**Fifteen-Year-Old Students’ Possession of Personal Banking Products and Their Financial Literacy in PISA 2012**

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**Introduction**

Financial literacy is a topic that has been growing in importance in the United States and other countries over the past decade. In the United States, for example, a Financial Literacy and Education Commission has developed and provided regular updates to a national strategy on financial education (FLEC 2011) and developed a national financial education website ([www.mymoney.](http://www.mymoney.)gov); and April has been designated Financial Literacy Month. It is estimated that over 50 countries are similarly developing strategies for financial education, with at least 7 of the 18 countries whose data are discussed in this brief having well-developed and advanced plans in place (OECD 2014a).

This interest in financial literacy is spurred in part by the global and national economic crises that occurred in the first decade of the 2000s and the recognition that individuals need a solid foundation of financial knowledge and skills to make sound decisions in an increasingly complex financial marketplace. However, as studies of adult populations have shown (Lin *et al*. 2016; NCEE 2005; Hilgert and Hogarth 2002), financial literacy is generally lacking, and those with low financial literacy have poorer outcomes than those with higher financial literacy—borrowing more, paying more fees, and accumulating less wealth (Lusardi and Mitchell 2009). There is a particular concern around increasing the financial literacy of young people, who will be facing decisions about their education and career paths, possibly financing their continued education, and ultimately living longer with potentially fewer welfare benefits than those in previous generations (OECD 2014a).

In this context, the Program for International Student Assessment (PISA) recently began assessing 15-year-old students in financial literacy, with questions about basic finance such as how to balance a checkbook, use a cash machine, identify different costs in a supermarket, and—importantly—understand that risk can vary with different financial choices (Schneider 2014). U.S. 15-year-olds performed similarly to the average of countries in the Organization for Economic Cooperation and Development (OECD) on this assessment (Gonzales and Kelly 2014).

This Statistics in Brief examines the results from the PISA financial literacy assessment, focusing on the extent to which young people have experience with two personal banking products (bank accounts and prepaid debit cards); the extent to which these experiences relate to their financial literacy; and the extent to which the results differ for students whose parents have different levels of educational attainment.

**Data, Measures, and Methods**

Using data for 15-year-old students from the 2012 administration of the Program for International Student Assessment (PISA), this Statistics in Brief examines cross-national differences in students’ possession of personal banking products and their financial literacy. It does so by examining the percentages of students who report they have both of two personal banking products (a bank account and a prepaid debit card); those who have a bank account only; and those who have neither, and then calculating the average financial literacy scores for students in each of these three categories.[[1]](#footnote-1) PISA defines financial literacy as the…

…knowledge and understanding of financial concepts and risks, and the skills, motivation, and confidence to apply such knowledge and understanding in order to make effective decisions across a range of financial contexts, to improve the financial well-being of individuals and society, and to enable participation in economic life. (OECD 2014a, p. 33)

To extend the analyses, students are further disaggregated by their parents’ highest level of education (as reported by their students), with comparisons between students whose parents have a bachelor’s degree or higher and those whose parents have less than a bachelor’s degree. Parents’ highest level of education is a proxy variable for students’ socio-economic status. The results thus indicate the extent to which the possession of personal banking products and average financial literacy differ by this aspect of students’ backgrounds.

Eighteen education systems, including 13 member countries of the Organization for Economic Cooperation and Development (OECD)[[2]](#footnote-2) and 5 non-member countries, participated in the PISA 2012 financial literacy assessment and are included in the analyses.

All of the analyses in this Statistics in Brief were carried out using the NCES’ PISA International Data Explorer (IDE), which is a free online tool for producing tables and doing statistical analyses with the PISA data.[[3]](#footnote-3) The score-point differences presented in the text were computed from unrounded numbers, and these may differ from computations made using the rounded whole numbers that appear in the tables. Percentage point differences were computed from rounded numbers.

Estimates were produced from cross-tabulations of the data, and *t* tests were performed in the IDE to test for differences between estimates. All of the estimates and comparisons that are discussed in this brief are statistically significant at the *p* < .05 level to ensure that they are larger than what might be expected due to sampling variation. No adjustments were made for multiple comparisons. Readers are cautioned not to make causal inferences about the data presented here. For more information, see the Technical Notes at the end of the report.

**Study Questions**

1. What percentage of students across the education systems participating in the PISA 2012 financial literacy assessment had bank accounts and prepaid debit cards?
2. How did student performance on the PISA 2012 financial literacy assessment relate to students’ possession of their own bank accounts and prepaid debit cards?
3. Did students’ possession of bank accounts and prepaid debit cards, and did their performance on the PISA 2012 financial literacy assessment, differ by their parents’ highest level of education?

**Key Findings**

* Education systems varied in 15-year-olds students’ possession of personal banking products, with the least variation seen among students who had both a bank account and a prepaid debit card and the greatest variation seen among students who had neither.Across education systems, the percentage of students who had both a bank account and a prepaid debit card ranged from 4 percent in Colombia to 27 percent in the Czech Republic; the percentage of students who only had a bank account ranged from 8 percent in Colombia to 58 percent in France; and the percentage of students who had neither ranged from 8 percent in Slovenia to 81 percent of students in Colombia.
* In the United States, 12 percent of 15-year-old students had both a bank account and a prepaid debit card; 35 percent had a bank account only; and 47 percent had neither type of personal banking product. In other words, about half have some type of personal banking product and about half do not.
* In many education systems, including the United States, students’ financial literacy was related to their possession of personal banking products. In the United States, in particular, students who had both a bank account and a prepaid debit card, as well as students with a bank account only, scored higher on the PISA 2012 financial literacy assessment than students with neither type of personal banking product. The score-point differences were 51 and 44 points, respectively, which is equivalent in both cases to over half a PISA proficiency level (about 75 points).
* In a number of education systems, including the United States, students were more likely to have one or both personal banking products when their parents had a bachelor’s degree or higher and were less likely to have either of the personal banking products when their parents had less than a bachelor’s degree. In the United States, 18 percent of students whose parents have a bachelor’s degree or higher had both a bank account and a prepaid debit card compared to 8 percent of students whose parents had less than a bachelor’s degree—or a difference of 10 percentage points. The difference in the percentage of U.S. students who had only a bank account was 21 percentage points (favoring those whose parents have a bachelor’s degree) and in those who had neither type was 27 percentage (favoring parents who had less than a bachelor’s degree).
* In a number of education systems and in all three categories of personal banking products, there were consistent differences in average financial literacy scores favoring students whose parents had a bachelor’s degree or higher. In other words, students of all personal banking experience levels scored better when their parents had a bachelor’s degree or higher. In the United States, the advantage for students whose parents had a bachelor’s degree or higher was 48 score points among students with a bank account only and 30 points among students with neither type of personal banking product. (The United States did not have sufficient data to meet reporting standards for students with both types of personal banking products.)

**Study Question 1: What percentage of students across the education systems participating in the PISA 2012 financial literacy assessments had bank accounts and prepaid debit cards?**

The first study question provides a descriptive picture of the extent to which 15-year-old students in the education systems participating in the PISA 2012 financial literacy assessment have basic personal banking products, as reported by the students . On average across the participating OECD education systems, 17 percent of students had both a bank account and a prepaid debit card, 31 percent had a bank account only, and 38 percent had neither a bank account nor a prepaid debit card (see figure 1).

Individual education systems, however, varied in 15-year-olds students’ possession of personal banking products. Across education systems, the percentage of students who had both a bank account and a prepaid debit card ranged from 4 percent in Colombia to 27 percent in the Czech Republic. In the United States, 12 percent of 15-year-old students had both types of personal banking products.

Greater variation was seen among 15-year-old students who had only a bank account, with the percentages across education systems ranging from 8 percent in Colombia to 58 percent of students in France—the only education system in which more than half the students had a bank account only. In the United States, 35 percent of students had a bank account only. In most education systems, it was more common for 15-year-old students to have a bank account only than to have a bank account and a prepaid debit card—even among education systems where relatively smaller percentages of students had bank accounts only.

The greatest variation was seen among 15-year-old students who had neither a bank account nor a prepaid debit card, with the percentages across education systems ranging from 8 percent in Slovenia to 81 percent in Colombia. In the United States, nearly half (47 percent) of students had neither a bank account nor a prepaid debit card. In eight education systems, the percentage of students with neither of the two personal banking products was 53 percent or greater: Colombia, Croatia, the Czech Republic, Israel, Italy, Poland, the Russian Federation, and the Slovak Republic. The education systems in which relatively small percentages of 15-year-old students had neither a bank account nor a prepaid debit card—that is, those systems where students’ possession of at least one personal banking product is most widespread—were Australia, the Belgium-Flemish Community, Estonia, France, New Zealand, and Slovenia. These education systems had 18 percent or fewer students with neither type of personal banking product.

[Figure 1: Percentage of 15-year-old students with various personal banking products, by education system: 2012]

**Study Question 2: How did student performance on the PISA 2012 financial literacy assessment relate to students’ possession of their own bank accounts and prepaid debit cards?**

The second study question examines whether 15-year-old students’ performance on the PISA 2012 financial literacy assessment is related to their possession of personal banking products. Generally, the data show that there is a positive relationship between students’ skills and knowledge and their possession of personal banking products, though note that some countries did not meet reporting standards in all categories.[[4]](#footnote-4)

In many education systems, 15-year-old students with both a bank account and prepaid debit card or with only a bank account scored higher, on average, on the financial literacy scale than those with neither (see figure 2). In Australia, the Belgium-Flemish Community, the Czech Republic, France, Italy, and the United States, students with both types of personal banking products scored higher than those with neither. In Australia, the Belgium-Flemish Community, Croatia, France, Israel, Italy, Shanghai-China, Spain, and the United States, students with only a bank account scored higher than those with neither.

Differences in scores between students with both personal banking products and those with neither ranged from 27 points in the Czech Republic to 71 points in the Belgium-Flemish Community. In the United States, the difference was 51 points. Differences in scores between students with a bank account only and those with neither personal banking product ranged from 16 points in Italy to 63 points in the Belgium-Flemish Community. In the United States, the difference was 44 points. (As a reference, about 75 points is the difference between each successive proficiency level on the PISA financial literacy scale.)

In Estonia, Italy, and Slovenia, 15-year-old students with both a bank account and a prepaid debit card scored higher than students with a bank account only. Italy was the only education system in which there were differences among students in all three categories, as was also the case for the OECD average. One exception to the general trends seen was Croatia, where students with both a bank account and a prepaid debit card were outscored by students with a bank account only.

Differences in scores between students with both a bank account and a prepaid debit card and those with a bank account only ranged from 20 points in Italy to 48 points in Estonia. There was no difference between the scores of students in these two categories in the United States.

[Figure 2. Average financial literacy score of 15-year-old students, by their possession of various personal banking products and education system: 2012]

**Study Question 3: Did students’ possession of bank accounts and prepaid debit cards, and did their performance on the PISA 2012 financial literacy assessment, differ by their parents’ highest level of education?**

The third study question examines whether the results from the first two study questions differ based on their parents’ highest level of education. Specifically, the analyses show the degree to which students’ possession of personal banking products, and their average financial literacy scores, are related to whether their parents have a bachelor’s degree or higher, or have less than a bachelor’s degree. Generally, the data show that the possession of personal banking products and average financial literacy scores are positively related to parents’ education level.

*Possession of Personal Banking Products*

In a number of education systems, students whose parents had a bachelor’s degree or higher were more likely to have one or both personal banking products than students whose parents had less than a bachelor’s degree. They also were less likely to have neither of the personal banking products. The analyses in this section should, however, be interpreted with caution, particularly for those education systems in which relatively large percentages of students answered “I don’t know” to either of the personal banking product questions (see appendix table 1). In these cases, it is possible that students whose parents have less than a bachelor’s degree were more likely to answer “I don’t know,” thus biasing the results (e.g., by potentially underestimating the percentages in some of the remaining categories). Such cases are footnoted where applicable in this report and the percentages across all categories are presented in appendix table 2. Nevertheless, it was important not to exclude these categories from the percentage distribution because they cannot be treated in the same manner as missing data (e.g., in the calculation of achievement scores), and because exclusion could bias the results (e.g., by potentially overestimating the percentages in some of the remaining categories).

In 10 education systems, including the United States, higher percentages of students whose parents have a bachelor’s degree or higher had both a bank account and a prepaid debit card than did students whose parents had less than a bachelor’s degree, with differences ranging from 3 percentage points in Italy to 17 percentage points in Estonia (see figure 3, panel a).[[5]](#footnote-5) In the United States, 18 percent of students whose parents have a bachelor’s degree or higher had both a bank account and a prepaid debit card compared to 8 percent of students whose parents had less than a bachelor’s degree—or a difference of 10 percentage points (table 1).

Fewer differences based on parents’ education level were found when examining the percentages of students with a bank account only—with differences seen only in the United States and three other education systems (see figure 3, panel b). The United States had the largest difference (21 percentage points) between students whose parents have a bachelor’s degree or higher and those whose parents have less than a bachelor’s degree, with differences in the other education systems ranging from 9 percentage points in Estonia to 15 percentage points in Croatia. In the United States, 47 percent of students whose parents have a bachelor’s degree or higher had a bank account only compared to 26 percent of students whose parents have less than a bachelor’s degree.

Differences based on parents’ education level were fairly prevalent when examining the percentages of students with neither a bank account nor a prepaid debit card—although the pattern was in the opposite direction (see figure 3, panel c). In nine education systems, including the United States, it was more common for students whose parents had *less* than a bachelor’s degree to have neither type of personal banking product than it was for students whose parents had a bachelor’s degree or higher. The United States had the largest difference (at 27 percentage points), with differences in the other education systems ranging from 8 percentage points in Estonia to 23 percentage points in Latvia. In the United States, 58 percent of students whose parents had less than a bachelor’s degree had neither a bank account nor a prepaid debit card compared to 31 percent of students whose parents had a bachelor’s degree or higher (table 1).

[Figure 3: Difference in percentage of 15 year-old students with various personal banking products, by parents' highest level of education and education system: 2012]

[Table 1: Percentage of 15-year-old students with various personal banking products, by parents' highest level of education and education system: 2012]

*Financial Literacy Scores*

In a number of education systems and in all three categories of personal banking products, there were consistent differences in average financial literacy scores favoring students whose parents had a bachelor’s degree or higher. In other words, students whose parents have a bachelor’s degree or higher scored higher in all personal banking product categories reported (figure 4).

In two of three education systems with sufficient data to meet reporting standards, among those students who had both a bank account and a prepaid debit card, the average financial literacy scores of students whose parents had a bachelor’s degree or higher were higher than those of students whose parents had less than a bachelor’s degree—by 59 score points in Australia and 57 score points in the Czech Republic (see figure 4, panel a).

In 7 of 10 education systems with sufficient data to meet reporting standards, among those students who have a bank account only, the average financial literacy scores of students whose parents had a bachelor’s degree or higher again were higher than those of students whose parents had less than a bachelor’s degree (see figure 4, panel b). Differences in scores ranged from 35 points in Slovenia to 51 points in New Zealand. In the United States, the average financial literacy score of students whose parents had a bachelor’s degree or higher was 547 points compared to 499 points among students whose parents had less than a bachelor’s degree, or 48 points higher (see table 2).

In 7 of 9 education systems with sufficient data to meet reporting standards, among those students who had neither a bank account nor a prepaid debit card, the average financial literacy scores of students whose parents have a bachelor’s degree or higher again were higher than those of students whose parents have less than a bachelor’s degree (see figure 4, panel c). Differences in scores ranged from 30 points in the United States to 71 score points in Israel. In the United States, the average financial literacy score of students whose parents have a bachelor’s degree or higher was 504 points compared to 473 points for students whose parents have less than a bachelor’s degree, or 30 points higher.

[Figure 4. Difference in average financial literacy scores of 15-year-old students possessing various personal banking products, by parents' highest level of education and education system: 2012]

[Table 2. Average financial literacy scores of 15 year-old students with various personal banking products, by parents' highest level of education and education system: 2012]

**Find Out More**

For questions about content or to download copies of this Statistics in Brief or view this report online, go to <http://nces.ed.gov/pubsinfo.asp?pubid=XXXXXX>.

More detailed information on PISA can be found on the NCES website. Readers may be interested in the following NCES products related to PISA:

Gonzales, P., and Kelly, D. (2014). *Financial Literacy of 15-Year-Olds: Results from PISA 2012* (NCES 2014-102). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC. <http://nces.ed.gov/pubs2014/2014102.pdf>.

Gonzales, P., and Kelly, D. (2014). *Problem-Solving Skills of 15-Year-Olds: Results from PISA 2012* (NCES 2014-103). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC. <http://nces.ed.gov/pubs2014/2014103.pdf>.

Kelly, D., Xie, H., Nord, C.W., Jenkins, F., Chan, J.Y., and Kastberg, D. (2012). *Performance of U.S. 15-Year-Old Students in Mathematics, Science, and Reading Literacy in an International Context* (NCES 2014-024). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Washington, DC. <http://nces.ed.gov/pubs2014/2014024rev.pdf>.

To access and explore PISA data, please visit the PISA International Data Explorer at <http://nces.ed.gov/surveys/international/ide/> or the NCES PISA home page at <http://nces.ed.gov/surveys/pisa/>.

**Technical Notes**

The estimates provided in this Statistics in Brief come from the 2012 administration of the Program for International Student Assessment (PISA). PISA is a cross-national study that measures 15-year-old students’ reading, mathematics, and science literacy and, in 2012, general problem solving and financial literacy. It is coordinated by the Organization for Economic Cooperation and Development (OECD), with governmental sponsors in each participating country. In the United States, PISA is sponsored by the National Center for Education Statistics (NCES).

In order to ensure comparability of the data across participating countries and education systems, OECD provided detailed international requirements on the various aspects of data collection and implemented quality control procedures. Participating countries and education systems were obliged to follow these requirements. These requirements—regarding the target population, sampling design, sample size, exclusions, and defining participation rates—are briefly described below. For more detailed information, please see OECD (2014b) and appendix A in Kelly et al. (2012).

***Target Population and Exclusions***

This Statistics in Brief only used data from PISA’s financial literacy assessment. PISA’s international desired population is 15-year-olds attending both publicly and privately controlled schools in grade 7 and higher. More specifically, the technical standards required that students in the sample be 15 years and 3 months to 16 years and 2 months at the beginning of the testing period.

PISA 2012 was designed to be as inclusive as possible, though it did provide guidelines for allowable exclusions. These guidelines allowed schools to be excluded for approved reasons (for example, schools in remote regions, very small schools, or special education schools) and students to be excluded in certain circumstances, including:

* **Students with functional disabilities.** These were students with a moderate to severe permanent physical disability such that they cannot perform in the PISA testing environment.
* **Students with intellectual disabilities.** These were students with a mental or emotional disability and who have been tested as cognitively delayed or who are considered in the professional opinion of qualified staff to be cognitively delayed such that they cannot perform in the PISA testing environment.
* **Students with insufficient language experience.** These were students who meet the three criteria of not being native speakers in the assessment language, having limited proficiency in the assessment language, and having less than 1 year of instruction in the assessment language.

Overall estimated exclusions (including both school and student exclusions) were to be under 5 percent of the PISA target population.

Across 18 participating countries and education systems, around 29,000 students completed the PISA 2012 financial literacy assessment, representing approximately nine million 15-year old students.

***Sampling Design and Sample Sizes***

It is not feasible to assess every 15-year-old student. Thus, a representative sample of students was selected from within a representative sample of schools.[[6]](#footnote-6) The sample design employed by the PISA assessment is generally referred to as a two-stage stratified systematic sample, with sampling probabilities proportional to the estimated number of 15-year-old students in the school based on grade enrollments. The first stage was a sample of schools, and the second stage was a sample of students within schools. The PISA international contractors responsible for the design and implementation of PISA internationally (hereafter referred to as the PISA consortium) drew the sample of schools for each participating country and education system.

A minimum of 4,500 students from a minimum of 150 schools was required in each participating country and education system. Following the PISA consortium guidelines, replacement schools were identified at the same time the PISA sample was selected by assigning the two schools neighboring the sampled school in the frame as replacements. The international guidelines specified that within schools, a sample of 35 students was to be selected in an equal probability sample unless fewer than 35 students age 15 were available (in which case all 15-year-old students were selected). For those countries and education systems participating in the optional financial literacy assessment samples of 43 students were required—i.e., 35 students to take the PISA main assessments and 8 students to take the financial literacy assessment. The United States sampled 50 students per school, though 8 students still took the financial literacy assessment.

***Participation Rates***

In order to minimize the potential for response biases, the OECD developed participation or response rate standards that apply to all participating countries and education systems and govern both whether or not a participating education system’s data are included in the PISA international dataset as well as the way in which national statistics are presented in the international reports.

The school response-rate target was 85 percent for all countries and education systems. This target applies in aggregate, not to each individual school. A minimum of 65 percent of schools from the original sample of schools was required to participate for an education system’s data to be included in the international database. Countries and education systems were allowed to use replacement schools (selected during the sampling process) to increase the response rate once the 65 percent benchmark had been reached. Replacement students within a school were not allowed.

The technical standards also required a minimum participation rate of 80 percent of sampled students from schools (sampled and replacement) within each education system. Follow-up sessions were required in schools where too few students participated in the originally scheduled test sessions to ensure a high overall student response rate. A student was considered to be a participant if he or she participated in the first testing session or a follow-up or makeup testing session. Data from education systems not meeting this requirement could be excluded from international reports.

***Financial Literacy Assessment Development***

PISA is a cooperative effort involving representatives from every country participating in the study. Development of the PISA 2012 financial literacy assessment was coordinated by the PISA consortium, under the guidance of a group of financial literacy experts from participating countries (OECD 2014a). The development process involved a field trial in which samples of 15-year-olds from participating countries and education systems participated. The financial literacy expert group recommended the final selection of tasks, which ensured that the tasks covered a range of difficulty, allowing for accurate measurement and description of the financial literacy competency. Given the sizable variation among OECD countries in the legislative, regulatory, and practical approaches taken to financial matters, the expert group also sought extensive input from experts and national representatives to ensure that the tasks applied equally to students from the different participating countries and education systems.

***Weighting, Scaling, and Plausible Values***

Before the data were analyzed, responses from the groups of students assessed were assigned sampling weights to ensure that their representation in the PISA results matched their actual percentage of the school population. With these sampling weights in place, the analyses of PISA data proceeded in two phases: scaling and estimation. During the scaling phase, item response theory (IRT) procedures were used to estimate the measurement characteristics of each assessment question. During the estimation phase, the results of the scaling were used to produce estimates of student achievement. Subsequent analyses related these achievement results to the background variables collected by PISA.

*Weighting*

Responses from the groups of schools and students were assigned sampling weights to adjust for over- or under-representation during the sampling of a particular group. The use of sampling weights is necessary for the computation of sound, nationally representative estimates. The weight assigned to each participating school was calculated as the reciprocal of the school’s probability of selection multiplied by the number of eligible students in the school. For replacement schools, the school base weight was set equal to the original school it replaced. The weight assigned to a student’s responses was given as the reciprocal of the probability of selection for each selected student from within a school. Weighting also adjusted for various situations (such as school and student nonresponse) because data cannot be assumed to be randomly missing. All analyses in this report using PISA 2012 data were conducted using these adjusted sampling weights.

*Scaling*

In PISA, the propensity of students to answer questions correctly was estimated with a one-parameter IRT model for dichotomous constructed-response items (Rasch 1960), and a partial credit IRT model for items with more than two categories (Masters and Wright 1997). The scale scores assigned to each student were estimated using a procedure described below (in the “Plausible values” section), with input from the IRT results. With IRT, the difficulty of each item, or item category, is deduced using information about how likely it is for students to get some items correct (or to get a higher rating on a constructed-response item) versus other items. Once the parameters of each item are determined, the ability of each student can be estimated even when different students have been administered different items. At this point in the estimation process, achievement scores are expressed in a standardized scale, with a mean of zero and a standard deviation of one. This scale was then transformed to an OECD mean of 500 and a standard deviation of 100, using the pooled, equally weighted database for OECD countries that participated in the PISA 2012 financial literacy assessment.

*Plausible values*

To keep student burden to a minimum, PISA administered a limited number of assessment items to each student—too few to produce accurate content-related scale scores for each student. To accommodate this situation, during the scaling process, plausible values were estimated to characterize students participating in the assessment, given their background characteristics. Plausible values are imputed values and not test scores for individuals in the usual sense. In fact, they are biased estimates of the proficiencies of individual students. Plausible values do, however, provide unbiased estimates of population characteristics (e.g., means and variances of demographic subgroups). They represent what the performance of an individual on the entire assessment might have been, had it been observed. Plausible values are estimated as random draws (usually five) from an empirically derived distribution of score values based on the student’s observed responses to assessment items and on background variables. Each random draw from the distribution is considered a representative value from the distribution of potential scale scores for all students in the sample who have similar characteristics and identical patterns of item responses. Differences between plausible values drawn for a single individual quantify the degree of error (the width of the spread) in the underlying distribution of possible scale scores that could have caused the observed performances.

***Sampling and Nonsampling Error and Variance Estimation***

Two broad categories of error occur in estimates generated from surveys: sampling errors and nonsampling errors.

Sampling errors occur when observations are based on samples rather than on entire populations. The standard error of a sample statistic indicates the precision of the statistic. The complex sampling design must be taken into account when calculating variance estimates such as standard errors. The approach used for calculating standard errors in PISA was the Fay method of balanced repeated replication (BRR) (Judkins 1990). The estimates in this Statistics in Brief were generated using the PISA International Data Explorer (IDE), which adjusts the variance estimation for complex sample designs.

Nonsampling errors in PISA can be attributed to several sources: information that is not complete for all respondents (e.g. some students refuse to participate or participate but answer only certain items); differences among respondents in question interpretation; the inability or unwillingness to give correct information; mistakes in recording or coding data; and other errors of collecting, processing, and imputing missing data.

***Interpreting Statistical Significance***

Comparisons of average scores and percentile cut-point scores were tested using Student’s *t* statistic. Differences between estimates were tested against the probability of a Type I error[[7]](#footnote-7) or significance level. The statistical significance of each comparison was determined by calculating the Student’s *t* value for the difference between each pair of scores and comparing the *t* value with published tables of significance levels for two-tailed hypothesis testing.

To test differences between independent estimates (e.g. average financial literacy scales between two education systems), Student’s t values were computed using the following formula:

where *E*1 and *E*2 are the estimates to be compared and se1 and se2 are their corresponding standard errors.

When comparing differences between nonindependent groups within the education system (e.g. average financial literacy scales between males and females within an education system), the following formula was used:

where E*grp1* and E*grp2* are the nonindependent group estimates being compared and se*(grp1-grp2)* is the standard error of the difference calculated using BRR, described above in the “Sampling and Nonsampling Error and Variance Estimation” section, to account for the correlation between the estimates for the two nonindependent groups.

There are some potential hazards in interpreting the results of statistical tests. First, the magnitude of the *t* statistics depends not only on observed differences between scores, but also on the number of respondents. A small difference found in a comparison across a large number of respondents would still produce a large and possibly statistically significant *t* statistic.

A second hazard stems from reliance on a sample, rather an entire population: one can conclude that a difference found in the sample is real when there is no true difference in the population. Statistical tests are designed to limit the risk of this Type 1, or “false positive,” error by setting a significance level, or alpha. An alpha level of .05 was selected for the findings in this report. It ensures that the probability of finding a false positive result is no more than 1 in 20 (.05) occurrences. However, failing to meet the significance level of .05 does not mean that there is no real difference between two quantities, only that the likelihood is less.

Thus, all differences cited in this report are statistically significant at the *p* < .05 level. No adjustments were made for multiple comparisons.

**References**

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**Appendix A: Supplemental Tables**

[insert Appendix Table 1. Percentage of 15-year-old students with various personal banking products, by education system: 2012]

[insert Appendix Table 2. Percentage of 15-year-old students with various personal banking products, by parents’ highest level of education and education system: 2012, by personal banking use (2012)]

1. In general, this brief does not describe the percentage of students with only a prepaid debit card because these percentages are relatively small. It also does not show the percentage of students who responded "I don't know" when asked if they had a bank account and if they had a prepaid debit card; it cannot be presumed that students who do not know if they have a bank account or a prepaid debit do not actually have one. Thus, the percentages of students in the categories reported in this brief will not necessarily sum to 100. Appendix table 1 provides the percentages and standard errors for students in all categories for reference. [↑](#footnote-ref-1)
2. One of the OECD member countries that participated in the PISA 2012 financial literacy assessment only administered the assessment to one of two subnational entities – the Flemish Community of Belgium. As such, the brief uses the term “education systems” in the discussion of results. [↑](#footnote-ref-2)
3. The IDE can be found at <http://nces.ed.gov/surveys/international/ide/>. [↑](#footnote-ref-3)
4. Of the 18 participating countries, the number not meet reporting standards for both a bank account and prepaid debit card was 7, for a bank account only was 5, and for neither type of product was 3. [↑](#footnote-ref-4)
5. In Estonia, 38 percent of students whose parents have less than a bachelor’s degree answered “I don’t know” to one or both of the personal banking product questions compared to 19 percent of students whose parents have a bachelor’s degree or higher (appendix table 2). There were also relatively large differences in the rates of “I don’t know” responses in Slovenia, with 22 percent of students whose parents have less than a bachelor’s degree answering “I don’t know” to one or both of the personal banking product questions compared to 14 percent of students whose parents have a bachelor’s degree or higher. The four other education systems (the Belgium-Flemish Community, New Zealand, the Russian Federation, and Shanghai-China) in which relatively large percentages of students who answered “I don’t know” (appendix table 1) had differences in percentages based on parents’ education level of 5 percentage points or less (appendix table 2). [↑](#footnote-ref-5)
6. This was true for all education systems that participated in the financial literacy assessment and most education systems that participated in the main PISA assessments. In five education systems, however—Iceland, Liechtenstein, Luxembourg, Macao-China and Qatar—all schools and all eligible students within schools were included in the sample. [↑](#footnote-ref-6)
7. A Type I error occurs when one concludes that a difference observed in a sample reflects a true difference in the population from which the sample was drawn, when no such difference is present. [↑](#footnote-ref-7)