other 19 countries, there appears to be an educational achievement advantage to residing in a two-parent household (figure 5). In all 20 countries, 15-years-olds who live in a two-parent household have higher mathematics literacy achievement, on average, than those students who live in non-two-parent families.

After taking into account selected SES measures, the predicted achievement gap was significantly reduced, though not eliminated, in the United States and Australia, Belgium, Canada, New Zealand, and Sweden. Thus, some of the educational achievement disadvantage for 15-year-olds who reside in non-two-parent households in these six countries can be explained by the students' SES.[13] In the other countries, the inclusion of the SES variables did not significantly reduce the achievement gap.

[13] See table 6 for coefficients and standard errors from the OLS regression analysis.

Figure 5. Estimated achievement gap of 15-year-old students from two-parent families versus 15-year-old students from non-two-parent family structures on the PISA mathematics literacy assessment, by country: 2003



Rounds to zero.

NOTE: Each bar represents the achievement gap between students from two-parent families and students from other family structures. Family structure is based on students' reports. Students from a "two-parent family" reported living with both their mother and father. "Other" family structures encompasses all other responses. The economic context controls are parent education, parent occupational status, and number of books in the home. The response rate in New Zealand for parent occupational status was below 85 percent.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

Summary

This *Statistics in Brief* described the differences in the distributions of nonschool factors related to student achievement among 15-year-old students and their families in the United States and other countries at similar levels of economic development. The first objective was to describe how the United States differs from the other countries assessed in terms of the distribution of SES and family characteristics. Generally, the United States did not differ from the other 19 countries in terms of the distribution of SES and family factors on four, but not all, of the characteristics. These were parental education, the number of books in the home, immigrant status, and language spoken at home. There were differences when looking at two characteristics parent occupation and family structure. The United States had a higher percentage of 15-year-olds with parents of high occupational status and a higher percentage of 15-year-olds residing in non-two-parent households compared to the 20-country average.

Describing the associations between these factors and mean achievement scores was the second objective of this report. The relationship between SES and achievement was consistent across all 20 countries. Students with highest levels of SES, as measured in this study, had an educational advantage over their lowest SES counterparts. This reinforces the associations previously documented in the literature both in the United States and abroad between SES and student educational achievement.

Less research has been conducted cross-nationally on the association between students' family characteristics and student achievement. Results of this study found that in nearly all of the countries, 15-year-olds with certain family characteristics outperformed other students. For example, there is an educational achievement disadvantage associated with residing in a non-two-parent family across all 20 countries.

The last objective of this study was to examine the interrelationship between SES and family factors to determine if low SES accounts for some of the educational achievement disadvantage of those students who do not speak the language of the test regularly at home, are foreign born, or who reside in a non-two-parent household. In some countries, a student's SES accounted for a portion of the disadvantage associated with being an immigrant or residing in a non-two-parent household. This was not the case, however, across all the countries in this study.

References

Adams, R. (Ed.). (in press). *PISA 2003 Technical Report.* Paris: Organization for Economic Cooperation and Development.

Baker, D.P. (1993). Compared to Japan, the U.S. is a Low Achiever ... Really. *Educational Researcher, 22*(2): 18-20.

Baker, D.P. (1997). Surviving TIMSS or Everything You Blissfully Forgot About International Comparisons. *Phi Delta Kappan, 79*(4): 295-300.

Blau, P.M., and Duncan, O. D. (1967). *The American Occupational Structure.* New York: John Wiley & Sons.

Boe, E., and Shin, S. (2005). Is the United States Really Losing the International Horse Race in Academic Achievement? *Phi Delta Kappan, 86*(9): 688-695.

Bollen, K., Glanville, J.A., and Stecklov, G. (2001). Socioeconomic Status and Class in Studies of Fertility and Health in Developing Countries. *Annual Review of Sociology, 27*:153-185.

Bracey, G. (2005). TIMSS, Rhymes with 'Dims,' as in 'Witted.' *Phi Delta Kappan*, May 1998: 686-687.

Bradshaw, J., and Finch, N. (2002). *A Comparison of Child Benefit Packages in 22 Countries.* Department of Work and Pensions (Research Report no. 174). Huddersfield, United Kingdom: Charlesworth Group.

Buchmann, C. (2002). Measuring Family Background in International Studies of Education: Conceptual Issues and Methodological Challenges. In A.C. Porter and A. Gamoran (Eds.), *Methodological Advances in Cross-National Surveys of Educational Achievement* (pp. 150-197). Washington, DC: National Academy Press.

Coleman, J.S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology, 94*: S95-S120.

Coleman, J.S., Kelly, D.L., Hobson, C.J., McPartland, J., Mood, A.M., Weinfeld, F.D., and York, R.L. (1966). *Equality of Educational Opportunity*. U.S. Department of Health, Education, and Welfare. Washington, DC: U.S. Government Printing Office.

Downey, D.B. (1994). The School Performance of Children From Single-Mother and Single-Father Families: Economic or Interpersonal Deprivation? *Journal of Family Issues, 15*: 129-147.

Duncan, G.J., and Brooks-Gunn, J. (Eds.). (1997). *Consequences of Growing Up Poor*. New York: Russell Sage.

Eldering, L., and Kloprogge, J. (Eds.). (1989). *Different Cultures Same School: Ethnic Minority Children in Europe.* Amsterdam: Swets and Zeitlinger B.V.

Entwisle, D.R., and Alexander, K. (1993). Entry Into School: The Beginning School Transition and Educational Stratification in the United States. *Annual Review of Sociology, 19*: 401-423.

Ganzeboom, H.B.G., DeGraaf, P.M., and Treiman, D.J. (1992). A Standard International Socio-Economic Index of Occupational Status. *Social Science Research, 21*: 1-56.

Gottfried, A. (1985). Measures of Socioeconomic Status in Child Development Research: Data and Recommendations. *Merrill-Palmer Quarterly, 31*(1): 85-92.

Hampden-Thompson, G., and Pong, S-L. (2005). Does Family Policy Environment Mediate the Effect of Single-Parenthood on Children's Academic Achievement? A Study of 14 European Countries. *The Journal of Comparative Family Studies, 36* (2): 227-248.

Hauser, R.M. (1994). Measuring Socioeconomic Status in Studies of Child Development. *Child Development, 65*(6): 1541-1545.

Hauser, R.M., and Huang, M.H. (1997). Verbal Ability and Socioeconomic Success: A Trend Analysis. *Social Science Research, 26*: 331-376.

Haverman, R., Wolfe, B., and Spaulding, J. (1991). Educational Achievement and Childhood Events and Circumstances. *Demography, 28:* 133-158.

Heyneman, S.P., and Loxley, W.A. (1983). The Effect of Primary-School Quality on Academic Achievement Across Twenty-Nine High- and Low-Income Countries. *American Journal of Sociology, 88*(6): 1162-1194.

Hout, M. (1988). More Universalism, Less Structural Mobility: The American Occupational Structure in the 1980s. *American Journal of Sociology, 93*: 1358-1400.

International Labor Organization. (1990). *ISCO-88: International Standard Classification of Occupations.* Geneva: Author.

Jencks, C., Bartlett, S., Corcoran, M., Crouse, J., Eaglesfield, D., Jackson, G., McClelland, K., Mueser, P., Olneck, M., Schwartz, J., Ward, S., and Williams, J. (1979). *Who Gets Ahead? The Determinants of Economic Success in America.* New York: Basic Books.

Lemke, M., Sen, A., Pahlke, E., Partelow, L., Miller, D., Williams, T., Kastberg, D., and Jocelyn, L. (2004). *International Outcomes of Learning in Mathematics Literacy and Problem Solving: PISA 2003 Results From the U.S. Perspective* (NCES 2005–003). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Lollock, L. (2001). *The Foreign Born Population in the United States: March 2000* (Current Population Reports, P20-534). U.S. Department of Commerce. Washington, DC: U.S. Census Bureau.

McLanahan, S.S., and Sandefur, G. (1994). *Growing Up With a Single Parent: What Hurts, What Helps?* Cambridge, MA: Harvard University Press.

Mueller, C.W., and Parcel, T.L. (1981). Measures of Socioeconomic Status: Alternatives and Recommendations. *Child Development, 52*: 13-30.

National Research Council. (2002). *Methodological Advances in Cross-National Surveys of Educational Achievement.* A.C. Porter and A. Gamoran (Eds.). Washington, DC: National Academy Press.

Plowden, B. (1967). *Children and Their Primary Schools*. London: HMSO.

Pong, S.L., Dronkers, J., and Hampden-Thompson, G. (2003). Family Policies and Children's School Achievement in Single- Versus Two-Parent Families. *Journal of Marriage and the Family, 65*(3): 681-699.

Purves, A. (1987). IEA Agenda for the Future. *International Review of Education, 33*: 104.

Rotberg, I. (1990). I Never Promised You First Place. *Phi Delta Kappan, 72*: 296-303.

Rotberg, I. (1995). Myths About Test Score Comparisons. *Science, 270*: 1446-1448.

Rotberg, I. (1998). Interpretation of International Test Score Comparisons. *Science, 280*: 1030-1031.

Schmid, C.L. (2001). Educational Achievement, Language-Minority Students, and the New Second Generation. *Sociology of Education, 74*: 71-87.

Shavit, Y., and Blossfield, H.P. (Eds.). (1993). *Persistent Inequality: Changing the Educational Stratification in Thirteen Countries.* Boulder, CO: Westview.

Shin, H.B., and Bruno, R. (2003). Language Use and English-Speaking Ability: 2000. *Census 2000 Brief* (C2KBR-29). U.S. Department of Commerce, Economics and Statistics Administration. Washington DC: U.S. Census Bureau.

Stedman, L.C. (1994). Incomplete Explanations: The Case of U.S. Performance in the International Assessments of Education. *Educational Researcher, 23*(7): 24-32.

Suter, L.E. (2000). Is Student Achievement Immutable? Evidence From International Studies on Schooling and Student Achievement. *Review of Educational Research, 70*(4): 529-545.

U.S. Department of Education. (1983). *A Nation at Risk.* Washington, DC: U.S. Government Printing Office.

United Nations Educational, Scientific, and Cultural Organization. (1997). *International Standard Classification of Education, ISCED 1997.* Montreal, Canada: Author.

West, J., Denton, K., and Reaney, L. (2000). *The Kindergarten Year* (NCES 2001-023). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Westbury, I. (1992). Comparing American and Japanese Achievement: Is the United States Really a Low Achiever? *Educational Researcher, 21*(5): 18-24.

Westbury, I. (1993). American and Japanese Achievement … Again. *Educational Researcher, 22*(3): 21-25.

Westat. (2000). *WesVar 4.0 User's Guide*. Rockville, MD: Author.

Williams, T., Levine, D., Jocelyn, L., Butler, P., and Haynes, J. (2000). *Mathematics and Science in the Eighth Grade: Findings From the Third International Mathematics and Science Study* (NCES 2000-014). U.S. Department of Education. Washington, DC: National Center for Education Statistics.

Wößmann, L. (2003). Schooling Resources Educational Institutions and Student Performance: The International Evidence. *Oxford Bulletin 65* (2): 117-170.

World Bank Country Classification, retrieved December 7, 2005, from http://web.worldbank.org/WBSITE/EXTERNAL/DATASTATISTICS/0,,contentMDK:20420458~menuPK:64133156~pagePK:64133150~piPK:64133175~theSitePK:239419,00.html

Methodology and Technical Notes

Sampling, Data Collection, and Response Rates for All Participating Countries

The sample of Program for International Student Assessment (PISA) students was selected in a way that represented the full population of 15-year-old students in each of the 41 countries that participated in 2003. The desired population in each country consisted of 15-year-olds attending both publicly and privately controlled educational institutions in grades 7 and higher. A minimum of 4,500 students from a minimum of 150 schools was required. Within schools, a sample of 35 students was to be selected in an equal probability sample unless fewer than 25 students age 15 were available (in which case all students were selected). International standards required that students be sampled based on an age definition of 15 years and 3 months to 16 years and 2 months at the beginning of the testing period. The testing period was required not to exceed 42 days between March 1, 2003, and August 31, 2003. Each country collected its own data, following international guidelines and specifications.

A minimum response rate target of 85 percent was required for initially selected educational institutions. In instances in which the initial response rate of educational institutions was between 65 and 85 percent, an acceptable school response rate could still be achieved using replacement schools, which were selected at the time of sample selection.

PISA also required a minimum participation rate of 80 percent of sampled students from original and replacement schools within each country. A student was considered a participant if he or she participated in the first testing session or a follow-up or makeup testing session.

Sampling, Data Collection, and Response Rates in the United States

The 2003 PISA school sample was drawn for the United States in November 2002. The sample design was developed to retain some of the properties of the 2000 PISA U.S. school sample and to follow international requirements as given in the PISA sampling manual. Unlike the 2000 PISA sample, which had a three-stage design, in the United States, the 2003 sample was drawn using a two-stage sampling process with the first stage a sample of schools, and the second stage a sample of students within schools. For PISA in 2000, the U.S. school sampling process used the selection of a sample of geographic Primary Sampling Units (PSUs) as the first stage of selection. The sample was not clustered at the geographic level for PISA 2003. This change was made in an effort to reduce the design effects observed in the 2000 data and to spread the respondent burden across school districts as much as possible.

The sample design for PISA was a stratified systematic sample, with sampling probabilities proportional to measures of size. The PISA sample had no explicit stratification and no oversampling of subgroups. The frame was implicitly stratified (i.e., sorted for sampling) by five categorical stratification variables: grade span of the school (five levels), type of school (public or private), region of the country (Northeast, Central, West, Southeast), type of location relative to populous areas (eight levels), and minority status (15 percent and below and above 15 percent). The last sort key within the implicit stratification was by estimated enrollment of 15-year-olds based on grade enrollments.

At the same time that the PISA sample was selected, replacement schools were identified following the PISA guidelines by assigning the two schools neighboring the sampled school on the frame as replacements. There were several constraints on the assignment of substitutes. One sampled school was not allowed to substitute for another, and a given school could not be assigned to substitute for more than one sampled school. Furthermore, substitutes were required to be in the same implicit stratum as the sampled school. If the sampled school was the first or last school in the stratum, then the second school following or preceding the sampled school was identified as the substitute. One was designated a first

If an original school refused to participate, the first replacement was then contacted. If that school also refused to participate, the second school was then contacted.

The U.S. PISA school sample consisted of 420 schools. This number was increased from the international minimum requirement of 150 to offset school nonresponse, reduce design effects. The schools were selected with probability proportionate to the school's estimated enrollment of 15-year-olds from the 2003 NAEP school frame with 2000-01 school data. The data for public schools came from the Common Core of Data (CCD), and the data for private schools came from the Private School Universe Survey (PSS). Any school containing at least one 7th- through 12th-grade class as of the school year 2000–01 was included on the school sampling frame. Participating schools provided lists of 15-year-old students, and a sample of 35 students was selected within each school in an equal probability sample. The overall sample design for the United States was intended to approximate a self-weighting sample of students as much as possible, with each 15-year-old student having an equal probability of being selected.

In the United States, for a variety of reasons reported by school administrators (such as increased testing requirements at the national, state, and local levels; concerns about timing of the PISA assessment; and loss of learning time), many schools in the original sample declined to participate. When it became clear that the United States would not meet the minimum response rate standards, in order to improve response rates and better accommodate school schedules, a second testing window was opened from September to November 2003 with the agreement of the PISA Consortium. For the fall data collection, the school sample included only original schools from the sample that had refused to participate in the spring but indicated a willingness to participate in a fall assessment. Substitute schools were not included in the fall sample because their participation would have had little effect on raising the final response rate.

In order to achieve a comparable sample of students in spring and fall, the age definition for students tested in the fall was adjusted such that all students tested were the same age.

In the United States, of the 420 sampled schools, 382 were eligible (some did not have any 15-year-olds enrolled) and 179 agreed to participate in the spring of 2003. An additional 70 original schools participated in the fall assessment for a total of 249 participating original schools. The school response rate (including spring and fall assessments) before replacement was 65 percent (weighted and unweighted). The weighted school response rate before replacement is given by the formula:

$$\text{weighted school response rate before replacement} = \frac{\sum_{i \in Y} W_i E_i}{\sum_{i \in (Y \cup N)} W_i E_i}$$

where Y denotes the set of responding original sample schools with age-eligible students, N denotes the set of eligible nonresponding original sample schools, W_i denotes the base weight for school i, $W_i = 1/P_i$, where P_i denotes the school selection probability for school i, and E_i denotes the enrollment size of age-eligible students, as indicated on the sampling frame.

In addition to the 249 participating original schools, 13 replacement schools also participated in the spring for a total of 262 participating schools in the United States.

A total of 7,598 students were sampled for the assessment. Of these students, 261 were deemed ineligible because of their enrolled grades, birthdays, or other reasons and were removed from the U.S. sample. Of the eligible 7,337 sampled students, an additional 534 students were excluded using the criteria described above, for a weighted exclusion rate of 7 percent.

Of the 6,803 remaining sampled students, a total of 5,456 students participated in the assessment in the United States, but 114 of these came from schools that had less than 50 percent student participation. Schools that had less than 50

percent student participation were classified as school nonrespondents, and these students (114 participating students and 187 nonparticipating students) were therefore excluded for the purposes of calculating student response rates. Thus, although data for 5,456 students are included in the database, student response rates were calculated by subtracting the 114 students from the 5,456 for a total of 5,342 participating students. The denominator for the student response rate is 6,502, which consists of 7,598 sampled students minus the following students: 261 ineligible; 534 excluded; 114 responding students from nonresponding schools; and 187 nonresponding students from nonresponding schools. An overall weighted student response of 83 percent was achieved (82 percent unweighted).

Two separate bias analyses were conducted in the United States to address potential problems in the data due to school nonresponse and possible achievement differences between students in spring and fall testing windows. Based on the nonresponse bias analysis, it was concluded that the data for the United States were adequate to generalize to the U.S. 15-year-old population and should be included in the international report and database. Based on the results of the second bias analysis, which was concerned with the possible achievement differences between students in spring and fall testing windows, it was concluded that the data for the United States were again adequate to generalize to the U.S. 15-year-old population and should be included in the international report and database.

Weighting. Students included in the final PISA sample for a given country were not all equally representative of the full student population, even though random samplings of schools and students were used to select the sample. The use of sampling weights is necessary for the computation of statistically sound, nationally representative estimates. Survey weights help adjust for intentional over- or under-sampling of certain sectors of the population, school or student nonresponse, or errors in estimating size of a school at the time of sampling. Survey weighting for PISA 2003 was carried out by Westat, Inc., as part of the PISA Consortium. The internationally defined weighting specifications for PISA required that each assessed student's sampling weight be the product of the inverse of the school's probability of selection, an adjustment for school-level nonresponse, the inverse of the student's probability of selection, and an adjustment for student-level nonresponse. All PISA analyses were conducted using these sampling weights. The base weight for each replacement school was equal to the base weight of the original school it replaced.

The individual country estimates and the international average are calculated using the final student weight (w_fstuwt).

Data Limitations

As with any study, there are limitations to PISA 2003 that researchers should take into consideration. Estimates produced using data from PISA 2003 are subject to two types of error, nonsampling and sampling errors. Nonsampling errors can be due to errors made in the collection and processing of data. Sampling errors can occur because the data were collected from a sample rather than a complete census of the population.

Nonsampling errors. Nonsampling error is a term used to describe variations in the estimates that may be caused by population coverage limitations, nonresponse bias, and measurement error, as well as by data collection, processing, and reporting procedures. For example, the sampling frame for the United States was limited to regular public and private schools in the 50 states and the District of Columbia. The sources of nonsampling errors are typically problems like unit and item nonresponse, the differences in respondents' interpretations of the meaning of the questions, response differences related to the particular time the survey was conducted, and mistakes in data preparation. Some of these issues (particularly unit nonresponse) are

discussed above in the section on U.S. sampling and data collection.

Missing data. There are four kinds of missing data. "Nonresponse" data occurs when a respondent was expected to answer an item but no response is given. Responses that are "missing or invalid" occur in multiple-choice items where an invalid response is given. The code is not used for open-ended questions. An item is "not applicable" when it is not possible for the respondent to answer the question. Finally, items that are "not reached" are consecutive missing values at the end of each test session. All four kinds of missing data are coded differently in the PISA 2003 database.

In general, it is difficult to identify and estimate either the amount of nonsampling error or the bias caused by this error. In PISA 2003, efforts were made to prevent such errors from occurring and to compensate for them when possible. For example, the design phase entailed a field test that evaluated items as well as the implementation procedures for the survey. It should also be recognized that most background information was obtained from students' self-reports, which are subject to respondent bias. One potential source of respondent bias in this survey was social desirability bias, for example, if students overreported their mathematics ability.

Missing background data are not included in the analyses for this report and are not imputed. Listwise deletion is applied to deal with cases that have missing values. In general, item response rates for the variables discussed in this report were over the NCES standard of 85 percent to report without notation. The one case in which more than 15 percent of the student responses were missing is flagged (for New Zealand for student report of parent occupation, with an item response rate of 84 percent).

Sampling errors. Sampling errors occur when the discrepancy between a population characteristic and the sample estimate arises because not all members of the reference population are sampled for the survey. The size of the sample relative to the population and the variability of the population characteristics both influence the magnitude of sampling error. The particular sample of 15-year-old students from the 2002–03 school year was just one of many possible samples that could have been selected. Therefore, estimates produced from the PISA 2003 sample may differ from estimates that would have been produced had another 15-year-old sample been drawn. This type of variability is called sampling error because it arises from using a sample of 15-year-old students in 2002–03, rather than all 15-year-old students in that year.

The standard error is a measure of the variability due to sampling when estimating a statistic. The approach used for calculating sampling variances in PISA was the balanced repeated replication (BRR), or balanced half-samples (Fay's method). Standard errors can be used as a measure for the precision expected from a particular sample. Standard errors for all of the estimates can be found in tables 1-5.

Statistical Procedures

International average. The international average is the weighted mean of the data values for all of the 20 countries. It reflects the value for a given variable when the 20 countries are considered as a whole (i.e., one single entity). The international average is calculated using the final student weight.

Significance tests. Comparisons made in the text were tested for statistical significance to ensure that the differences are larger than might be expected due to sampling variation. When comparisons are made, *t* statistics were calculated using the following formula:

$$t = \frac{(est_1 - est_2)}{\sqrt{(se_1)^2 + (se_2)^2}}$$

Some tests, however, compared estimates from related groups (e.g., U.S. students compared to the international average). To account for this

sample dependency, the *t* statistic for dependent samples was computed using the following formula, where *p* is the proportion of the subgroup to the total group:

$$t = \frac{E_{sub} - E_{tot}}{\sqrt{\left(se_{sub}^2 + se_{tot}^2\right) - 2\,p\left(se_{sub}^2\right)}}$$

Ordinary least squares regression. The regression analysis is used in this report to investigate the relationship between a dependent variable (achievement scores) and several independent variables. Regression coefficients were calculated in WesVar[14] using the following model:

$$Y_i = \beta_1\chi_{i1} + \ldots + \beta_p\chi_{ip} + \varepsilon_i$$

where Y_i is the observed value of Y for the i-th individual in the sample, χ_{ij} is the value of independent variable j for unit i, and ε_i is a random error with a mean of zero.

Country Classification

The World Bank classifies economies for analytical and operational purposes. The main criterion for classifying economies is gross national income (GNI) per capita. Each economy is classified as low income, middle income (lower middle income and upper middle income), or high income based on its GNI per capita. In 2004, the high income group threshold was set at a GNI per capita of $10,066 or more.

Constructs and Variables Used in Study

Parent education. Students were asked to indicate the highest level of education of their parent/parents based on national qualifications. The students' responses were then coded in accordance with the International Standard Classification of Education (ISCED) in order to obtain internationally comparable categories for the parents' educational attainment level.[15] For both mothers' and fathers' educational attainment there was a range from zero (did not go to school) to six (completed college). In this study, if either of a student's parents completed a bachelor's, master's, or postgraduate degree or held some sort of postsecondary vocational qualification (which correspond to ISCED levels 5A, 5B, or 6), the student was considered as having postsecondary-educated parents. It should be noted that the distribution of students whose parents have completed a bachelor's, master's, or postgraduate degree and students whose parents hold some sort of postsecondary vocational qualification does vary cross nationally.

Parent occupational status. Parent occupational status is based on either the student's father's or mother's occupation (whichever is higher) as reported by the student. Occupations were coded to the International Standard Classification of Occupations 1988 (ISCO-88) and then grouped into major occupational groups.[16] Values on the index range from 16 to 90; low values represent low socio-economic status and high values represent high socio-economic status. For the purposes of this study, the variable was transformed into quarters with the "high" occupational status group representing the upper 25 percent.

Books in the home. Students were asked to report how many books they had in their home. Students were asked if they had 0-10, 11-25, 26-100, 101-200, 201-500, or more than 500 books at home. For the purposes of this report, these categories were collapsed to form a dichotomous variable of more than 200 books and 200 or fewer books in the home.

Language spoken at home. Students were asked what language they spoke at home always or most of the time. In the United States, the assessment was given in English and students were asked if they spoke English, Spanish, or another language. Other countries included response options for students to choose an official national language other than the language

[14] For further information, see Westat (2000).

[15] See United Nations Educational, Scientific, and Cultural Organization (1997).

[16] For more information about ISCO-88, see International Labor Organization (ILO) (1990).

of the assessment (for example, in Canada, students taking an assessment in English could choose French) or a national dialect. For the purposes of this report, students were grouped into two categories: test-language speakers (students whose native language was the language in which the assessment was administered) and non-test-language speakers (students whose native language was a language other than the one in which the assessment was administered).

Immigrant status. Students were asked to report whether or not they and their parents were born in the country of assessment or in another country. The responses were then grouped into two categories: 1) native-born students (those students born in the country of assessment regardless of parent birthplace) and 2) foreign-born students (those students born outside the country of assessment and whose parents were born outside of the country).

Family structure. Students were asked to report who usually lived at home with them. The response categories were then grouped into two categories: 1) two-parent households (students who reported living with both mother and father) and 2) non-two-parent households (all other response combinations including single-parent families, step-families, and guardian families). It should be noted that there was no response category for students to indicate whether parents were biological or not.

For further details about the assessment and any of the topics discussed here, see the OECD's *PISA 2003 Technical Report* (Adams in press).

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For More Information

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Table 1. Percentage distribution and standard errors of 15-year-old students, by select socioeconomic status (SES) and family characteristics and country: 2003

	SES characteristics											
	Parent education				Parent occupational status				Books in the home			
	Postsecondary		Secondary and below		High		Middle and low		More than 200		200 or fewer	
Country	Percent	*se*	Percent	*se*	Percent	*se*	Percent	*se*	Percent	*se*	Percent	*se*
International average	**45.8**	**0.47**	**54.2**	**0.47**	**27.1**	**0.48**	**72.9** ▲	**0.48**	**24.2**	**0.52**	**75.8**	**0.52**
Australia	54.2	0.80	45.8 ▼	0.80	30.8	0.68	69.2 ▲	0.68	34.7	0.75	65.3 ▼	0.75
Austria	43.2	1.05	56.8 ▲	1.05	18.0	0.97	82.0 ▲	0.97	22.7	0.88	77.3	0.88
Belgium	57.2	0.84	42.8 ▼	0.84	27.2	0.86	72.8 ▲	0.86	23.1	0.67	77.0	0.67
Canada	63.6	0.75	36.4 ▼	0.75	29.0	0.77	71.0 ▲	0.77	29.4	0.59	70.7 ▼	0.59
Denmark	58.5	1.26	41.5 ▼	1.26	21.0	1.04	79.0 ▲	1.04	26.5	1.11	73.5 ▼	1.11
Finland	66.7	0.77	33.3 ▼	0.77	26.6	0.88	73.4 ▲	0.88	23.1	0.76	76.9	0.76
France	37.4	1.05	62.6 ▲	1.05	21.7	1.02	78.3 ▲	1.02	21.0	0.98	79.0	0.98
Germany	41.1	0.96	58.9 ▲	0.96	21.8	0.90	78.2 ▲	0.90	29.2	0.94	70.9 ▼	0.94
Greece	41.6	1.76	58.5 ▲	1.76	20.5	1.57	79.5 ▲	1.57	17.8	1.09	82.2 ▲	1.09
Iceland	40.3	0.80	59.8 ▲	0.80	37.1	0.81	62.9 ▼	0.81	38.5	0.76	61.5 ▼	0.76
Ireland	39.9	1.19	60.1 ▲	1.19	21.3	1.10	78.7 ▲	1.10	21.1	0.94	79.0	0.94
Italy	34.4	0.92	65.7 ▲	0.92	18.4	0.78	81.6 ▲	0.78	21.2	0.73	78.8	0.73
Netherlands	47.6	1.16	52.4	1.16	29.4	1.01	70.6 ▲	1.01	25.5	1.26	74.5	1.26
New Zealand[1]	44.6	0.78	55.4 ▲	0.78	28.9	0.87	71.1 ▲	0.87	29.9	0.75	70.1 ▼	0.75
Norway	62.8	0.96	37.2 ▼	0.96	34.5	0.98	65.5	0.98	38.8	1.19	61.2 ▼	1.19
Portugal	25.9	1.15	74.1 ▲	1.15	13.8	1.07	86.2 ▲	1.07	16.0	1.06	84.0 ▲	1.06
Spain	38.0	1.50	62.0 ▲	1.50	14.1	1.00	85.9 ▲	1.00	27.4	1.13	72.6 ▼	1.13
Sweden	60.6	0.94	39.4 ▼	0.94	27.1	0.87	72.9 ▲	0.87	36.3	0.99	63.7 ▼	0.99
Switzerland	41.5	1.04	58.5 ▲	1.04	21.7	1.18	78.3 ▲	1.18	24.4	1.09	75.6	1.09
United States	48.5	0.99	51.5	0.99	33.2	0.96	66.8	0.96	22.3	1.11	77.7	1.11

See notes at end of table.

Table 1. Percentage distribution and standard errors of 15-year-old students, by select socioeconomic status (SES) and family characteristics and country: 2003—Continued

	Family characteristics											
	Language in the home				Immigrant status				Family structure			
	Test-language		Non-test-language		Native born		Foreign born		Two-parent family		Non-two-parent family	
Country	Percent	*se*	Percent	*se*	Percent	*se*	Percent	*se*	Percent	*se*	Percent	*se*
International average	**90.3**	**0.35**	**9.7**	**0.35**	**90.5**	**0.25**	**9.5**	**0.25**	**65.7**	**0.50**	**34.3 ▼**	**0.50**
Australia	91.0	0.66	9.0	0.66	87.0	0.72	13.0 ▲	0.72	69.4	0.52	30.6 ▼	0.52
Austria	91.0	0.74	9.0	0.74	89.7	0.72	10.3	0.72	75.9	0.81	24.1 ▼	0.81
Belgium	83.8	0.80	16.2 ▲	0.80	92.0	0.73	8.0	0.73	71.9	0.64	28.1 ▼	0.64
Canada	86.6	0.74	13.4 ▲	0.74	79.0	0.95	21.0 ▲	0.95	70.0	0.55	30.0 ▼	0.55
Denmark	96.1	0.48	3.9 ▼	0.48	95.4	0.42	4.6 ▼	0.42	66.3	1.12	33.7 ▼	1.12
Finland	97.1	0.22	2.9 ▼	0.22	96.9	0.27	3.1 ▼	0.27	69.7	0.83	30.3 ▼	0.83
France	93.3	0.75	6.7 ▼	0.75	94.5	0.55	5.5 ▼	0.55	69.9	0.94	30.1 ▼	0.94
Germany	92.3	0.57	7.7	0.57	83.6	0.85	16.4 ▲	0.85	74.5	0.72	25.5 ▼	0.72
Greece	96.8	0.39	3.2 ▼	0.39	92.1	0.69	7.9	0.69	71.2	1.32	28.9 ▼	1.32
Iceland	98.4	0.22	1.6 ▼	0.22	97.4	0.31	2.7 ▼	0.31	71.2	0.85	28.8 ▼	0.85
Ireland	97.6	0.53	2.4 ▼	0.53	95.9	0.50	4.1 ▼	0.50	79.9	0.77	20.1 ▼	0.77
Italy	81.0	1.09	19.0 ▲	1.09	95.7	0.39	4.4 ▼	0.39	79.6	0.63	20.4 ▼	0.63
Netherlands	85.4	1.28	14.6 ▲	1.28	91.7	1.39	8.3	1.39	78.7	0.91	21.3 ▼	0.91
New Zealand	90.7	0.70	9.3	0.70	84.9	0.74	15.1 ▲	0.74	64.9	0.87	35.1 ▼	0.87
Norway	94.8	0.54	5.2 ▼	0.54	95.1	0.50	4.9 ▼	0.50	64.0	0.84	36.0 ▼	0.84
Portugal	98.6	0.21	1.4 ▼	0.21	96.4	1.05	3.6 ▼	1.05	77.2	0.79	22.8 ▼	0.79
Spain	84.2	1.46	15.8 ▲	1.46	96.0	0.42	4.0 ▼	0.42	81.3	0.57	18.7 ▼	0.57
Sweden	92.4	0.71	7.6	0.71	92.8	0.72	7.2 ▼	0.72	66.0	0.79	34.0 ▼	0.79
Switzerland	87.9	0.70	12.1 ▲	0.70	87.7	0.58	12.3 ▲	0.58	73.5	0.77	26.5 ▼	0.77
United States	91.0	0.69	9.0	0.69	90.9	0.45	9.1	0.45	55.3	1.08	44.7	1.08

▲ Percentage larger than the respective U.S. percentage ($p < .05$).

▼ Percentage smaller than the respective U.S. percentage ($p < .05$).

[1]The response rate for parent occupational status is below 85 percent.

NOTE: The international average is the weighted mean of the data values for the 20 countries included in the study and reflects the value for a given variable when the 20 countries are considered as a whole (i.e., one single entity). The international average is not related to the OECD average as referred to in the PISA international report (OECD 2004) as well as other national reports. The individual country estimates were calculated using the final student weight. The SES and family characteristics are based on students' reports. If either of a student's parents completed a postsecondary vocational qualification or a bachelor's, master's, or postgraduate degree (corresponding to the International Standard Classification of Education [ISCED] levels 5A, 5B, or 6), the student was considered as having postsecondary-educated parents. Parent occupational status is based on either of the student's parents' occupation (whichever is higher), and the variable was transformed into quarters with "high" occupational status representing the upper quarter. "Test-language" students reported speaking the always or most of the time at home while "non-test-language" students reported using another language always or most of the time at home. Students from a "two-parent family" reported living with both their mother and father. The category "non-two-parent family" encompasses all other responses. *se* means standard error. Detail may not sum to totals because of rounding.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

Table 2. Mean mathematics literacy scores and standard errors of 15-year-old students, by select socioeconomic status (SES) and family characteristics and country: 2003

	SES characteristics											
	Parent education				Parent occupational status				Books in the home			
	Postsecondary		Secondary and below		High		Middle and low		More than 200		200 or fewer	
Country	Score	*se*	Score	*se*	Score	*se*	Score	*se*	Score	*se*	Score	*se*
International average	**519.4 ▲**	**1.64**	**478.9 ▲**	**1.55**	**541.0 ▲**	**1.90**	**486.1 ▲**	**1.30**	**546.5 ▲**	**1.63**	**480.6 ▲**	**1.45**
Australia	544.1 ▲	2.56	504.9 ▲	2.59	564.4 ▲	2.59	514.3 ▲	2.02	558.2 ▲	2.26	508.1 ▲	2.36
Austria	518.8 ▲	3.87	499.4 ▲	3.34	555.0 ▲	5.30	498.6 ▲	2.98	564.8 ▲	3.97	490.7 ▲	2.94
Belgium	560.6 ▲	2.59	511.1 ▲	2.77	589.7 ▲	3.28	521.8 ▲	2.61	578.0 ▲	3.18	523.6 ▲	2.44
Canada	547.7 ▲	1.95	517.6 ▲	1.93	568.3 ▲	2.57	526.3 ▲	1.50	564.6 ▲	2.21	524.6 ▲	1.75
Denmark	535.7 ▲	2.95	490.3 ▲	3.14	562.5 ▲	4.34	508.5 ▲	2.71	552.9 ▲	3.48	501.9 ▲	2.61
Finland	554.1 ▲	1.98	526.7 ▲	2.58	576.4 ▲	2.94	534.6 ▲	1.95	578.9 ▲	3.20	534.4 ▲	1.75
France	535.1 ▲	3.03	502.0 ▲	2.79	559.1 ▲	4.14	503.2 ▲	2.53	562.3 ▲	3.99	499.3 ▲	2.60
Germany	545.8 ▲	3.85	493.7 ▲	3.78	567.7 ▲	4.03	500.8 ▲	3.25	562.7 ▲	3.62	490.8 ▲	3.42
Greece	466.3 ▼	5.38	430.0 ▼	3.21	497.4 ▼	5.73	436.7 ▼	3.49	494.0 ▼	5.77	435.8 ▼	3.50
Iceland	532.7 ▲	2.32	504.6 ▲	1.93	536.5 ▲	2.67	507.7 ▲	1.88	540.6	2.59	500.9 ▲	1.97
Ireland	525.4 ▲	3.20	489.2 ▲	2.53	545.4 ▲	3.66	496.1 ▲	2.34	537.0	3.81	494.1 ▲	2.50
Italy	481.6 ▼	3.77	457.6	3.31	510.7 ▼	5.46	459.4 ▼	3.18	512.2 ▼	3.38	454.2 ▼	3.33
Netherlands	566.5 ▲	3.38	527.2 ▲	3.50	583.7 ▲	3.77	531.4 ▲	3.08	592.3 ▲	3.43	526.6 ▲	3.28
New Zealand[1]	549.6 ▲	2.83	513.9 ▲	2.75	564.6 ▲	3.36	510.7 ▲	2.37	566.3 ▲	3.04	508.1 ▲	2.39
Norway	510.9	2.70	475.0 ▲	2.63	532.4	3.44	483.1 ▲	2.42	528.0	3.14	476.4 ▲	2.39
Portugal	492.8 ▼	5.52	458.7	3.01	532.3	4.20	457.3 ▼	3.25	525.3 ▼	4.07	455.7 ▼	3.48
Spain	510.9	3.03	471.9 ▲	2.27	534.4	3.82	479.6 ▲	2.23	529.0	2.96	469.5	2.26
Sweden	521.0 ▲	2.80	498.2 ▲	3.10	554.4 ▲	3.99	499.8 ▲	2.31	550.0 ▲	3.25	487.1 ▲	2.47
Switzerland	549.0 ▲	4.64	514.0 ▲	2.76	570.3 ▲	4.16	518.6 ▲	3.21	578.0 ▲	4.71	510.3 ▲	2.87
United States	505.6	3.40	464.6	2.97	526.4	3.38	472.2	2.77	536.9	3.64	468.9	2.73

See notes at end of table.

Table 2. Mean mathematics literacy scores and standard errors of 15-year-old students, by select socioeconomic status (SES) and family characteristics and country: 2003—Continued

	Family characteristics											
	Language in the home				Immigrant status				Family structure			
	Test-language		Non-test-language		Native born		Foreign born		Two-parent family		Non-two-parent family	
Country	Score	*se*	Score	*se*	Score	*se*	Score	*se*	Score	*se*	Score	*se*
International average	**502.4** ▲	**1.45**	**460.2** ▲	**3.30**	**499.8** ▲	**1.46**	**444.7**	**2.98**	**508.8**	**1.27**	**473.6** ▲	**2.15**
Australia	527.3 ▲	2.05	515.1 ▲	5.81	526.2 ▲	2.08	511.4 ▲	5.11	534.3 ▲	2.16	503.8 ▲	3.04
Austria	513.0 ▲	3.30	456.2	7.20	512.3 ▲	3.23	447.1	6.22	510.2	3.41	498.7 ▲	3.98
Belgium	541.3 ▲	2.74	529.6 ▲	4.77	539.4 ▲	2.38	413.7	9.11	545.9 ▲	2.47	502.4 ▲	3.27
Canada	538.6 ▲	1.63	525.1 ▲	4.06	537.7 ▲	1.58	513.0 ▲	3.84	544.5 ▲	1.69	516.4 ▲	2.23
Denmark	517.1 ▲	2.69	474.1 ▲	10.11	517.2 ▲	2.65	454.0	8.41	524.8 ▲	2.97	495.9 ▲	3.64
Finland	546.3 ▲	1.92	496.0 ▲	6.68	546.3 ▲	1.86	481.7 ▲	8.84	548.4 ▲	1.98	535.7 ▲	2.91
France	517.7 ▲	2.43	456.3	8.46	514.7 ▲	2.30	442.7	10.71	519.0 ▲	2.65	497.5 ▲	3.74
Germany	523.1 ▲	3.32	433.6	6.78	518.4 ▲	3.50	424.4	5.36	514.9 ▲	3.42	504.1 ▲	5.16
Greece	446.9 ▼	3.86	399.1 ▼	9.37	449.1 ▼	3.92	396.1 ▼	6.19	452.7 ▼	4.09	427.9 ▼	5.66
Iceland	516.5 ▲	1.46	467.6	13.45	516.9 ▲	1.45	449.2	9.71	520.4 ▲	1.69	503.3 ▲	2.93
Ireland	503.3 ▲	2.44	490.2 ▲	11.73	502.9 ▲	2.43	500.7 ▲	13.03	509.7	2.52	476.3 ▲	3.75
Italy	475.1 ▼	3.04	441.4	6.15	467.7 ▼	3.06	420.6	7.49	470.0 ▼	3.02	452.1	4.06
Netherlands	549.0 ▲	3.29	524.9 ▲	8.52	546.9 ▲	2.89	437.9	10.17	550.8 ▲	2.85	516.5 ▲	4.52
New Zealand	526.4 ▲	2.39	507.7 ▲	6.52	525.8 ▲	2.39	510.8 ▲	4.23	538.0 ▲	2.24	499.9 ▲	3.33
Norway	499.8 ▲	2.29	449.7	8.10	498.0 ▲	2.36	439.9	8.14	505.1	2.80	479.7 ▲	2.84
Portugal	467.7 ▼	3.42	426.8	15.49	469.1 ▼	2.96	383.7 ▼	17.04	469.7 ▼	3.25	453.1	5.46
Spain	485.3	2.76	485.1 ▲	4.18	487.1	2.36	435.9	10.19	487.9 ▼	2.53	474.4 ▲	3.49
Sweden	517.5 ▲	2.22	456.8	10.00	515.4 ▲	2.42	427.4	8.40	520.0 ▲	2.73	490.0 ▲	3.30
Switzerland	540.0 ▲	3.74	467.2 ▲	6.14	536.7 ▲	3.26	454.2 ▲	5.66	533.4 ▲	3.53	509.5 ▲	4.16
United States	489.9	2.86	443.7	6.27	487.7	2.88	434.8	6.41	504.5	2.87	458.7	3.41

▲ Score larger than the respective U.S. score ($p < .05$).

▼ Score smaller than the respective U.S. score ($p < .05$).

[1]The response rate for parent occupational status is below 85 percent.

NOTE: The international average is the weighted mean of the data values for the 20 countries included in the study and reflects the value for a given variable when the 20 countries are considered as a whole (i.e., one single entity). The international average is not related to the OECD average as referred to in the PISA international report (OECD 2004) as well as other national reports. The individual country estimates were calculated using the final student weight. The SES and family characteristics are based on students' reports. If either of a student's parents completed a postsecondary vocational qualification or a bachelor's, master's, or postgraduate degree (corresponding to the International Standard Classification of Education [ISCED] levels 5A, 5B, or 6), the student was considered as having postsecondary-educated parents. Parent occupational status is based on either of the student's parents' occupation (whichever is higher), and the variable was transformed into quarters with "high" occupational status representing the upper quarter. "Test-language" students reported speaking the language in which the test was administered always or most "non-test-language" students reported using another language always or most of the time at home. Students from a "two-parent family" reported living with both their mother and father. The category "non-two-parent family" encompasses all other responses. *se* means standard error.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

Table 3. Mean mathematics literacy achievment gaps and standard errors of 15-year-old students, by select socioeconomic status and family characteristics and country: 2003

	SES characteristics						Family characteristics					
	Parent education		Parent occupational status		Books in the home		Language in the home		Immigrant status		Family structure	
Country	Gap	*se*	Gap	*se*	Gap	*se*	Gap	*se*	Gap	*se*	Gap	*se*
International average	40.4	1.69	54.9	1.84	65.9	1.64	42.2	3.41	55.1	2.97	35.2 ▼	1.72
Australia	39.2	3.30	50.2	2.38	50.1 ▼	2.53	12.2 ▼	5.61	14.8 ▼	4.66	30.5 ▼	2.74
Austria	19.5 ▼	3.82	56.5	4.86	74.1	3.57	56.8	7.25	65.2	5.97	11.5 ▼	3.83
Belgium	49.5	3.58	67.9 ▲	4.33	54.4 ▼	3.77	11.7 ▼	5.57	125.7 ▲	9.42	43.5	2.89
Canada	30.1 ▼	2.34	42.0 ▼	2.69	40.1 ▼	2.33	13.5 ▼	3.99	24.6 ▼	3.30	28.1 ▼	2.19
Denmark	45.4	3.70	54.1	4.83	51.0 ▼	3.43	43.0	10.08	63.1	8.11	29.0 ▼	3.33
Finland	27.4 ▼	2.67	41.8 ▼	3.16	44.5 ▼	2.94	50.3	7.02	64.6	8.81	12.8 ▼	2.96
France	33.2	3.65	56.0	4.67	63.0	4.34	61.4	8.80	72.1	10.59	21.5 ▼	3.85
Germany	52.2 ▲	4.22	66.9 ▲	3.98	71.9	3.76	89.5 ▲	6.58	94.0 ▲	6.02	10.8 ▼	4.43
Greece	36.3	5.03	60.7	5.58	58.2	5.34	47.7	9.41	53.1	6.29	24.8 ▼	5.45
Iceland	28.0 ▼	3.20	28.7 ▼	3.43	39.7 ▼	3.52	48.9	13.63	67.8	9.90	17.1 ▼	3.43
Ireland	36.2	3.50	49.4	3.99	42.9 ▼	4.11	13.1 ▼	11.90	2.2 ▼	13.00	33.4 ▼	3.77
Italy	24.0 ▼	3.51	51.3	5.31	58.0	3.92	33.7	6.28	47.2	7.02	18.0 ▼	2.95
Netherlands	39.3	4.07	52.3	4.16	65.7	4.62	24.0 ▼	9.33	108.9 ▲	10.86	34.3 ▼	4.44
New Zealand[1]	35.7	3.70	54.0	3.55	58.1	3.41	18.7 ▼	6.91	15.0 ▼	4.32	38.1	3.44
Norway	35.9	2.81	49.3	3.56	51.6 ▼	3.16	50.2	8.06	58.2	8.34	25.4 ▼	3.03
Portugal	34.1	4.75	74.9 ▲	4.31	69.6	5.22	41.0	14.76	85.4	16.79	16.6 ▼	4.33
Spain	38.9	3.06	54.8	4.08	59.5	2.97	0.3 ▼	5.07	51.3	9.94	13.5 ▼	3.26
Sweden	22.8 ▼	3.31	54.6	3.84	62.9	3.55	60.8	9.50	88.0 ▲	8.42	30.0 ▼	3.42
Switzerland	35.0	3.75	51.7	4.11	67.7	3.58	72.8 ▲	6.26	82.5 ▲	5.31	23.9 ▼	3.50
United States	41.0	3.52	54.3	3.51	68.0	3.47	46.1	6.48	52.9	5.93	45.7	3.07

▲ Achievement gap larger than the respective U.S. achievement gap ($p < .05$).

▼ Achievement gap smaller than the respective U.S. achievement gap ($p < .05$).

[1]The response rate for parent occupational status is below 85 percent.

NOTE: The international average is the weighted mean of the data values for the 20 countries included in the study and reflects the value for a given variable when the 20 countries are considered as a whole (i.e., one single entity). The international average is not related to the OECD average as referred to in the PISA international report (OECD 2004) as well as other national reports. The individual country estimates were calculated using the final student weight. The SES and family characteristics are based on students' reports. The achievement gap represents the average achievement score point difference of students with postsecondary-educated parents compared to students with parents educated to the secondary level or below. If either of a student's parents completed a postsecondary vocational qualification or a bachelor's, master's, or postgraduate degree (corresponding to the International Standard Classification of Education [ISCED] levels 5A, 5B, or 6), the student was considered as having postsecondary-educated parents. Student reports of parents' educational attainment may be inaccurate as some students either do not know or exaggerate parent education. Parent occupational status is based on either of the student's parents' occupation (whichever is higher), and the variable was transformed into quarters. The achievement gap for parent occupational status represents the average achievement score point difference of students with one or more parents in the upper quarter compared to students with parents whose occupations fell in the lower quarters. The achievement gap for books in the home represents the average achievement score point difference between students from homes with more than 200 books in the home and students from homes with 200 or fewer books. The achievement gap for language in the home represents the average achievement difference between test-languange and non-test-language students. "Test-language" students reported speaking the language in which the test was administered always or most of the time at home while "non-test-language" students reported using another language always or most of the time at home. The achievement gap for immigrant status represents the average achievement score point difference between native-born and foreign-born students. The achievement gap for family structure represents the average achievement score point difference between students from two-parent families and students from other family structures. Students from a "two-parent family" reported living with both their mother and father. The category "non-two-parent family" encompasses all other responses. *se* means standard error.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

Table 4. Coefficients and standard errors from Ordinary Least Squares regression of the achievement of 15-year-old students who are test-language speakers before and after controlling for socioeconomic status (SES) characteristics: 2003

	Australia		Austria		Belgium		Canada		Denmark		Finland		France		Germany		Greece		Iceland	
Variables	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Intercept	515.1	494.4	456.2	454.6	529.6	517.9	525.1	502.4	474.1	456.7	496.0	472.3	456.3	458.6	433.6	424.9	399.1	392.1	467.6	445.6
	(5.81)	(5.73)	(7.20)	(6.75)	(4.77)	(4.59)	(4.06)	(4.06)	(10.11)	(10.79)	(6.68)	(6.91)	(8.46)	(7.64)	(6.78)	(8.19)	(9.37)	(8.24)	(13.45)	(13.33)
Family characteristic																				
Test-language speaker	12.2	3.0	56.8	39.4	11.7	-0.6	13.5	10.3	43.0	31.8	50.3	49.3	61.4	41.3	89.5	70.8	47.7	35.4	48.9	47.0
	(5.61)	(5.68)	(7.25)	(6.77)	(5.57)	(4.87)	(3.99)	(3.76)	(10.08)	(10.42)	(7.02)	(7.18)	(8.80)	(7.93)	(6.58)	(7.79)	(9.41)	(8.49)	(13.63)	(13.21)
SES factors																				
Parent education																				
Postsecondary educated	†	19.5	†	1.4	†	24.2	†	15.8	†	30.0	†	14.8	†	8.7	†	23.4	†	16.8	†	15.6
	†	(2.54)	†	(3.58)	†	(3.16)	†	(2.07)	†	(3.45)	†	(2.73)	†	(3.59)	†	(3.90)	†	(4.37)	†	(3.44)
Parent occupational status																				
High occupational status	†	33.9	†	35.2	†	42.1	†	31.6	†	31.1	†	30.8	†	35.3	†	35.0	†	38.9	†	18.2
	†	(2.06)	†	(4.52)	†	(3.89)	†	(2.72)	†	(4.76)	†	(3.52)	†	(4.70)	†	(3.61)	†	(5.43)	†	(3.69)
Number of books in the home																				
More than 200 books	†	37.9	†	62.0	†	32.3	†	30.7	†	35.5	†	34.7	†	47.8	†	44.6	†	42.5	†	35.4
	†	(2.23)	†	(3.51)	†	(3.34)	†	(2.20)	†	(3.36)	†	(2.95)	†	(3.64)	†	(3.46)	†	(4.36)	†	(3.80)

See notes at end of table.

Table 4. Coefficients and standard errors from Ordinary Least Squares regression of the achievement of 15-year-old students who are test-language speakers before and after controlling for socioeconomic status (SES) characteristics: 2003—Continued

	Ireland		Italy		Netherlands		New Zealand[1]		Norway		Portugal		Spain		Sweden		Switzerland		United States	
Variables	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before		Before	After
Intercept	490.2	477.9	441.4	438.3	524.9	513.6	507.7	472.5	449.7	431.5	426.8	426.9	485.1	463.5	456.8	450.8	467.2	461.8	443.7	434.2
	(11.73)	(11.54)	(6.15)	(6.35)	(8.52)	(8.05)	(6.52)	(7.81)	(8.10)	(7.51)	(15.49)	(14.62)	(4.18)	(4.07)	(10.00)	(9.95)	(6.14)	(5.29)	(6.27)	(5.92)
Family characteristic																				
Test-language speaker	13.1	8.5	33.7	21.7	24.0	9.0	18.7	27.4	50.2	34.4	41.0	27.8	0.3	0.0	60.8	40.2	72.8	55.8	46.1	27.8
	(11.90)	(11.56)	(6.28)	(6.63)	(9.33)	(8.49)	(6.91)	(7.97)	(8.06)	(9.02)	(14.76)	(14.93)	(5.07)	(4.55)	(9.50)	(9.71)	(6.26)	(5.72)	(6.48)	(6.13)
SES factors																				
Parent education																				
Postsecondary educated	†	17.7	†	-0.8	†	15.8	†	16.7	†	16.9	†	-1.0	†	21.7	†	2.7	†	12.0	†	17.0
	†	(3.30)	†	(3.19)	†	(3.86)	†	(7.97)	†	(2.90)	†	(5.05)	†	(2.90)	†	(3.16)	†	(3.83)	†	(2.88)
Parent occupational status																				
High occupational status	†	34.6	†	32.6	†	28.7	†	38.0	†	33.1	†	54.1	†	24.8	†	39.5	†	28.7	†	37.7
	†	(3.89)	†	(4.81)	†	(3.86)	†	(3.92)	†	(3.76)	†	(4.73)	†	(4.23)	†	(3.76)	†	(4.31)	†	(3.45)
Number of books in the home																				
More than 200 books	†	29.7	†	46.3	†	49.4	†	46.8	†	40.8	†	51.2	†	47.0	†	49.5	†	51.2	†	51.1
	†	(3.74)	†	(3.78)	†	(4.41)	†	(4.05)	†	(3.27)	†	(5.80)	†	(2.89)	†	(3.44)	†	(3.73)	†	(3.39)

† Not applicable.

[1]The response rate for parent occupational status is below 85 percent.

NOTE: SES and family characteristics are based on students' reports. Students from a "two-parent family" reported living with both their mother and father. If either of a student's parents completed a postsecondary vocational qualification or a bachelor's, master's, or postgraduate degree (corresponding to the International Standard Classification of Education [ISCED] levels 5A, 5B, or 6), the student was considered as having postsecondary-educated parents. Parent occupational status is based on either of the student's parents' occupation (whichever is higher), and the variable was transformed into quarters with "high" occupational status representing the upper quarter. Standard errors are in parentheses.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

Table 5. Coefficients and standard errors from Ordinary least squares regression of the achievement of native-born 15-year-old students before and after controlling for socioeconomic status (SES) characteristics: 2003

	Australia		Austria		Belgium		Canada		Denmark		Finland		France		Germany		Greece		Iceland	
Variables	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Intercept	511.4	489.7	447.1	443.1	413.7	435.9	513.0	501.1	454.0	437.2	481.7	468.7	442.7	444.1	424.4	450.7	396.1	386.0	449.2	436.5
	(5.11)	(4.62)	(6.22)	(6.34)	(9.11)	(7.67)	(3.84)	(4.57)	(8.41)	(9.34)	(8.84)	(8.96)	(10.71)	(10.73)	(5.36)	(5.97)	(6.19)	(6.09)	(9.71)	(10.89)
Family characteristic																				
Native-born student	14.8	6.6	65.2	50.6	125.7	82.4	24.6	10.5	63.1	51.3	64.6	53.2	72.1	53.5	94.0	39.4	53.1	43.7	67.8	56.7
	(4.66)	(4.24)	(5.97)	(6.11)	(9.42)	(7.39)	(3.30)	(4.06)	(8.11)	(9.21)	(8.81)	(9.00)	(10.59)	(10.38)	(6.02)	(6.09)	(6.29)	(6.10)	(9.90)	(11.16)
SES factors																				
Parent education																				
Postsecondary educated	†	20.1	†	1.9	†	21.8	†	16.2	†	30.4	†	14.5	†	9.3	†	23.3	†	18.2	†	15.5
	†	(2.47)	†	(3.53)	†	(3.16)	†	(2.07)	†	(3.33)	†	(2.69)	†	(3.47)	†	(3.99)	†	(4.36)	†	(3.31)
Parent occupational status																				
High occupational status	†	34.2	†	34.7	†	43.6	†	31.9	†	30.9	†	30.2	†	37.0	†	37.6	†	37.0	†	17.7
	†	(2.08)	†	(4.42)	†	(3.92)	†	(2.70)	†	(4.67)	†	(3.54)	†	(4.73)	†	(3.81)	†	(5.39)	†	(3.51)
Number of books in the home																				
More than 200 books	†	38.1	†	61.3	†	30.8	†	30.6	†	34.7	†	34.2	†	47.9	†	46.6	†	40.7	†	34.7
	†	(2.14)	†	(3.46)	†	(3.04)	†	(2.16)	†	(3.24)	†	(2.98)	†	(3.64)	†	(3.46)	†	(4.36)	†	(3.74)

See notes at end of table.

Table 5. Coefficients and standard errors from Ordinary Least Squares regression of the achievement of native-born 15-year-old students before and after controlling for socioeconomic status (SES) characteristics: 2003—Continued

	Ireland		Italy		Netherlands		New Zealand[1]		Norway		Portugal		Spain		Sweden		Switzerland		United States	
Variables	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Intercept	500.7	475.2	420.6	417.8	437.9	458.6	510.8	483.1	439.9	427.1	383.7	377.5	435.9	423.6	427.4	428.1	454.2	446.0	434.8	424.3
	(13.03)	(11.63)	(7.49)	(7.31)	(10.17)	(7.79)	(4.23)	(5.59)	(8.14)	(8.76)	(17.04)	(18.40)	(10.19)	(9.51)	(8.40)	(7.97)	(5.66)	(4.33)	(6.41)	(6.48)
Family characteristic																				
Native-born student	2.2	11.0	47.2	35.7	108.9	63.9	15.0	16.0	58.2	37.6	85.4	78.1	51.3	41.3	88.0	60.7	82.5	68.7	52.9	35.3
	(13.00)	(11.39)	(7.02)	(7.08)	(10.86)	(7.66)	(4.32)	(5.43)	(8.34)	(8.87)	(16.79)	(18.39)	(9.94)	(8.90)	(8.42)	(7.61)	(5.31)	(4.56)	(5.93)	(6.25)
SES factors																				
Parent education																				
Postsecondary educated	†	17.9	†	1.5	†	15.6	†	17.3	†	17.0	†	1.8	†	22.5	†	3.6	†	12.9	†	18.3
	†	(3.30)	†	(3.06)	†	(3.69)	†	(3.93)	†	(2.95)	†	(3.92)	†	(2.87)	†	(3.20)	†	(3.27)	†	(2.83)
Parent occupational status																				
High occupational status	†	34.9	†	33.3	†	30.6	†	38.3	†	32.7	†	52.9	†	24.9	†	39.5	†	29.4	†	39.0
	†	(3.90)	†	(5.10)	†	(3.88)	†	(3.94)	†	(3.78)	†	(4.70)	†	(4.27)	†	(3.66)	†	(4.30)	†	(3.35)
Number of books in the home																				
More than 200 books	†	29.8	†	47.7	†	48.5	†	47.2	†	40.1	†	49.8	†	46.0	†	49.5	†	50.6	†	51.1
	†	(3.72)	†	(3.96)	†	(4.18)	†	(4.00)	†	(3.27)	†	(4.91)	†	(2.87)	†	(3.23)	†	(3.83)	†	(3.35)

† Not applicable.

[1]The response rate for parent occupational status is below 85 percent.

NOTE: SES and family characteristics are based on students' reports. Students were asked to report whether or not they and their parents were born in the country of assessment or in another country. The responses were then grouped into two categories: 1) native-born students (those students born in the country of assessment regardless of parent birthplace) and 2) foreign-born students (those students born outside the country of assessment and whose parents were also born outside of the country). If either of a student's parents completed a postsecondary vocational qualification or a bachelor's, master's, or postgraduate degree (corresponding to the International Standard Classification of Education [ISCED] levels 5A, 5B, or 6), the student was considered as having postsecondary-educated parents. Parent occupational status is based on either of the student's parents' occupation (whichever is higher), and the variable was transformed into quarters with "high" occupational status representing the upper quarter. Standard errors are in parentheses.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.

Table 6. Coefficients and standard errors from Ordinary Least Squares regression of the achievement of 15-year-old students from two-parent families before and after controlling for socioeconomic status (SES) characteristics: 2003

	Australia		Austria		Belgium		Canada		Denmark		Finland		France		Germany		Greece		Iceland	
Variables	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Intercept	503.8	481.8	498.7	482.2	502.4	490.4	516.4	498.1	495.9	472.5	535.7	516.1	497.5	486.6	504.1	485.3	427.9	413.0	503.3	485.1
	(3.04)	(2.52)	(3.98)	(4.26)	(3.27)	(3.27)	(2.23)	(2.55)	(3.64)	(3.80)	(2.91)	(3.13)	(3.74)	(3.70)	(5.16)	(4.79)	(5.66)	(4.72)	(2.93)	(3.20)
Family characteristic																				
Two-parent family	30.5	21.3	11.5	7.8	43.5	32.6	28.1	19.6	29.0	23.2	12.8	6.5	21.5	13.1	10.8	0.3	24.8	19.8	17.1	10.7
	(2.74)	(2.23)	(3.83)	(3.63)	(2.89)	(2.50)	(2.19)	(1.99)	(3.33)	(3.43)	(2.96)	(2.93)	(3.85)	(3.55)	(4.43)	(4.07)	(5.45)	(4.93)	(3.43)	(3.41)
SES Characteristic																				
Parent education																				
Postsecondary educated	†	19.3	†	1.0	†	23.2	†	15.0	†	29.5	†	14.4	†	9.2	†	24.0	†	13.6	†	14.8
	†	(2.54)	†	(3.64)	†	(3.24)	†	(2.06)	†	(3.46)	†	(2.71)	†	(3.53)	†	(3.97)	†	(4.37)	†	(3.42)
Parent occupational status																				
High occupational status	†	33.4	†	36.6	†	42.2	†	30.4	†	29.3	†	29.7	†	36.8	†	37.7	†	39.9	†	17.2
	†	(2.14)	†	(4.26)	†	(4.05)	†	(2.69)	†	(4.64)	†	(3.49)	†	(4.65)	†	(3.77)	†	(5.67)	†	(3.56)
Number of books in the home																				
More than 200 books	†	36.7	†	64.6	†	30.0	†	29.6	†	34.6	†	34.1	†	48.0	†	48.7	†	42.6	†	34.6
	†	(2.18)	†	(3.58)	†	(3.13)	†	(2.15)	†	(3.28)	†	(3.00)	†	(3.66)	†	(3.48)	†	(4.52)	†	(3.72)

See notes at end of table.

Table 6. Coefficients and standard errors from Ordinary Least Squares regression of the achievement of 15-year-old students from two-parent families before and after controlling for socioeconomic status (SES) characteristics: 2003—Continued

	Ireland		Italy		Netherlands		New Zealand[1]		Norway		Portugal		Spain		Sweden		Switzerland		United States	
Variables	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After	Before	After
Intercept	476.3	463.8	452.1	439.0	516.5	498.9	499.9	483.2	479.7	452.9	453.1	442.1	474.4	455.2	490.0	471.4	509.5	490.9	458.7	443.1
	(3.75)	(3.77)	(4.06)	(4.45)	(4.52)	(4.56)	(3.33)	(3.71)	(2.84)	(2.97)	(5.46)	(4.52)	(3.49)	(3.31)	(3.30)	(3.68)	(4.16)	(3.79)	(3.41)	(3.32)
Family characteristic																				
Two-parent family	33.4	28.3	18.0	17.4	34.3	26.7	38.1	24.6	25.4	17.3	16.6	14.0	13.5	10.2	30.0	20.2	23.9	21.1	45.7	29.0
	(3.77)	(3.50)	(2.95)	(2.97)	(4.44)	(3.60)	(3.44)	(4.05)	(3.03)	(3.06)	(4.33)	(3.70)	(3.26)	(3.15)	(3.42)	(3.47)	(3.50)	(3.19)	(3.07)	(2.75)
SES factors																				
Parent education																				
Postsecondary educated	†	17.5	†	0.9	†	15.3	†	16.1	†	16.5	†	-0.9	†	22.0	†	3.4	†	11.8	†	17.9
	†	(3.24)	†	(3.09)	†	(3.74)	†	(3.82)	†	(3.02)	†	(4.76)	†	(2.86)	†	(3.11)	†	(3.31)	†	(2.70)
Parent occupational status																				
High occupational status	†	33.9	†	33.3	†	30.2	†	35.6	†	32.3	†	55.4	†	24.8	†	39.1	†	32.5	†	35.2
	†	(3.80)	†	(5.01)	†	(3.66)	†	(4.01)	†	(3.70)	†	(4.89)	†	(4.28)	†	(3.86)	†	(4.13)	†	(3.39)
Number of books in the home																				
More than 200 books	†	28.2	†	48.0	†	49.2	†	44.6	†	40.0	†	50.9	†	46.4	†	51.3	†	54.0	†	47.3
	†	(3.60)	†	(3.96)	†	(4.08)	†	(3.95)	†	(3.39)	†	(5.75)	†	(2.93)	†	(3.27)	†	(3.40)	†	(3.20)

† Not applicable.

[1]The response rate for parent occupational status is below 85 percent.

NOTE: SES and family characteristics are based on students' reports. If either of a student's parents completed a postsecondary vocational qualification or a bachelor's, master's, or postgraduate degree (corresponding to the International Standard Classification of Education [ISCED] levels 5A, 5B, or 6), the student was considered as having postsecondary-educated parents. Parent occupational status is based on either of the student's parents' occupation (whichever is higher), and the variable was transformed into quarters with "high" occupational status representing the upper quarter. Standard errors are in parentheses.

SOURCE: Organization for Economic Cooperation and Development (OECD), Program for International Student Assessment (PISA), 2003.