Gender, Parental Characteristics, and Financial Knowledge of High School Students: Evidence From Multicountry Data

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This study examines the gender gap in financial literacy by using the Financial Literacy Assessment from the OECD's Programme for International Student Assessment (PISA). The analysis focuses on the influence of parents on their children's understanding of financial concepts, utilizing multilevel modeling procedures to examine variance among students, within schools, and within countries. Based on data from 18 countries, results suggest that a gender gap in financial knowledge favoring male high school students is present and that parents may influence their children's financial knowledge.

Keywords: financial knowledge, gender gap, parental influence, PISA

Individuals must learn to grasp concepts related to money and other financial matters in order to navigate today's world successfully; thus, citizens must possess a certain amount of financial literacy. The term financial literacy suggests that consumers have a basic understanding of how to use and manage money, as well as how to make use of that knowledge within the financial system that they inhabit via corresponding financial behaviors (Atkinson, McKay, Collard, & Kempson, 2007; Hung, Parker, & Yoong, 2009). Despite the growing importance placed on financial literacy, the average citizen of the world has been deemed financially illiterate (Atkinson & Messy, 2012; Lusardi & Mitchell, 2011). This finding is troubling since being financially literate is crucial to individuals and to communities in the global economy, as increased financial knowledge has been linked to better financial behaviors (Hastings, Madrian, & Skimmyhorn, 2013; Hilgert, Hogarth, Vitt, & Anderson, 2003; Lusardi & Mitchell, 2014; Robb & Woodyard, 2011).

In addition to the issue of financial illiteracy, a prominent gender gap has developed over time, whereby males tend to be more financially literate than females. This gap has been identified in adults (Atkinson & Messy, 2012; Lusardi, 2011; Organisation for Economic Co-operation and Development [OECD], 2013) and in high school students from a variety of developed countries (Becchetti, Caiazza, & Coviello, 2013; Butters, Asarta, & McCoy, 2012; Lührmann, Serra-Garcia, & Winter, 2012). It would appear that this gap could have negative effects on financial behaviors and aggregate outcomes (Atkinson & Messy, 2012; Lusardi & Mitchell, 2007, 2008; OECD, 2013).

Using the Programme for International Student Assessment (PISA) Financial Literacy Assessment, this study first examined student financial knowledge and whether or not a gender gap in financial knowledge is present at the high school level. This analysis is important given that previous research findings are inconsistent regarding whether or not a gender gap in the financial knowledge of high school students exists (Hill & Asarta, 2016; Lusardi, Mitchell, & Curto, 2010). Through the use of hierarchical linear modeling, we examined financial knowledge across the sample of students within schools and within countries to best assess the nested nature of the data and to account for unequal variances. Then, using this methodology, analyses focused on the relationships between parental characteristics and student financial knowledge overall, as well as between

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parental characteristics and the potential gender gap in student knowledge. This article adds to the growing body of literature examining the financial knowledge of high school students by focusing the analysis on a large, multicountry sample. It also adds to the existing literature by identifying potential factors that are associated with the gender gap in financial knowledge with the goal of improving the financial literacy of both male and female high school students.

Literature Review and Hypotheses

The State of Financial Literacy

A successful member of society has an understanding of his or her role as a consumer in the global economy (Danes, 1994; Ward, 1974). Through surveys and tests of financial knowledge, research has shown that adults from a variety of backgrounds and countries lack financial knowledge and are thus financially illiterate (Atkinson & Messy, 2012; Lusardi, 2011; Lusardi & Mitchell, 2011). Furthermore, high school students both in the United States and other countries have also been found to lack basic knowledge in personal finance (Becchetti et al., 2013; Borodich, Deplazes, Kardash, & Kovzik, 2010; Butters et al., 2012; Jang, Hahn, & Park, 2014; Lührmann et al., 2012; Walstad, Rebeck, & MacDonald, 2010). These studies point to a lack of financial knowledge both in adult populations around the world and in high-school aged individuals from a variety of countries.

Importance of Financial Knowledge

A lack of financial knowledge is concerning because individual financial knowledge is directly linked to individual financial behaviors. Several research studies have found positive relationships between financial knowledge and financial behaviors such as increased savings, increased wealth, and increased investments (Hastings et al., 2013; Henager & Cude, 2016; Hilgert et al., 2003; Robb & Woodyard, 2011; Xiao & O'Neill, 2016). Additionally, greater levels of financial knowledge have been linked to higher savings rates within communities and increased community participation in the stock market (Brown, Ivokvić, Smith, & Weisbenner, 2008; Lachance, 2014). Increased financial knowledge is, indeed, particularly important in many decision-making processes at both the individual and social levels (Ameriks, Leahy, & Hall, 2003; Hastings et al., 2013; Lusardi & Mitchell, 2014). Thus, attempts to increase financial knowledge should result in behavioral changes that are positive not only for individuals but also for their communities.

Gender Gap in Financial Literacy

A prominent gender gap in financial literacy among adults has been identified across the world, whereby women tend to be less financially literate than men. In the United States, for example, women have been found to be less financially literate than men on a variety of financial literacy assessments (Chen & Volpe, 2002; Lusardi et al., 2010). International studies have also identified a gender gap consistent with that of the United States (Falahati & Paim, 2011; Hung, Yoong, & Brown, 2012; Klapper, Lusardi, & Panos, 2013). At the high school level, however, the presence of a gender gap is not as well defined. Several studies performed in the United States have found that male and female students perform equally well on financial knowledge surveys (Hill & Asarta, 2016; Mandell & Klein, 2007; Tennyson & Nguyen, 2001; Walstad et al., 2010). Other studies, however, point to a prominent gender gap favoring male students (Butters et al., 2012; Lusardi et al., 2010). Internationally, some smaller scale studies conducted in a handful of countries have also identified a gender gap that favors male students (Becchetti et al., 2013; Cameron, Calderwood, Cox, Lim, & Yamaoka, 2013, 2014; Jang et al., 2014; Lührmann et al., 2012). These inconsistent findings suggest that more research is needed to determine whether the gender gap in financial knowledge is a global phenomenon as well as to identify the determinants that contribute to its presence. Interestingly, this pervasive gender gap in knowledge does not always correlate to gender differences with respect to financial decisions. Some studies have reported gender differences (Lusardi & Mitchell, 2007, 2008; OECD, 2013), while others have failed to determine whether or not a lack of financial knowledge influences gender differences in financial decisions (Ameriks et al., 2003; Atkinson & Messy, 2012; Robb & Sharpe, 2009).

Parental Influence on Financial Literacy

Research has shown that parents have the ability to influence how their children view financial matters. Children grow up learning how to be consumers and how to live in an economic world (Denhardt & Jeffress, 1971; Ward, 1974), a process known as consumer socialization. As parents interact with their children, they influence them both explicitly and implicitly, thus teaching them how to

be consumers (Jorgensen & Savla, 2010; Moschis, 1985; Ward, 1974). Children who learn financial information from their parents, even at a young age, tend to not only have more financial knowledge but also exhibit better financial behaviors later in life (Danes, 1994; Kim & Chatterjee, 2013; Koonce, Mimura, Mauldin, Rupured, & Jordan, 2008; Mimura, Koonce, Plunkett, & Pleskus, 2015). Parents can also have differing influential effects depending on the child's gender; for example, sons and daughters appear to learn differently from their parents or place differing emphasis on parental influence in financial matters (Edwards, Allen, & Hayhoe, 2007; Jorgensen & Savla, 2010; Newcomb & Rabow, 1999). Besides the direct influences that consumer socialization has on financial knowledge, many studies have also focused on indirect measures of parental influence on their children's understanding of financial concepts. For example, parental income and education have been found to be positively associated with the financial knowledge of teenagers (Jorgensen & Savla, 2010; Mandell & Klein, 2007; Tennyson & Nguyen, 2001; van Rooij, Lusardi, & Alessie, 2012).

Given the lack of financial knowledge around the world, and its direct link to financial behaviors, we first sought to examine overall student financial knowledge using the Financial Literacy Assessment from the OECD's PISA. Past research has shown mixed results regarding a gender gap in financial knowledge. Thus, our second goal was to examine whether that gender gap is present within the PISA sample. Finally, this study examined relationships between parental characteristics and student financial knowledge, as past research has indicated that parents can potentially influence their children's financial knowledge.

Method

Data

The inaugural Financial Literacy Assessment was part of the 2012 PISA, an international assessment of students' skills and knowledge in mathematics, reading, science, problem solving, and financial literacy near the end of their compulsory education. Each country participating in the 2012 PISA had the option of administering the Financial Literacy Assessment. Among the countries participating in the overall PISA, 18 countries administered the Financial Literacy Assessment to students. Among these 18 countries, 13 were members of the OECD (Australia, the Flemish Community of Belgium, the Czech Republic, Estonia, France, Israel, Italy, New Zealand, Poland, the Slovak Republic, Slovenia, Spain, and the United States). In addition to the 13 OECD member countries, a total of 5 non-member countries or economies also chose to administer the assessment (OECD, 2014a). These partner countries were: Colombia, Croatia, Latvia, the Russian Federation, and the economy of Shanghai-China.

For the countries opting into the Financial Literacy Assessment portion of PISA, a two-stage stratified sampling method was used, where schools within countries were sampled first. Then, to obtain a representative sample, each country was required to select a minimum of 150 schools. If a school was chosen to administer the 2012 PISA, the school could self-select out of the assessment and a replacement school was then selected. Once schools were included in the sample, a subsample of students from each school was chosen for the assessment as part of the second step in the two-stage stratified sampling procedure. Each school randomly selected at least 43 students; 35 students took the core assessment (reading, math, science, and problem solving), and 8 students completed the Financial Literacy Assessment. In all, 29,041 students completed the assessment in financial literacy, which is representative of a sample of approximately nine million 15-year old students from the 18 participating countries or economies (OECD, 2014a).

The Financial Literacy Assessment consisted of four 30-minute sessions involving clusters of questions from three different content areas: reading (one cluster), mathematics (one cluster), and financial literacy (two clusters). The financial literacy clusters included 40 items divided between multiple-choice and constructed-response questions. Information regarding the content of the questions is available from the OECD (2014a). To account for international differences, and to measure proficiency, student "scores" were reported as plausible value (PV) data rather than as individual scores. The PV data was transformed into a scaled score with a mean of 500 and a standard deviation of 100 (OECD, 2014a). Finally, students were required to complete a survey including questions about themselves, their families, and their home lives, as well as a short money management questionnaire focused on noncognitive aspects of financial literacy (e.g., ownership of a bank account).

TABLE 1. Sample Sizes for Schools and Students Within Countries

Country (N = 18)	Number of participating schools	Number of participating students
OECD member countries/economies		
Australia	148	248
Flemish Community (Belgium)	29	53
Czech Republic	282	541
Estonia	204	432
France	229	433
Israel	30	54
Italy	1,061	3,149
New Zealand	148	344
Poland	181	449
Slovak Republic	184	431
Slovenia	256	558
Spain	188	441
United States	153	462
Non-OECD member countries/economies		
Colombia	176	431
Croatia	190	517
Latvia	162	382
Russian Federation	167	398
Shanghai-China	176	606
Total	3,964	9,929

Due to missing data, we used a restricted sample of 9,929 students from 3,964 schools in 18 countries. Table 1 presents sample sizes for both schools and students within each country.

The sample sizes varied greatly across countries due to the fact that the Financial Literacy Assessment was optional at both the country level and the school level. For example, Italy had the largest number of participating schools at 1,061, whereas the Flemish Community of Belgium had the smallest sample at 29 participating schools. Student samples ranged from 53 students in the Flemish Community of Belgium to 3,149 students in Italy. It is important to note that the student-level finalized weight was used in all subsequent analyses presented in this article, so the differences in sample sizes were not a concern.

Variables

Parental characteristics were examined to determine their relationship with student performance. Variables used in subsequent analyses included: the student's gender (*Male)*; the mother's and father's highest level of schooling based on the International Standard Classification of Education which ranges from ISCED 1 (primary education) to ISCED 3A (completing upper secondary; *Mother's Highest Schooling, Father's Highest Schooling)*; the mother's and father's employment status (*Mother Employment, Father Employment)*; whether the student's mother or father lived in the student's household (*Mother Lives in Home, Father Lives in Home)*; how often the student discussed money matters with their parents or other adults (*Talk about Money*); whether or not the student learned to manage money in school (*Learn about Money in School*), which is used to measure the

TABLE 2. Sample Means (Standard Deviations in Parentheses)

Variable	Mean	Explanation
Student performance in Financial Literacy Assessment (Dependent Variable)	507.91 (95.22)	Average score on PISA 2012 Financial Literacy Assessment
Male	.50 (.50)	0 = Female 1 = Male
Mother's highest level of schooling (Mother's Highest Schooling)	4.31 (.92)	1 = Did not complete ISCED level 1 2 = ISCED, level 1 3 = ISCED, level 2 4 = ISCED, level 3B, 3C 5 = ISCED, level 3A
Mother's employment status (Mother Employment)	0.72 (.45)	0 = Not employed 1 = Employed
Father's highest level of schooling (Father's Highest Schooling)	4.23 (.96)	1 = Did not complete ISCED level 1 2 = ISCED, level 1 3 = ISCED, level 2 4 = ISCED, level 3B, 3C 5 = ISCED, level 3A
Father's employment status (Father Employment)	.89 (.31)	0 = Not employed 1 = Employed
Mother lives in student's household (Mother Lives in Home)	.96 (.18)	0 = No 1 = Yes
Father lives in student's household (Father Lives in Home)	.88 (.32)	0 = No 1 = Yes
How often they talk to parents or other adults about money matters (Talk about Money)	2.49 (.96)	1 = Never or hardly ever 2 = Once or twice a month 3 = Once or twice a week 4 = Almost every day
Learned to manage money in school (Learn about Money in School)	.36 (.48)	0 = No 1 = Yes
Student's socioeconomic status (ESCS)	-.003 (16.59)	Index of economic, social, and cultural status

Notes. ISCED = International Standard Classification of Education; ISCED, level 1 = primary education; ISCED, level 2 = lower secondary; ISCED, level 3A = upper secondary with access to level 5A (theoretically oriented postsecondary); ISCED, level 3B = upper secondary with access to level 5B (technically oriented postsecondary); ISCED, level 3C = upper secondary with access to level 4 (postsecondary nontertiary). For more information, see http://www.oecd.org/education/skills-beyond-school/1962350.pdf

students' opportunity to learn about financial matters; and the student's socioeconomic status (*ESCS*). Table 2 contains information about means, standard deviations, sample sizes, and variable explanations for each independent variable of interest.

In the sample, there was an equal distribution of male and female students. Mothers in the sample were, on average, more formally educated than fathers, though postsecondary education and advanced degrees are collapsed into ISCED level 3A (completing upper secondary) which may mask gender differences beyond that level of education. The data also showed that a higher percentage of fathers were employed than mothers and that less than 40% of students learned to manage money in schools. Additionally, most students reported having a mother living in their households (M = .96) and a father living in their households (M = .88).

Data Analyses

We utilized multilevel modeling to conduct the analyses presented below given the nested nature of the PISA data (Raudenbush & Bryk, 2002). Multilevel models can include both fixed and random effects to allow for shrunken and more precise estimates as well as differing results among the different levels of analysis (Clarke, Crawford, Steele, & Vignoles, 2010; Michaelowa, 2001). Due to the fact that the probabilities associated with schools and students being chosen in the sampled countries were different, the OECD included sample weights that were used in subsequent analyses (OECD, 2014a, 2014b).

Three-level multilevel models were estimated to examine differences across students within different schools and countries. This approach allowed for the determination of variance at the student, school, and country levels while still answering questions about the relationships between gender, parental characteristics, and financial knowledge. Each model took the form of an educational production function (Hanushek, 1979, 1986, 1997) as specified by Raudenbush and Bryk (2002) in a multilevel modeling framework. The student-level equation (level-1) is

$$Y_{ijk} = \pi_{0jk} + \pi_{1jk}\left(X_{ijk}\right) + \varepsilon_{ijk} \quad (1)$$

where Y_{ijk} is a measure of financial knowledge for student i in school j in country k.

π_{0jk} is the intercept for school j in country k.

X_{ijk} is a vector of independent variables at the student level (*ESCS, Learn about Money in School, Male, Mother's Highest Schooling, Mother Employment, Father's Highest Schooling, Father Employment, Mother Lives in Home, Father Lives in Home, Talk about Money)*.

π_{1jk} are the student-level fixed effects.

ε_{ijk} is the student-level random effect (or variance).

To model the school effect, the regression coefficients from the student-level equations were used as outcome variables. The school-level equations (level-2) are

$$\pi_{0jk} = \beta_{00k} + r_{0jk} \quad (2)$$

$$\pi_{1jk} = \beta_{10k} + r_{1jk} \quad (3)$$

where π_{0jk} is the intercept for school j in country k.

π_{1jk} is the slope for school j in country k.

β_{00k} is the overall mean intercept for school j in country k.

β_{10k} is the overall mean slope for school j in country k.

r_{0jk} - r_{1jk} are the school-level random effects (or variance).

Finally, to model country effects, the regression coefficients from the school-level equations were used as outcome variables. The country-level equations (level-3) are

$$\beta_{00k} = \gamma_{000} + u_{00k} \quad (4)$$

$$\beta_{10k} = \gamma_{100} + u_{10k} \quad (5)$$

where γ_{000} is the average country intercept.

γ_{100} is the average country slope.

$u_{00k} - u_{10k}$ represent the country-level random effects.

Results

Table 3 shows average performance by gender, the difference between average male and female performance, and whether or not that difference was statistically significant.

Across the entire sample of students, there existed a statistically significant difference between the average scores of males and females, indicating the presence of a gender gap favoring males. At the county level, only a few individual countries exhibited statistically significant differences in mean scores by gender. A comparison of the gender gap in OECD countries and non-OECD countries was examined for robustness, and no significant differences were found between the two groups. Of the countries who exhibited statistically significant differences in mean scores by gender, Italy, New Zealand, the United States, Colombia, and Latvia exhibited gender gaps favoring male students, and only the Slovak Republic exhibited a gender gap where female students outperformed male students. The remaining countries did not exhibit statistically significant differences between the financial knowledge of male and female students.

TABLE 3. Differences in Student Performance by Country and Gender

Country (N = 18)	Male	Female	Difference (Male - Female)
OECD member countries/economies			
Australia	540.51	542.60	-2.08
Flemish Community (Belgium)	500.37	474.91	25.47
Czech Republic	541.74	530.22	11.52
Estonia	505.29	500.73	4.56
France	542.43	528.35	14.08
Israel	508.48	519.42	-10.93
Italy	505.75	490.83	14.91***
New Zealand	483.69	475.75	7.94*
Poland	494.47	483.73	10.75
Slovak Republic	483.04	503.63	-20.60***
Slovenia	507.31	503.63	3.68
Spain	484.78	489.56	-4.78
United States	503.57	485.65	17.92*
Non-OECD member countries/economies			
Colombia	541.71	524.08	17.63*
Croatia	583.87	586.09	–2.23
Latvia	496.25	479.66	16.59***
Russian Federation	480.46	477.80	2.65
Shanghai-China	569.04	563.76	5.29
Average	515.15	508.91	6.24***

*$p < .05$. **$p < .01$. ***$p < .001$.

Model Estimates

To examine variance within the sample, an unconditional model was built within a multilevel modeling framework. Intraclass correlations (ICCs) were calculated and showed that 61.53% of the variance in student achievement occurred at the student level, while 30.50% occurred at the school level. Thus, 7.97% of the variance occurred at the country level. Table 4 presents fixed effects results for a multilevel modeling analysis of how the student's gender and parental characteristics are related to financial knowledge.

In all models, the opportunity to learn measure (*Learn about Money in School*) was not highly significant, while socioeconomic status was significantly correlated with a student's financial knowledge. Model 2 added the student's gender (*Male*) as a predictor of student performance. On average, being male was associated with a statistically significant increase in performance of approximately 12% points over female students. The model's findings were consistent with previous findings reporting that male students tend to exhibit more financial knowledge than female students (Becchetti et al., 2013; Lührmann et al., 2012).

Model 3 included additional variables to examine the possibility of parental influence being correlated with student financial knowledge. The gender gap in this model was virtually identical to that of Model 2, with male students significantly outperforming female students by 12.53% points. Additionally, all parental characteristics proved to be correlated with a student's financial knowledge in this model. Having a mother live in the student's household and a student's financial knowledge were found to be strongly associated. Yet, most students reported having a mother live in their home (mean of *Mother Lives in Home* = 0.96), so the coefficient on *Mother Lives in Home* should be modestly interpreted. The statistically significant correlations of the mother's highest level of schooling and the father's highest level of schooling are also worth noting. In this case, having a more educated mother or a more educated father was

TABLE 4. Multilevel Regression Estimates of Predictors of Financial Knowledge, Fixed Effects (Standard Errors in Parentheses)

	Model 1	Model 2	Model 3	Model 4
Intercept	505.19**** (7.00)	499.95**** (7.47)	426.43**** (11.08)	427.31**** (12.77)
ESCS	35.25**** (.94)	34.11**** (.92)	29.17**** (1.18)	29.01**** (1.18)
Learn about Money in School	3.56* (1.78)	3.73* (1.75)	3.39 (1.75)	3.26 (1.75)
Male		12.10**** (2.24)	12.53**** (2.21)	13.67 (14.06)
Mother's Highest Schooling			3.50*** (1.17)	6.61**** (1.48)
Mother Employment			6.07*** (1.97)	10.37**** (2.61)
Father's Highest Schooling			3.47*** (1.08)	.87 (1.39)
Father Employment			-7.87** (2.74)	-7.68* (3.56)
Mother Lives in Home			29.61**** (4.89)	29.16**** (7.11)
Father Lives in Home			9.72*** (2.62)	5.77 (3.46)
Talk about Money			3.44**** (.89)	2.71** (1.19)
Male*Mother's Highest Schooling				-7.35*** (2.19)
Male*Mother Employment				-7.88* (3.90)
Male*Father's Highest Schooling				6.01** (2.05)
Male*Father Employment				-1.20 (5.53)
Male*Mother Lives in Home				0.003 (9.81)
Male*Father Lives in Home				9.19 (5.25)
Male*Talk about Money				1.47 (1.78)
Percentage of level 1 variance explained	.10	.30	.31	.31
Percentage of level 2 variance explained	.23	.30	.31	.31

Random effects were also estimated and are available from the authors upon request.
$^{*}p < .10$. $^{**}p < .05$. $^{***}p < .01$. $^{****}p < .001$.

associated with higher student scores. The mother's and father's employment statuses were also correlated with their child's financial knowledge, while discussing money matters with parents or other adults revealed more of a moderate positive association with a student's financial knowledge.

Model 4 examined student gender and parental characteristics by including interaction terms. *Male* was not statistically significant. The variables for mother's highest level of schooling and employment status, having a mother live in the student's household, and discussing money with parents remained positive and significant, while the father's employment status continued to be negatively correlated with student financial knowledge. Interestingly, the father's highest level of schooling and having a father live in the household were no longer statistically significant in Model 4.

In interpreting interaction terms, the parental characteristics helped explain some of the gender gap in relation to achievement, as evidenced by the nonsignificant coefficient on the *Male* fixed effect. Additionally, we only focused on the influence of interactions if the student was male. The first significant and negative interaction was found for male students with highly educated mothers. The same influence was reversed for male students with highly educated fathers. Furthermore, the interaction between the student's gender and the mother's employment status was marginally significant, predicting that male students would not be as influenced by having a working mother as female students. Therefore, female students with working mothers were expected to have slightly more financial knowledge than male students with working mothers.

Discussion

One goal of this study was to examine student performance and gender to determine whether a global gender gap in student financial knowledge exists. In Models 2 and 3, male students significantly outperformed their female counterparts across the entire sample, a finding consistent with previous studies (Becchetti et al., 2013; Lührmann et al., 2012). Our unique contribution to the literature is the use of the largest sample of countries ever examined to analyze the gender gap in financial knowledge among high school students. It is not clear if students from certain countries contributed to the gender gap more than others, as gender was not included as a random variable by country. Subsequent research should focus on whether the student's home country has an impact on the gender gap in achievement. Given vast international differences in education, however, it is difficult to cite specific policies that could aid in closing this gap. Country-by-country analyses could aid in identifying specific policies that countries could implement to close the gender gap. Countries should aim to close any gender gaps in financial knowledge, as gender gaps in knowledge can often lead to gender gaps in financial behaviors (Lusardi & Mitchell, 2007, 2008; OECD, 2013). Ensuring men and women have similar financial knowledge will be a step in helping to ensure equitable financial outcomes for men and women.

This study also examines the gender gap in financial knowledge within the context of parental characteristics. Variables such as a mother's highest level of schooling and a father's highest level of schooling are found to be positively correlated with a student's financial knowledge, suggesting that parents, specifically mothers, may be able to influence their children's financial knowledge as well as the gender gap. Additionally, having a mother live in the student's household exhibits the strongest association with a student's financial knowledge. Though most students in the sample report having a mother live in their home, this finding could point to one of two things; that mothers influence their children's financial knowledge, or that having a mother live at home with the child has an influence on overall knowledge. Looking at a more specific potential influence that parents have on their child's financial knowledge, we find that discussing money matters at home and with other adults can influence the financial knowledge of high school students.

When examining interactions between gender and parental characteristics, we discover that parents may influence male and female students differently. Unfortunately, the parental characteristics presented in the dataset do not directly measure impact on consumer socialization. The frequency by which parents discussed money matters with their children, however, is positively correlated with financial knowledge, suggesting that perhaps parental influence on consumer socialization is an explicit process rather than an implicit one. It could thus be important to encourage parents to talk about money with their children. Past studies have shown that encouraging parents to discuss money with their children has had a positive influence on their children's financial knowledge (Grinstein-Weiss, Spader, Yeong, Taylor, & Freeze, 2011; Johnson & Sherraden, 2007; Koonce et al., 2008; Mimura et al., 2015; Van Campenhout, 2015). Programs that encourage parents to discuss financial matters with their children could help increase financial knowledge, close the gender gap, and lead to better financial outcomes for their children.

One limitation of this study is the sample size. Here, the sample of 9,929 students used for the analyses is smaller than the 29,041 students who originally completed the assessment. Due to the rotated design that was implemented to conduct the PISA Financial Literacy Assessment, this dataset contained missing data for some variables of interest, including whether or not students had any formal financial education and also, whether or not students worked. Another limitation lies within the self-reported data. Students reported all information about their parents rather than their parents reporting that information themselves. While a parent survey was distributed to the parents of the students involved in the assessment, very few parents completed them and therefore, the data could not be used in this study. Thus, detailed information about the student's home life, including household income, other adults living in the home, and additional details about the student's life could not be included in the analyses. Future work should examine more details about both the student's and the parent's financial backgrounds and home life.

The PISA Financial Literacy Assessment was the first large-scale international test of financial knowledge, and it represents an opportunity to examine questions about gender and financial knowledge around the world. This study

contributes to the growing body of literature by examining the international financial knowledge of high school students and the factors that may be related to the gender gap in financial knowledge. Our work identifies a persistent and prominent gender gap in personal finance knowledge favoring males. Efforts to address this gap should be made on a country-by-country basis, since cultural, educational, and economic conditions vary. For example, Bauer and Dahlquist (1999), Hung et al. (2012), and OECD (2013) suggest some country-specific policy considerations and polices, such as creating financial education programs specifically designed for female high school students and working to eliminate gender bias in the classroom. Additional research is needed to identify potential strategies appropriate to each context.

We are encouraged by the potential positive influence parents can have on eliminating the gender gap in financial education. As such, our findings suggest that policies targeting parents could have a trickle-down effect on their children's financial knowledge. Again, given the international nature of this study, it is difficult to suggest universal policies. However, involving parents in the process of explicitly teaching their children about financial matters could help increase student financial knowledge. Past research has shown the positive effects of encouraging financial education in homes, providing financial education in personal finance workshops, and increasing parental involvement in schools (Bruhn, de Souza Leão, Legovini, Marchetti, & Zia, 2013; Huang, Nam, & Sherraden, 2013; Van Campenhout, 2015). Overall, however, there is a need for individual countries and schools to reevaluate financial education programs to include more parental involvement (Van Campenhout, 2015). Results from the 2012 PISA Financial Literacy Assessment suggest that parents could influence their children's financial knowledge, and therefore parents should be encouraged to become more involved in financial education initiatives targeted at increasing the financial knowledge of future generations of students and citizens.

Our work is among the first to utilize the PISA Financial Literacy Assessment, allowing us to explore the presence of and contributors to the gender gap in high school financial literacy. Findings identify a gender gap favoring male high school students, confirming prior research and establishing the scale of the problem. We also note the potential parents have to shape the development of their children's financial knowledge. These findings offer important directions for future research, with the goal of launching national and international conversations about strengthening policy in the interest of creating a more financially literate world.

References

Ameriks, J., Leahy, J., & Hall, R. (2003). Wealth accumulation and the propensity to plan. *The Quarterly Journal of Economics, 118*(3), 1007–1047. doi:10.1162/00335530360698487

Atkinson, A., McKay, S., Collard, S., & Kempson, E. (2007). Levels of financial capability in the UK. *Public Money and Management, 27*(1), 29–36. doi:10.1111/j.1467-9302.2007.00552.x

Atkinson, A., & Messy, F. (2012). Measuring financial literacy: Results of the OECD/International Network of Financial Education (INFE) pilot study. *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 15. Paris: OECD Publishing.

Bauer, R. J., & Dahlquist, J. R. (1999). Recognizing and eliminating gender bias in finance education. *Financial Practice and Education, 9*(1), 83–92.

Becchetti, L., Caiazza, S., & Coviello, D. (2013, April). Financial education and investment attitudes in high schools: Evidence from a randomized experiment. *Applied Financial Economics, 23*, 817–836. doi:10.1080/09603107.2013.767977

Borodich, S., Deplazes, S., Kardash, N., & Kovzik, A. (2010). Comparative analysis of the levels of financial literacy among students in the U.S., Belarus, and Japan. *Journal of Economics and Economic Education Research, 11*(3), 71–86.

Brown, J. R., Ivković, Z., Smith, P. A., & Weisbenner, S. (2008). Neighbors matter: Causal community effects and stock market participation. *American Finance Association, 63*(3), 1509–1531. doi:10.1111/j.1540-6261.2008.01364.x

Bruhn, M., de Souza Leão, L., Legovini, A., Marchetti, R., & Zia, B. (2013). The impact of high school financial education: Experimental evidence from Brazil. *Policy Research Working Paper*, WPS 6723. Washington, DC: World Bank Group.

Butters, R. B., Asarta, C. J., & McCoy, S. (2012). Financial literacy and gender in U.S. high schools. *Journal of Economics and Finance Education, 11*(2), 142–149.

Cameron, M. P., Calderwood, R., Cox, A., Lim, S., & Yamaoka, M. (2013). Personal financial literacy among high school students in New Zealand, Japan and the United States. *Citizenship, Social and Economics Education, 12*(3), 200–215. doi:10.2304/csee.2013.12.3.200

Cameron, M. P., Calderwood, R., Cox, A., Lim, S., & Yamaoka, M. (2014). Factors associated with financial literacy among high school students in New Zealand. *International Review of Economics Education, 16*(Pt. A), 12–21. doi:10.1016/j.iree.2014.07.006

Chen, H., & Volpe, R. P. (2002). Gender differences in personal financial literacy among college students. *Financial Services Review, 11*(3), 289–307.

Clarke, P., Crawford, C., Steele, F., & Vignoles, A. F. (2010). *The choice between fixed and random effects models: Some considerations for educational research*. IZA Discussion Paper. University of Bristol, UK: Department of Economics.

Danes, S. M. (1994). Parental perceptions of children's financial socialization. *Financial Counseling and Planning, 5*(1), 127–149.

Denhardt, R. B., & Jeffress, P. W. (1971). Social learning and economic behavior: The process of economic socialization. *American Journal of Economics and Sociology, 30*(2), 113–125. doi:10.1111/j.1536-7150.1971.tb02952.x

Edwards, R., Allen, M. W., & Hayhoe, C. R. (2007). Financial attitudes and family communication about students' finances: The role of sex differences. *Communication Reports, 20*(2), 90–100. doi:10.1080/0893421070164371

Falahati, L., & Paim, L. (2011). Gender differences in financial well-being among college students. *Australian Journal of Basic and Applied Sciences, 5*(9), 1765–1776.

Grinstein-Weiss, M., Spader, J., Yeong, H. Y., Taylor, A., & Freeze, E. B. (2011). Parental transfer of financial knowledge and later credit outcomes among low- and moderate-income homeowners. *Children and Youth Services Review, 33*(1), 78–85. doi:10.1016/j.childyouth.2010.08.015

Hanushek, E. A. (1979). Conceptual and empirical issues in the estimation of educational production functions. *The Journal of Human Resources, 14*(3), 351–388. doi:10.2307/145575

Hanushek, E. A. (1986). The economics of schooling: Production and efficiency in public schools. *Journal of Economic Literature, 24*(3), 1141–1177.

Hanushek, E. A. (1997). Assessing the effects of school resources on student performance: An update. *Educational Evaluation and Policy Analysis, 19*(2), 141–164. doi:10.3102/01623737019002141

Hastings, J. S., Madrian, B. C., & Skimmyhorn, W. L. (2013). Financial literacy, financial education, and economic outcomes. *Annual Review of Economics, 5*(1), 347–373. doi:10.1146/annurev-economics-082312-125807

Henager, R., & Cude, B. (2016). Financial literacy and long- and short-term financial behavior in different age groups. *Journal of Financial Counseling and Planning, 27*(1), 3–19. doi:10.1891/1052-3073.27.1.3

Hilgert, M. A., Hogarth, J. M., Vitt, L. A., & Anderson, C. (2003, July). Household financial management: The connection between knowledge and behavior. *Federal Reserve Bulletin,* 309–322.

Hill, A. T., & Asarta, C. J. (2016). Gender and student achievement in personal finance: Evidence from *Keys to Financial Success*. In C. Aprea, K. Breuer, P. Davies, B. Fuhrmann, N. K. Koh, J. S. Lopus, & E. Wuttke (Eds.), *International handbook of financial literacy*. Singapore: Springer Publishing.

Huang, J., Nam, Y., & Sherraden, M. S. (2013). Financial knowledge and child development account policy: A rest of financial capability. *Journal of Consumer Affairs, 47*(1), 1–26. doi:10.1111/joca.12000

Hung, A., Parker, A., & Yoong, J. (2009). Defining and measuring financial literacy. *RAND Corporation Working Papers*, No. 708. Santa Monica, CA: RAND Corporation.

Hung, A., Yoong, J., & Brown, E. (2012). Empowering women through financial awareness and education. *OECD Working Papers on Finance, Insurance and Private Pensions*, No. 14. Paris: OECD Publishing.

Jang, K., Hahn, J., & Park, H. J. (2014). Comparison of financial literacy between Korean and U.S. high school students. *International Review of Economics Education, 16*(Pt. A), 22–38.

Johnson, E., & Sherraden, M. (2007). From financial literacy to financial capability among youth. *Journal of Sociology & Social Welfare, 34*(3), 119–145.

Jorgensen, B. L., & Savla, J. (2010). Financial literacy of young adults: The importance of parental socialization. *Family Relations, 59*(4), 465–478. doi:10.1111/j.1741-3729.2010.00616.x

Kim, J., & Chatterjee, S. (2013). Childhood financial socialization and young adults' financial management. *Journal of Financial Counseling and Planning, 24*(1), 61–79.

Klapper, L., Lusardi, A., & Panos, G. A. (2013). Financial literacy and its consequences: Evidence from Russia during the financial crisis. *Journal of Banking & Finance, 37*(10), 3904–3923. doi:10.1016/j.jbankfin.2013.07.014

Koonce, J., Mimura, Y., Mauldin, T., Rupured, A. M., & Jordan, J. (2008). Financial information: Is it related to savings and investing knowledge and financial behavior of teenagers? *Journal of Financial Counseling and Planning, 19*(2), 19–28.

Lachance, M. (2014). Financial literacy and neighborhood effects. *Journal of Consumer Affairs, 48*(2), 251–273. doi:10.1111/joca.12024

Lührmann, M., Serra-Garcia, M., & Winter, J. (2012). The effects of financial literacy training: Evidence from a field experiment with German high-school children. *Documento De Trabajo De La Universidad De Munich, 2012-24*. https://epub.ub.uni-muenchen.de/14101/

Lusardi, A. (2011). *Americans' financial capability. National Bureau of Economic Research Working Paper Series, No. 17103*. https://www.nber.org/papers/w17103.pd

Lusardi, A., & Mitchell, O. S. (2007). Financial literacy and retirement preparedness: Evidence and implications for financial education. *Business Economics, 42*(1), 35–44. doi:10.2145/20070104

Lusardi, A., & Mitchell, O. S. (2008). Planning and financial literacy: How do women fare? *American Economic Review, 98*(2), 413–417. doi:10.1257/aer.98.2.413

Lusardi, A., & Mitchell, O. S. (2011). Financial literacy around the world: An overview. *Journal of Pension Economics and Finance, 10*(4), 497–508. doi:10.1017/S1474747211000448

Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of Economic Literature, 52*(1), 5–44. doi:10.1257/jel.52.1

Lusardi, A., Mitchell, O. S., & Curto, V. (2010). Financial literacy among the young. *Journal of Consumer Affairs, 44*(2), 358–380. doi:10.1111/j.1745-6606.2010.01173.x

Mandell, L., & Klein, L. S. (2007). Motivation and financial literacy. *Financial Services Review, 16*(2), 63–81.

Michaelowa, K. (2001). Primary education quality in francophone Sub-Saharan Africa: Determinants of learning achievement and efficiency considerations. *World Development, 29*(10), 1699–1716. doi:10.1016/S0305-750X(01)00061-4

Mimura, Y., Koonce, J., Plunkett, S., & Pleskus, L. (2015). Financial information source, knowledge, and practices of college students from diverse backgrounds. *Journal of Financial Counseling and Planning, 26*(1), 63–78. doi:10.1891/1052-3073.26.1.63

Moschis, G. P. (1985). The role of family communication in consumer socialization of children and adolescents. *Journal of Consumer Research, 11*(4), 898–913. doi:10.1086/209025

Newcomb, M. D., & Rabow, J. (1999). Gender, socialization, and money. *Journal of Applied Social Psychology, 29*(4), 852–869. doi:10.1111/j.1559-1816.1999.tb02029.x

Organisation for Economic Co-operation and Development. (2013). *Women and financial education: Evidence, policy responses and guidance*. Paris: Author.

Organisation for Economic Co-operation and Development. (2014a). *PISA 2012 results: Students and money (volume VI) financial literacy skills for the 21st century*. Paris: Author.

Organisation for Economic Co-operation and Development. (2014b). *PISA 2012 technical report*. Paris: Author.

Raudenbush, S., & Bryk, A. (2002). *Hierarchical linear models: Applications and data analysis methods*. Thousand Oaks, CA: Sage.

Robb, C. A., & Sharpe, D. L. (2009). Effect of personal financial knowledge on college students' credit card behavior. *Journal of Financial Counseling and Planning, 20*(1), 25–43.

Robb, C. A., & Woodyard, A. (2011). Financial knowledge and best practice behavior. *Journal of Financial Counseling and Planning, 22*(1), 60–70.

Tennyson, S., & Nguyen, C. (2001). State curriculum mandates and student knowledge of personal finance. *Journal of Consumer Affairs, 35*(2), 241–262. doi:10.1111/j.1745-6606.2001.tb00112.x

Van Campenhout, G. (2015). Revaluing the role of parents as financial socialization agents in youth financial

literacy programs. *The Journal of Consumer Affairs, 49*(1), 186–222. doi:10.1111/joca.12064

van Rooij, M. C. J., Lusardi, A., & Alessie, R. J. M. (2012). Financial literacy, retirement planning and household wealth. *The Economic Journal, 122*(560), 449–478. doi:10.1111/j.1468-0297.2012.02501.x

Walstad, W. B., Rebeck, K., & MacDonald, R. A. (2010). The effects of financial education on the financial knowledge of high school students. *Journal of Consumer Affairs, 44*(2), 336–357. doi:10.1111/j.1745-6606.2010.01172.x

Ward, S. (1974). Consumer socialization. *Journal of Consumer Research, 1*(2), 1–14. doi:10.1086/208584

Xiao, J. J., & O'Neill, B. (2016). Consumer financial education and financial capability. *International Journal of Consumer Studies, 40*(6), 712–721. doi:10.1111/ijcs.12285

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