The Value of Financial Education
: Who Would Benefit the Most in the Long Run?

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ABSTRACT

This study analyzes the long-term influence of early financial education on financial literacy and financial behaviors in adulthood. We collect the data from the responses from the national survey conducted by the Financial Education Steering Committee (FESC) in Singapore during the period of May to July 2018. We find that early financial education has a significantly positive impact on financial literacy and behaviors of females when they reach adulthood. Actual attendance to financial education is requisite for improved financial literacy and behaviors as no significant relationship between imaginary attendance and financial literacy and behaviors exist. Our study contributes to two streams of the literature - one on financial education, literacy and behaviors and another on the women's opportunities in the workplace - by finding the long-term effect of early education on financial capabilities of women, which can help to promote gender diversity in the workplace and society.

Keywords: female, financial behavior, financial education, financial literacy

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1. Introduction

If a person received financial education as a child, would it improve financial decision making when he or she reaches adulthood? From when do people need financial education? Which group would benefit the most from financial literacy in the long run? This study answers such significant questions firstly in the literature using a unique experimental setting in Singapore. How financial literacy affects and varies among different groups of people has been an important topic in literature (Alcon, 1999; Bernheim and Garrett, 2003; Lusardi et al., 2010; Lusardi and Mitchell, 2004; Lusardi and Mitchell, 2014). Most of the studies use surveys, whereas few use regressions to find causality among financial education, literacy and/or behaviors (Hastings et al., 2013; Hung et al., 2011; Huston, 2010; Lusardi and Mitchell, 2014). Furthermore, most findings are largely disconnected and pertaining to a narrow window of time. Our study extends the literature by finding the long-term effect of early financial education on financial literacy and behaviors in adulthood. We use a sample of the population from Singapore that had received financial education in primary and/or secondary school and responded to the survey questionnaire when they reached adulthood. Our findings indicate that early financial education is beneficial especially for females who often display the lower level of financial knowledge and behaviors than man (Alcon, 1999; Fonseca et al., 2010; Lusardi and Mitchell, 2014) albeit the growing importance of their role in the workplace (Abdullah et al., 2016; Blum et al., 1994; Chapman, 1975; Cook & Glass, 2014; Hastings et al., 2013; Ragins et al., 1998).

Why does financial literacy matter? Individuals face many diverse, yet challenging choices with regard to financial decision making. For example, the government or employers decided how to invest pension funds for their employees in the past while individuals should make portfolio decisions by themselves today (Cole et al., 2013). The kinds and complexity of the financial

products are increasing at a rapid pace, widening the gap between the required amount of knowledge in making economic decisions and actual financial literacy of the ordinary people who are subject to various behavioral biases (Baker and Nofsinger, 2010; Bailey and Ng, 2011; Benartzi and Thaler, 1995; Moore and Healy, 2008; Nofsinger and Sias, 1999; Oechssler *et al*., 2009; Shumway, 2005; Weber and Camerer, 1998). As a result, financial illiteracy incurs significant costs (Lusardi and de Bassa Scheresberg, 2013; Lusardi and Tulfano, 2015) and hinders efficient economic participation (e.g. The Programme for International Student Assessment (PISA)[1]; Lusardi and Mitchell, 2014).

Our study contributes to a growing literature on financial literacy as follows. First, it yields female-focused implications for the impact of financial education on both financial literacy and behaviors. While the differences between females and males regarding their financial literacy or behaviors have been reported in the past (Alcon, 1999; Fonseca et al., 2010; Lusardi and Mitchell, 2014), how the effect of early education varies depending on the gender has not been addressed. Addressing this issue can provide guidance for the policy makers who seek to improve social welfare by promoting gender diversity as well as financial literacy and capabilities of the ordinary people. Second, we examine the long-term effect of early financial education on both financial literacy and behaviors. It fills the crucial gap in literature, most of which focus on the immediate effect of financial education (Bernheim et al., 2001a,b; Bruhn et al., 2016; Lusardi and Mitchell, 2007; Lusardi and Mitchell 2009; Lusardi and Mitchell, 2011a). In doing so, we address the distinction between education and information acquisition that is often confused and thus obscures the implications of the findings in prior studies (Fernandes et al., 2013). More importantly, we

[1] PISA is launched by the Organization for Economic Co-operation and Development (OECD) and assesses the financial knowledge of 15-year-old students around the world.

alleviate the issue of endogeneity by finding a long-term relationship. Third, we run additional tests to measure the placebo effect in order to distinguish the effect of the respondents' actual attendance to financial education in earlier school years from that of imaginary attendance. The results show that those who believe that they have attended financial education in primary and/or secondary school, but have not indeed, show no improvement in financial literacy or behaviors in adulthood while those who have actually attended show significant improvement in both. Lastly, our study links the two separate yet major streams of the literature - one on financial education, literacy and behaviors and another on the role and capability development of women in the workplace - by finding the effect of proper education on financial capabilities of women. Simply put, early financial education can contribute to enhancing women's status in the workplace where such skills are required. We believe that the improved perception of women's financial abilities can help promote the gender diversity in the workplace and society in the long-run.

The paper proceeds as follows. Section II reviews the existing literature. Section III explains the data and methods employed for the empirical research. Section IV discusses the empirical results. Section V discusses the implications of the empirical findings. Section VI concludes.

2. Literature review

2.1 Previous literature on financial education, literacy and/or behaviors

The literature on financial education traces back to as early as the mid-80s. The importance of early education has been highlighted in multiple accounts, suggesting that early education helps to improve economic understanding of the citizens (Buckles and Freeman, 1984; Hansen, 1985). Furthermore, prior studies test various sub-samples of the population, such as the young, retirees,

and women, and find the effect of financial education, which is often measured by financial literacy (Berheim and Garrett, 2003; Bernheim et al., 2001b, Lusardi and Mitchell, 2007; Lusardi and Mitchell, 2009; Lusardi and Mitchell, 2010; Lusardi and Mitchell, 2011a; Lusardi and Mitchell, 2011b; Lusardi and Mitchell, 2014; Lusardi et al., 2011). For example, people at the workplace or retirees commonly are found financially illiterate and poorly prepared for life after retirement (Berheim and Garrett, 2003; Bernheim et al., 2001b; Lusardi and Mitchell, 2007; Lusardi and Mitchell, 2011a; Lusardi et al., 2011). In addition, females and people under 36 are least financially literate across the countries like the United States, Germany, Netherlands, and Switzerland (Lusardi and Mitchell, 2014). At the household level, there is a crucial gap in the level of financial knowledge between spouses, which is mitigated only when necessary such as just before the death of a male spouse (Hsu, 2011).

The lack of financial education also results in significant costs that would have been unnecessary otherwise (Lusardi and Tufano, 2009) while, on the contrary, financial education provides the ordinary people with benefits in making economic decisions (Abreu and Mendes, 2010; Cole and Shastry, 2014). Delavande, Rohwedder, and Willis (2008) present a simple two-period model for savings and portfolio allocation between bonds and equities to posit that individuals acquire financial knowledge to gain access to higher-return assets by seeking external help or self-education. The importance of early financial education with regard to savings and budgeting is also highlighted among students (Bruhn et al., 2016). Most of the literature on this topic yields implications for policy makers from the findings on the core assumption that financial illiteracy likely leads to poor judgement with regard to the management of personal financial portfolios, thereby hindering the well-being of the ordinary people, an essential element for a healthy society.

2.2 Linking two separate streams of the literature

In the meantime, there is another body of literature that shed light on the differences in the status of males and females in the management or board of directors at firms (Abdullah et al., 2016; Blum et al., 1994, Chapman, 1975; Cook and Glass, 2013; Ragins et al., 1998). Our study extends such literature by suggesting that early education can play a crucial role in narrowing the gap between the status of males and females at such firms. According to our findings, early financial education can empower women financially, thereby increasing the likelihood of enhancing their positions in the workplace and society especially where such skills are required. Therefore, our study shall link the two separate, yet major streams of the literature, one on the importance of financial education and another on women's role in the workplace, thereby enhancing the depth and breadth of the research on the topic of gender diversity.

2.3 Common methods employed in the past literature

On the research method, we acknowledge that conducting surveys and analyzing responses to survey questionnaires are a daunting work per se; however, finding causal relationships advances the literature to a different level especially on the topic of financial education, literacy and behaviors. In fact, statistical analysis and causal relationships are rarely found on this topic (Hastings et al., 2013; Hung et al., 2011; Huston, 2010; Lusardi and Mitchell, 2014). One of the reasons may be related to the problem of endogeneity that this kind of empirical research usually entails. In this regard, our study examines the long-term effect of financial education on financial literacy and behaviors, alleviating such a concern.

3. Data and method

3.1 MoneySENSE

On October 16, 2003, the Singapore Government launched a national financial education program called MoneySENSE, spearheaded by the Financial Education Steering Committee (FESC), which is chaired by the Monetary Authority of Singapore (MAS) and comprises several public agents and government ministries. The purpose was to provide financial education for individual citizens and to ultimately enhance their basic financial literacy and capabilities in making prudent investment decisions and lifetime financial plans. Thanks to this program, the primary and secondary schools in Singapore have been providing financial education to their students since then. Despite the expectation that such a governmental initiation would enhance the overall financial literacy and behaviors of the citizens, the research on its long-term effect has yet to be conducted. Therefore, we collect the data accumulated for years at MAS to conduct empirical research and find the long-term relationship between early financial education and financial literacy as well as financial behaviors.

3.2 Measuring financial literacy and behaviors

To measure financial literacy and behaviors, we collect data from the responses to the survey that was conducted by FESC on the individuals who had received education from MoneySENSE in primary and/or secondary school. The survey questionnaire[2] contains a total of twenty eight questions, as detailed in Appendix I, that are divided into the following six categories:

[2] The original questions were adopted from the National Financial Capability Study (NFCS) test that is commissioned by the Financial Industry Regulatory Authority (FINRA) Investor Education Foundation in consultation with the U.S Treasury Department and President's Advisory Council of Financial Literacy. It examines the indicators of financial literacy and behaviors as well as demographics of the respondents and has been verified in its usefulness by a number of previous studies that examine financial literacy or behaviors (Lusardi 2007; Lusardi et al. 2011; Parker et al. 2012; Behrman et al., 2012; Gustman et al., 2012; Abreu and Mendes, 2010).

(1) Financial Literacy Test, (2) Tier 1 Basic Money Management (savings and budgeting), (3) Tier 2 Financial Planning, (4) Tier 3 Investment Know-How, (5) Housing, and (6) Demographics. Of the twenty eight questions, the first six questions are designed to measure financial literacy of the respondents, asking whether they understand the fundamental concepts in economics and finance using the examples of everyday transactions. A survey respondent receives one mark for each correct answer, so the value of the variables that cover Financial Literacy Test ranges from 0 to 6 since there are six questions in total. The rest of the questions in the survey questionnaire are yes or no questions or multiple choice questions that measure the respondents' financial behaviors and demographics.

To measure financial behaviors, we create five variables such as *Stock, Insurance, Coverage, Care* and *Savings* (*see* Table 1 for description). Of the five variables, three variables, *Insurance*, *Coverage* and *Care,* are related to the respondents' activities regarding insurance plans. These variables are related to the additional questions formulated by FESC and reflect the financial environment that is unique to the Singaporeans. The Life Insurance Association of Singapore, in fact, reports a total of S$154 million in health insurance premiums for the first quarter of 2017, highlighting the role of insurance plans in financial planning for the lives of the Singaporeans. For example, *MediShield Life* is the basic healthcare plan administered by the Central Provident Fund (CPF) board to help the ordinary citizens to pay their burdensome hospital bills. However, its coverage is pegged to the expected treatment cost in Class B2 or C wards in public hospitals and its stringent guidelines often result in claims being rejected due to the increasing life expectancy in Singapore. Complementing such limitations, *Private Integrated Shield Plans* cover the additional costs for being hospitalized both in public and private hospitals. Unlike *MediShield Life*, however, the premiums for *Integrated Shield Plans* cannot be fully financed using *MediSave*,

which is a national medical savings scheme in Singapore. It was introduced in 1984 to help individuals to save a portion of their income in a medical-focused savings account to meet future hospital bills.

Finally, we create various additional variables that reflect the respondents' family background, occupation, education, current age, marital status and income. The relevant data are obtained from the responses to the last part of the survey questionnaire. Table 1 presents the description of the variables used in the empirical tests in the study.

[Insert Table 1 about here]

4. Empirical results

4.1 Sample characteristics

Table 2 reports the summary of statistics of the sample collected during the period of May to July 2018. Of the 903 respondents, 502 have received financial education in primary and/or secondary school while 401 have not. Therefore, we divide the group into a control and treatment group accordingly, which enables us to conduct additional tests for the placebo effect for robustness (*see* Table 6 and Table 7).

[Insert Table 2 about here]

In Panel A of Table 2, the sample is evenly divided between men and women, who account for 51.7% and 48.3% of the sample, respectively, and also between married and not married, who account for 52.8% and 47.2% of the sample, respectively. Considering the fact that the mainstream

literature analyzes financial literacy or behaviors of the older population who are 50 or older, the average age of 30 is relatively young. This is attributable to the fact that the survey has been conducted only after about a decade from their primary and/or secondary school years.

Panel B of Table 2 presents the correlation matrix of all variables used in the study. All of the variables show fairly low correlations to one another, except for *Insurance* and *Savings*. The correlation coefficient of 0.742 for the two variables indicates that those who tend to save more also tend to buy more insurance products and vice versa. It makes good sense since the act of buying insurance is interpreted as financially preparing for the future uncertainty at the current stage, which can also be achieved through savings. Despite possibly the same reason for the respondents to use both savings and insurance products, we include both variables in the empirical tests because they measure different kinds of financial behaviors of the respondents in the financial market.

4.2 Difference-in-difference estimates

Table 3 reports the difference-in-difference estimates measuring the effect of early financial education on financial literacy and behaviors in adulthood between the treatment and control group, each of which are again divided into two sub-groups by gender. The treatment group represents those who have received financial education in primary and/or secondary school while the control group represents those who haven't.

[Insert Table 3 about here]

Overall, the results indicate significant differences among females and males of the two groups across all measured categories. Specifically, the level of financial literacy shows the biggest difference with the t-value of 5.18, indicating females who have received early financial education show the most improvement in financial literacy when they reach adulthood. Among the variables that measure each category of financial behaviors, females who have received early education show the most improvement in *Insurance* with the t-value of 4.13, indicating the increased tendency to purchase insurance products after the education. In addition, females that have received financial education earlier show higher likelihood of participating in the stock market (t-value of 2.20), understanding details of their insurance plans (t-value of 3.63) and saving (t-value of 2.57).

4.3 The long-term effect of financial education on financial literacy and behaviors

Figure 1 presents an illustration of the effect of financial education on financial literacy of men and women simultaneously.

[Insert Figure 1 about here]

Clearly, financial education is only effective for women compared to men who display no significant improvement in the level of financial knowledge after education.

To analyze the effect of education on financial literacy, Table 4 reports regression results for the long-term effect of financial education on financial literacy for females while introducing the interaction variable, *Female x Education*. The dependent variables represent the level of the respondents' overall financial literacy as well as of their knowledge in six different categories used

to measure financial literacy. The six questions that are included in the survey questionnaire specifically ask for their knowledge in the general interest rate (Q1), inflation (Q2), bond pricing (Q3), mortgage payment (Q4), portfolio diversification (Q5) and compounding effect of interest rates on loans (Q6).

Furthermore, one may have gained financial knowledge outside MoneySENSE such as from their own parents who work in the related field or from their own jobs; thus, we include a number of control variables such as *Education, Background, Job, Employment, Higher Education, Current Age, Married* and *Income*.

[Insert Table 4 about here]

In column (1) of Table 4, *Female x Education* shows a positive coefficient of 0.572 with a statistical significance at the 1% level, while *Female* or *Education* variable alone shows negative and statistically significant coefficients of -0.446 and -0.268, respectively. Such results indicate that females who are generally less financially literate than men show significantly higher financial literacy once they have acquired financial education in the early stage of their lives. *Education* alone is also negatively related to financial literacy with statistical significance at the 1% level, indicating that the positive effect of education only exists when concerning females. Specifically, the effects of education for males and to females are shown in the coefficients of -0.268 and 0.304, respectively. Although we can explain why the effect is positive and stronger for females, it is puzzling why the effect is significantly negative for males. We leave this question to future studies.

Moreover, of the six categories, early financial education is the most effective in increasing the knowledge of the compounding effect of interest rates on loans (coefficient of 0.255), portfolio

diversification (coefficient of 0.208) and mortgage payment (coefficient of 0.200), all of which show positive coefficients with the statistical significance at the 1% level. Early financial education does not seem to affect the level of knowledge for females with regard to Q1 and Q3, the general knowledge in interest rates and bond pricing, respectively.

In terms of other variables, only *Age* shows no relationship with any of the dependent variables, indicating that the age when taking the literacy test does not affect the results. This is in sharp contrast to the previous finding that financial knowledge decays as time passes after respondents receive financial education (Fernandes et al., 2013). Lastly, the marital status positively affects financial literacy with regard to mortgage payment and the compounding effect of interest rates on loans. In previous literature, the marital status is also found to increase financial literacy especially in women (Hsu, 2011, Lusardi and Mitchell, 2008; Fonseca et al., 2010, Zissimopoulos et al., 2013).

Furthermore, we examine the effect of financial education on financial behaviors for different genders and Figure 2 illustrates the outcomes.

[Insert Figure 2 about here]

To varying degrees, the outcomes regarding all five variables, such as stock market participation (*Stock*), number of insurance plans owned (*Insurance*), knowledge of the ownership of insurance plans (*Coverage*) and details of the products (*Care*) and savings through insurance products (*Savings*) in Figure 3 strongly confirm the following statement. Men generally display more advanced financial behaviors than women before education; however, women display enhanced behaviors in all categories of financial behaviors in the test after receiving early

financial education. The measured financial behaviors proxied for by *Savings* and *Care* even deteriorate for men after receiving financial education.

Table 5 reports regression results for the long-term effect of early financial education on financial behaviors. The same five dependent variables cover the broad range of financial behaviors as in Figure 2.

[Insert Table 5 about here]

The coefficients for *Female x Education* across all five dependent variables that measure financial behaviors are positive and statistically significant, indicating that early financial education positively and significantly affects financial behaviors of females when they reach adulthood. Such a finding is invaluable since *Female* alone is negatively related to the same variables that are used to measure financial behaviors. It indicates that the financial behaviors of adult females significantly differ depending on the early acquisition of the relevant knowledge.

Among the control variables, *Income* is positively related to financial behaviors, indicating that higher income earners tend to display advanced financial behaviors and participate more in economic activities than lower income earners. Lastly, the marital status is related to enhanced financial behaviors in adulthood as shown in the positive and statistically significant coefficients of *Married* throughout all specifications except for *Coverage*. This may be attributable to the fact that people become more financially considerate and responsible after getting married regardless of their prior education or knowledge in finance (Hsu, 2011, Lusardi and Mitchell, 2008; Fonseca et al., 2010, Zissimopoulos et al., 2013).

4.4 The placebo effect - robustness

We run two additional tests for robustness to distinguish the effect of the respondents' actual attendance to financial education in primary and/or secondary school from that of imaginary attendance. By using the evenly divided sample between the treatment and control group, the results in Table 4 and 5 present the estimates of the actual attendance while the results in Table 6 and 7 present the estimates of the pseudo attendance. The variable, *p.Education*, represents the imaginary attendance of the respondents who have falsely answered "yes" on the question that asked for their attendance although they did not attend any such education in primary and/or secondary school. Results in Table 4 are comparable to those in Table 6 while results in Table 5 are comparable to those in Table 7.

[Insert Table 6 and 7 about here]

In the first column of Table 6, the interaction term, *Female x p.Education*, has a coefficient of -0.365 with little statistical significance. This indicates that females who have not actually received financial education do not show meaningful improvement in financial literacy when they reach adulthood. Such results are in sharp contrast to those found in the first column of Table 4 where *Female x Education* shows a statistically significant coefficient with regard to *Financial Literacy* that measures the overall financial literacy of the respondents. Likewise, *Female x p.Education* in Table 7 is only marginally related to the five dependent variables whereas *Female x Education* in Table 5 shows positive and statistically significant relationships with the same five variables that measure financial behaviors. Such results from additional tests on the placebo effect strongly suggest that the effect of financial education on both financial literacy and behaviors for

women are real and causal and only exists when they actually receive education in early school years. The results contradict the findings from Allgood and Walstad (2016) who argue that perceived financial literacy is almost as effective as actual literacy on financial behaviors; however, they measure the relation between financial literacy and behaviors, not the effect of early financial education on both terms.

5. Discussion

5.1 Implications and generalization

The empirical results overall suggest that early financial education is effective especially for females. Conforming to the findings of the previous studies, our test results show that females are less financially literate than males before education is administered. However, when financial education is administered, the outcome is reversed. Specifically, early financial education is effective for females to better comprehend the compounding effect of interest rates on loans, portfolio diversification and mortgage payment when they reach adulthood. Although our results are drawn from the analysis of the responses from the Singaporeans, since financial illiteracy among females is broadly found in literature (Alcon, 1999; Fonseca et al., 2010; Lusardi and Mitchell, 2014), we believe that the effect of early financial education shall be applicable to a broader setting, and possibly more salient in emerging markets (Banerjee and Duflo, 2011). Furthermore, according to our findings, the effect of early financial education is strongly evident in the enhanced financial behaviors of females as shown in their increased stock market participation, insurance activities, and savings. Such findings not only confirm the previous findings that highlight the controversy over women's (relative) financial illiteracy, but also extend them by showing how the situation can be materially improved with proper education. Therefore,

our study generates partial solutions for policy makers who seek an effective way to promote social welfare as well as gender diversity by enhancing financial literacy and economic participation of the female citizens.

5.2 Contributions to the literature

Lusardi and Mitchell (2014) point out that the existing literature lacks in finding the causal link between financial education and financial literacy or behaviors. In our study, we find significant causal relationships between financial education and financial literacy as well as behaviors. Specifically, we find the long-term effect of early financial education on financial literacy and behaviors in adulthood. This is an extension to a few prior studies that test the near term effect of financial education by taking a sample from students just before entering the workplace or to-be-retirees who prepare for retirement (Bernheim et al., 2001a,b; Bruhn et al., 2016; Lusardi and Mitchell, 2007; Lusardi and Mitchell 2009; Lusardi and Mitchell, 2011a).

We also narrow our focus to females, who show a potential to become more financially literate and adequate economic decision makers upon the receipt of proper education. The narrowed focus on females in analyzing the effect of financial education on literacy and behaviors enables our study to link two separate streams of the literature, one on financial education, literacy and behaviors and another on the role and capability development of women in the workplace. More specifically, women can benefit socially from the improved financial literacy and behaviors in the workplace where such skills are required; and early financial education can help them to achieve it, according to our findings. In the end, we believe that, if enforced effectively, early financial education can help promote gender diversity especially in the workplace where financial literacy matters.

Furthermore, the findings from two additional empirical tests for robustness imply that early financial education is only effective when education is actually administered. The results draw a distinction between the actual and imaginary education with regard to their effectiveness and once again emphasize the importance of installing proper educational programs in the public institutions. This contradicts the finding of Allgood and Walstad (2016) that argue that perceived financial literacy is as effective as actual financial literacy on financial behaviors.

Meanwhile, a number of studies that examine the sample of the population that receive financial education in fact examine those who receive financial information just before the financial literacy test. There is a distinction between financial education and financial information acquisition. To examine the actual effect of it, financial education should be administered for a sufficient period of time. Fernandes et al. (2013) argue that the effect of education decays after a certain period of time, which may be the result of referring to temporary financial information acquisition that is different from financial education that we refer to. Our study measures the effect of education as it is conducted on the sample that received financial education as a mandatory course during their primary and/or secondary school. Our study also shows that the effect of financial education has not decayed at all after the passage of a long period of time. As a consequence, our study yields statistically significant results from precisely measuring the effect of financial education, hence the relationship between financial education and financial literacy and behaviors.

6. Conclusion

In this paper, we analyze the long-term relationship between early financial education and financial literacy and behaviors with a particular focus on females. Our study extends the previous

literature with the following contributions. First, we find that early financial education is effective on both financial literacy and behaviors of females when they reach adulthood. In doing so, we provide guidance for policy makers who consider financial literacy a critical element in economic participation today that can help to promote social welfare. Second, we examine the long-term effect of financial education on both financial literacy and behaviors while the majority of the previous studies focus on the near-term effect of financial education (Bernheim et al., 2001a,b; Bruhn et al., 2016; Lusardi and Mitchell, 2007; Lusardi and Mitchell 2009; Lusardi and Mitchell, 2011). Finding a long-term effect also helps to mitigate the issue of endogeneity. Third, we test the existence of the placebo effect to strengthen our findings. The results from the empirical tests indicate that the actual attendance is the only determinant that affects financial literacy and behaviors in adulthood while imaginary attendance yields no statistically significant impact on both. Lastly, we find that early financial education can empower women financially, thereby increasing the likelihood of enhancing their positions in the workplace and the society. Therefore, our study links the two separate streams of the literature - one on the effect of financial education and another on the women's role and capability development in the workplace, thereby enhancing the depth and breadth of the research on the topic of gender diversity.

The Singapore government has given its people an opportunity to enhance their financial literacy and behaviors by requiring primary and/or secondary schools to provide financial education to students. Also supported by Bernheim et al., (2001a) who argue that financial education mandates in high school can help asset accumulation of the once exposed students when they reach adulthood, such an idea of the Singapore government can be adopted by policymakers around the world. Lusardi et al.(2011) suggest that mandating financial education in high school can be "socially optimal to raise financial knowledge for everyone." In this respect, early financial

education is expected to reduce the costs related to financial illiteracy while promoting the well-being of the society.

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Table 1. Variable description.

This table describes the variables used in the empirical tests.

Variable	Definition
Financial Literacy	Respondents' total scores from the first six questions on the National Financial Capability Study (NFCS) test, on a scale of 0 to 6.
Education	Receipt of financial education in school. A dummy variable that equals 1 if received, or 0 otherwise.
Female	Respondents' gender. A dummy variable that equals 1 if female, or 0 otherwise.
Stock	Respondents' participation in the stock market. A dummy variable that equals 1 if participating, or 0 otherwise.
Insurance	The number of insurance plans respondents are covered, on a scale of 0 to 3
Coverage	Knowledge of the insurance coverage respondents hold. A dummy variable that equals 1 if he/she knows, or 0 otherwise.
Care	Awareness of the kind of insurance plans respondents own. A dummy variable that equals 1 if he/she knows, or 0 otherwise.
Savings	Respondents' savings plan. A dummy variable that equals 1 if he/she has a plan, or 0 otherwise.
Background	Career of respondents' parents in financial industries. A dummy variable that equals 1 if yes, or 0 otherwise.
Job	Respondents' occupation. A dummy variable that equals 1 if related to financial industry, or 0 otherwise.
Employment	Respondents' employment status. A dummy variable that equals 1 if employed, or 0 otherwise.
Higher Education	The level of respondent's education. A dummy variable that equals 1 if equal to or higher than Bachelor's Degree, or 0 otherwise.
Age	Respondents' current age.
Married	Respondents' marital status. A dummy variable that equals 1 if married, or 0 otherwise.
Income	Respondents' total income. (Unit: 10K SGD)

Table 2. Summary of statistics.

This table reports the summary of statistics of the variables.

Panel A. Summary of statistics

	Obs.	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Financial Literacy	903	5.00	0.98	2.00	4.00	6.00	6.00
Education	903	0.56	0.50	0.00	0.00	1.00	1.00
Female	903	0.48	0.50	0.00	0.00	1.00	1.00
Stock	903	0.53	0.50	0.00	0.00	1.00	1.00
Insurance	903	2.14	0.96	0.00	1.00	3.00	3.00
Coverage	903	0.37	0.48	0.00	0.00	1.00	1.00
Care	903	0.94	0.24	0.00	1.00	1.00	1.00
Savings	903	0.52	0.50	0.00	0.00	1.00	1.00
Background	903	0.19	0.39	0.00	0.00	0.00	1.00
Job	903	0.17	0.37	0.00	0.00	0.00	1.00
Employment	903	0.96	0.20	0.00	1.00	1.00	1.00
Higher Education	903	0.86	0.35	0.00	1.00	1.00	1.00
Age	903	29.92	1.92	24.00	29.00	31.00	36.00
Married	903	0.53	0.50	0.00	0.00	1.00	1.00
Income	903	5.40	1.99	2.00	3.50	7.50	10.00

Panel B. Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) Financial literacy	1														
(2) Education	0.210***	1													
(3) Female	-0.103***	-0.031	1												
(4) Stock	0.248***	0.333***	-0.123***	1											
(5) Insurance	0.361***	0.182***	-0.139***	0.462***	1										
(6) Coverage	0.188***	0.222***	-0.043	0.151***	0.359***	1									
(7) Care	0.244***	0.099***	-0.060*	0.267***	0.555***	0.189***	1								
(8) Savings	0.279***	0.073**	-0.177***	0.245***	0.742***	0.327***	0.259***	1							
(9) Background	0.241***	0.096***	0.003	0.212***	0.228***	0.051	0.086**	0.250***	1						
(10) Job	0.271***	0.164***	-0.095***	0.224***	0.255***	0.239***	0.073**	0.208***	0.155***	1					
(11) Employment	0.421***	0.220***	-0.069**	0.210***	0.326***	0.145***	0.400***	0.136***	0.072**	0.092***	1				
(12) Higher education	0.326***	0.300***	0.024	0.308***	0.405***	0.117***	0.317***	0.237***	0.125***	0.129***	0.509***	1			
(13) Age	0.028	-0.055*	-0.065**	0.227***	0.074**	-0.021	0.046	-0.024	-0.124***	0.067**	0.075**	0.047	1		
(14) Married	0.103***	-0.021	0.012	0.157***	0.145***	0.068**	0.123***	0.057*	-0.121***	0.073**	0.163***	0.055*	0.261***	1	
(15) Income	0.372***	0.494***	-0.086**	0.422***	0.373***	0.381***	0.239***	0.255***	0.223***	0.447***	0.350***	0.251***	0.107***	0.130***	1

Table 3. Difference-in-Difference (DiD).

This table measures the effect of financial education on financial literacy and behaviors by gender and group. T-statistics are computed with Heteroscedasticity-consistent standard errors and are reported in parentheses. *, **, and *** represent 10%, 5%, 1% significance level, respectively.

	Female		Male		Diff-in-Diff	
	Yes	No	Yes	No	(t-stat)	
Financial Literacy	5.238	4.493	5.135	5.045	0.655	5.180
Financial Behavior						
Stock	0.655	0.254	0.707	0.443	0.138	2.200
Insurance	2.281	1.672	2.308	2.214	0.515	4.128
Coverage	0.477	0.189	0.447	0.303	0.144	2.286
Care	0.974	0.871	0.951	0.960	0.113	3.625
Savings	0.498	0.343	0.598	0.612	0.169	2.571

Table 4. The effect of financial education on financial literacy.

This table examines the effect of female finance education on financial literacy. T-statistics are computed with Heteroscedasticity-consistent standard errors and are reported in parentheses. *, **, and *** represent a 10%, 5%, and 1% significance level, respectively.

	Dependent variable:						
	Total	Q1	Q2	Q3	Q4	Q5	Q6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female*Education	0.572***	0.000	-0.078*	(0.013)	0.200***	0.208***	0.255***
	(0.113)	(0.000)	(0.047)	(0.058)	(0.057)	(0.045)	(0.043)
Female	-0.446***	0.000	0.084**	0.073*	-0.120***	-0.211***	-0.271***
	(0.091)	(0.000)	(0.039)	(0.043)	(0.044)	(0.035)	(0.037)
Education	-0.268***	0.000	0.065*	-0.215***	-0.033	-0.093***	0.009
	(0.084)	(0.000)	(0.037)	(0.046)	(0.045)	(0.027)	(0.027)
Background	0.405***	0.000	0.035	0.107***	0.103***	0.078***	0.083***
	(0.069)	(0.000)	(0.025)	(0.033)	(0.035)	(0.025)	(0.024)
Job	0.322***	0.000	0.005	0.115***	0.083**	0.124***	-0.005
	(0.070)	(0.000)	(0.030)	(0.040)	(0.040)	(0.021)	(0.024)
Employment	1.299***	0.000	0.296***	0.184*	0.401***	-0.083	0.501***
	(0.187)	(0.000)	(0.091)	(0.095)	(0.089)	(0.076)	(0.068)
Higher Education	0.328***	0.000	-0.041	0.197***	0.001	0.047	0.124***
	(0.106)	(0.000)	(0.038)	(0.055)	(0.050)	(0.043)	(0.046)
Age	-0.012	0.000	-0.008	-0.015*	-0.003	0.005	0.009*
	(0.015)	(0.000)	(0.006)	(0.008)	(0.008)	(0.006)	(0.006)
Married	0.100*	0.000	-0.044*	-0.051*	0.100***	-0.010	0.105***
	(0.058)	(0.000)	(0.023)	(0.030)	(0.031)	(0.023)	(0.022)
Income	0.074***	0.000	0.018***	0.053***	0.005	-0.002	-0.000
	(0.018)	(0.000)	(0.007)	(0.009)	(0.009)	(0.007)	(0.006)
Constant	3.450***	1.000***	0.719***	0.575**	0.363	0.826***	-0.033
	(0.461)	(0.000)	(0.193)	(0.238)	(0.233)	(0.187)	(0.167)
Obs.	903	903	903	903	903	903	903
Adj. R^2	0.305	0.495	0.052	0.133	0.098	0.068	0.311

Table 5. The effect of financial education on financial behaviors.

This table examines the effect of financial education on financial decisions in stock market participation and insurance purchase. T-statistics are computed with Heteroscedasticity-consistent standard errors and are reported in parentheses. *, **, and *** represent 10%, 5%, and 1% significance level, respectively.

	Dependent variable:				
	Stock	Insurance	Coverage	Care	Savings
	(1)	(2)	(3)	(4)	(5)
Female*Education	0.150***	0.505***	0.145**	0.098***	0.189***
	(0.056)	(0.108)	(0.059)	(0.029)	(0.061)
Female	-0.178***	-0.511***	-0.091**	-0.075***	-0.279***
	(0.041)	(0.081)	(0.042)	(0.024)	(0.044)
Education	0.094**	-0.357***	(0.034)	-0.086***	-0.204***
	(0.045)	(0.087)	(0.046)	(0.022)	(0.047)
Background	0.204***	0.363***	(0.057)	0.021	0.237***
	(0.039)	(0.069)	(0.036)	(0.014)	(0.038)
Job	0.022	0.189***	0.111**	-0.029*	0.090**
	(0.043)	(0.068)	(0.048)	(0.017)	(0.042)
Employment	-0.160***	0.250	(0.001)	0.308***	-0.168*
	(0.054)	(0.169)	(0.059)	(0.091)	(0.089)
Higher Education	0.283***	0.855***	0.026	0.115***	0.327***
	(0.043)	(0.105)	(0.050)	(0.035)	(0.056)
Age	0.050***	0.003	-0.020**	-0.002	-0.018**
	(0.007)	(0.015)	(0.008)	(0.004)	(0.008)
Married	0.099***	0.197***	0.031	0.029**	0.065**
	(0.030)	(0.053)	(0.032)	(0.012)	(0.031)
Income	0.058***	0.106***	0.081***	0.018***	0.048***
	(0.009)	(0.017)	(0.010)	(0.004)	(0.010)
Constant	-1.460***	0.626	0.492**	0.555***	0.778***
	(0.217)	(0.465)	(0.235)	(0.149)	(0.262)
Obs.	903	903	903	903	903
Adj. R^2	0.306	0.307	0.157	0.199	0.181

Table 6. The effect of pseudo financial education on financial literacy - robutsness.

This table reproduces Table V with the pseudo-education. T-statistics are computed with Heteroscedasticity-consistent standard errors and are reported in parentheses. *, **, and *** represent 10%, 5%, and 1% significance level, respectively.

	Dependent variable:						
	Total	Q1	Q2	Q3	Q4	Q5	Q6
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female*p.Education	-0.365	0.000	0.080	0.077	-0.173	-0.283**	-0.066
	(0.300)	(0.000)	(0.066)	(0.119)	(0.142)	(0.121)	(0.118)
Female	-0.109*	0.000	0.037	0.064**	-0.001	-0.083***	-0.126***
	(0.058)	(0.000)	(0.024)	(0.031)	(0.029)	(0.023)	(0.022)
p.Education	0.163	0.000	-0.017	-0.018	0.062	0.071***	0.063
	(0.182)	(0.000)	(0.066)	(0.082)	(0.081)	(0.024)	(0.042)
Background	0.393***	0.000	0.035	0.122***	0.094***	0.073***	0.069***
	(0.071)	(0.000)	(0.026)	(0.034)	(0.035)	(0.025)	(0.025)
Job	0.359***	0.000	-0.003	0.135***	0.091**	0.138***	-0.002
	(0.071)	(0.000)	(0.031)	(0.040)	(0.040)	(0.022)	(0.026)
Employment	1.392***	0.000	0.279***	0.205**	0.428***	-0.046	0.526***
	(0.181)	(0.000)	(0.092)	(0.095)	(0.089)	(0.077)	(0.067)
Higher Education	0.315***	0.000	-0.031	0.128**	0.016	0.045	0.157***
	(0.108)	(0.000)	(0.036)	(0.053)	(0.050)	(0.043)	(0.046)
Age	-0.012	0.000	-0.008	-0.008	-0.006	0.003	0.007
	(0.016)	(0.000)	(0.006)	(0.008)	(0.008)	(0.006)	(0.006)
Married	0.097	0.000	-0.044*	-0.035	0.094***	-0.015	0.098***
	(0.059)	(0.000)	(0.023)	(0.032)	(0.032)	(0.023)	(0.024)
Income	0.069***	0.000	0.023***	0.025***	0.011	-0.003	0.014**
	(0.017)	(0.000)	(0.006)	(0.008)	(0.008)	(0.007)	(0.005)
Constant	3.259***	1.000***	0.747***	0.440*	0.344	0.807***	-0.079
	(0.470)	(0.000)	(0.196)	(0.243)	(0.235)	(0.187)	(0.169)
Obs.	903	903	903	903	903	903	903
Adj. R^2	0.286	0.495	0.048	0.093	0.083	0.052	0.258

Table 7. The effect of pseudo financial education on financial behaviors - robustness.

This table reproduces Table VI with the pseudo-education. T-statistics are computed with Heteroscedasticity-consistent standard errors and are reported in parentheses. *, **, and *** represent 10%, 5%, and 1% significance level, respectively.

	Dependent variable:				
	Stock	Insurance	Coverage	Care	Savings
	(1)	(2)	(3)	(4)	(5)
Female*p.Education	0.259**	-0.135	-0.024	0.020	0.357**
	(0.128)	(0.344)	(0.154)	(0.019)	(0.148)
Female	-0.112***	-0.220***	-0.010	-0.019	-0.183***
	(0.029)	(0.056)	(0.030)	(0.015)	(0.031)
p.Education	-0.458***	0.145	-0.074	0.041**	0.060
	(0.076)	(0.164)	(0.097)	(0.016)	(0.104)
Background	0.191***	0.361***	-0.061*	0.022	0.242***
	(0.036)	(0.070)	(0.036)	(0.014)	(0.038)
Job	0.020	0.230***	0.118**	-0.020	0.107**
	(0.039)	(0.069)	(0.047)	(0.016)	(0.044)
Employment	-0.135***	0.339**	0.024	0.325***	-0.139*
	(0.052)	(0.164)	(0.060)	(0.092)	(0.084)
Higher Education	0.330***	0.803***	0.033	0.099***	0.280***
	(0.042)	(0.097)	(0.050)	(0.036)	(0.051)
Age	0.042***	0.008	-0.022***	0.000	-0.009
	(0.007)	(0.015)	(0.008)	(0.004)	(0.008)
Married	0.057*	0.208***	0.021	0.035***	0.086***
	(0.031)	(0.056)	(0.032)	(0.013)	(0.032)
Income	0.080***	0.085***	0.085***	0.012***	0.031***
	(0.008)	(0.014)	(0.009)	(0.003)	(0.009)
Constant	-1.312***	0.323	0.491**	0.464***	0.476*
	(0.217)	(0.473)	(0.238)	(0.158)	(0.261)
Obs.	903	903	903	903	903
Adj. R^2	0.305	0.289	0.151	0.186	0.175

Figure 1. The effect of financial education on financial literacy by gender.

This figure illustrates the effect of financial education on financial literacy of men and women simultaneously. Financial literacy is calculated as the total scores of the individual respondents in the financial literacy test administered by the Financial Education Steering Committee (FESC) in Singapore.

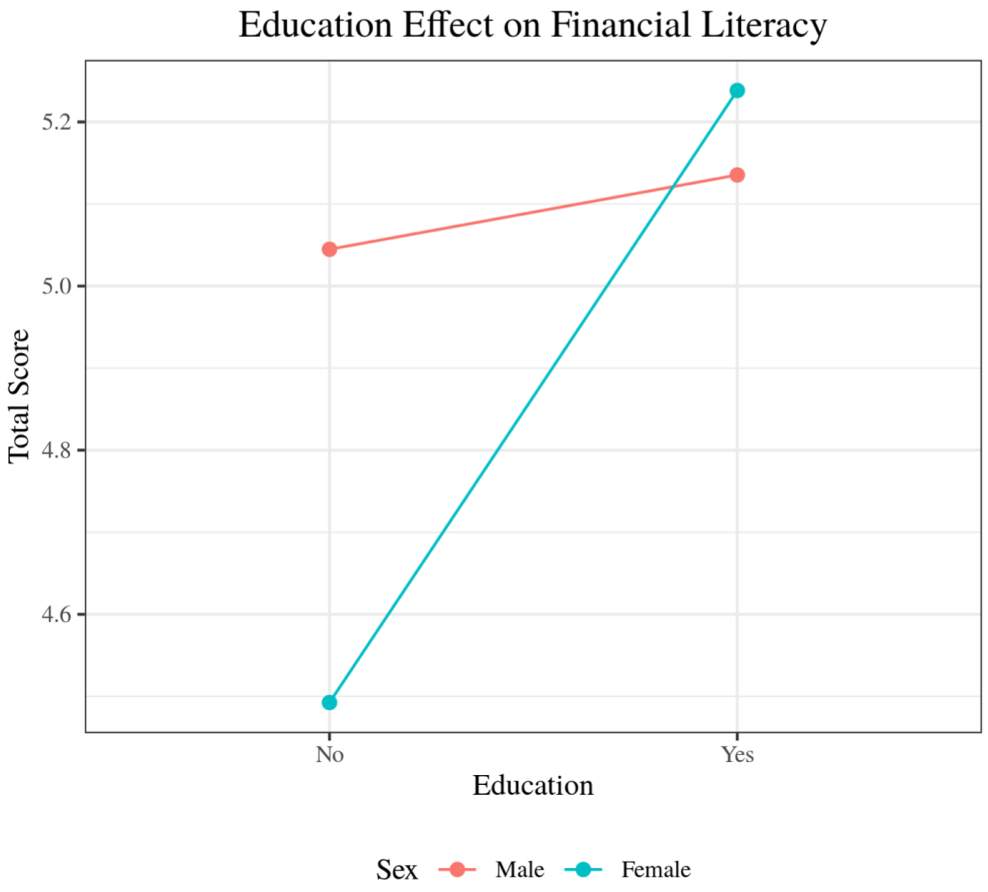
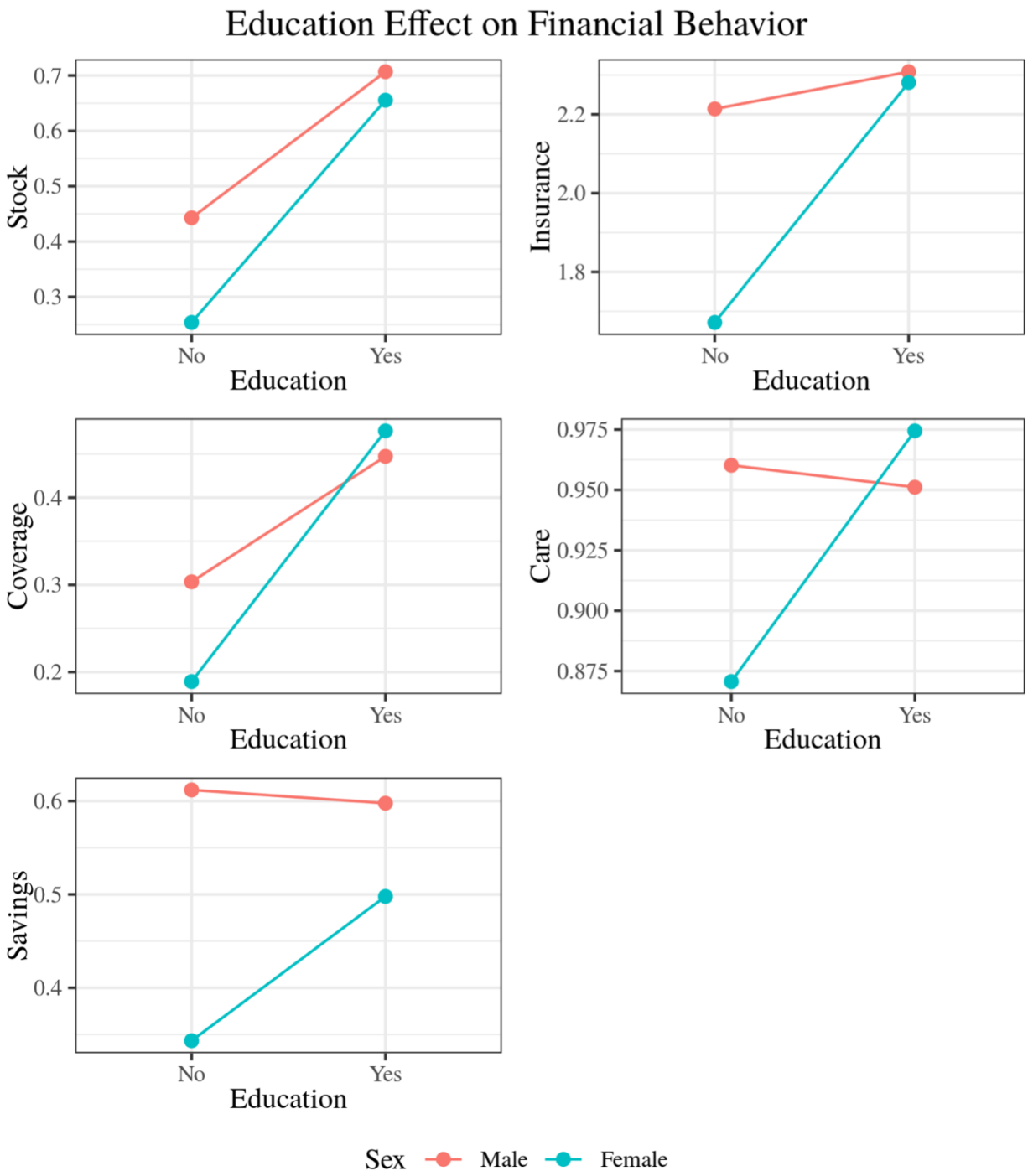


Figure 2. The effect of financial education on financial behavior by gender.

This figure illustrates the effect of financial education on financial behaviors for men and women. The financial behaviors are measured in five categories, such as *Stock*, *Insurance*, *Coverage*, *Care* and *Savings* in the survey questionnaire administered by the Financial Education Steering Committee (FESC) in Singapore.



Appendix I. Survey questionnaire (NFCS financial literacy test: QN 1-6)

1. Suppose you have $100 in a savings account earning 2 percent interest a year. After five years, how much would you have?

   a) More than $102 b) Exactly $102 c) Less than $102 d) Don't Know

2. Imagine that the interest rate on your savings account is 1 percent a year and inflation is 2 percent a year. After one year, would the money in the account buy more than it does today, exactly the same or less than today?

   a) More Same b) Less c) Don't Know

3. If interest rates rise, what will typically happen to bond prices? Rise, fall, stay the same, or is there no relationship?

   a) Rise b) Fall c) Stay the Same d) No Relationship e) Don't Know

4. A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage but the total interest over the life of the loan will be less.

   a) True b) False c) Don't Know

5. Buying a single company's stock usually provides a safer return than a stock mutual fund.

   a) True b) False c) Don't Know

6. Suppose you owe $1,000 on a loan and the interest rate you are charged is 20% per year compounded annually. If you didn’t pay anything off, at this interest rate, how many years would it take for the amount you owe to double?

   a) Less than 2 years b) 2 to 4 years c) 5 to 9 years d) 10 or more years e) Don't know

7. What percentage of your monthly income do you save?

   - 10% - 20% - 30% - 40% - 50% - I save whatever is left

8. Do you have a 6-month emergency fund?

   - Yes - No - Not sure

9. Do you set aside part of your monthly income as funds for retirement? (not considering CPF)

   - Yes - No (I do not) - No (I don't feel it is necessary as there is CPF)

10. Do you know what is the bank's monthly saving interest rate you are getting?

    - Yes - No

11. I save and plan for yearly holiday trips.

    - Yes - No, I go to holidays as and when my bank account can afford

12. Which of the following insurance plan do you have?

    - Integrated Shieldplans only - Critical Illness only - Savings plan only - Integrated Shieldplans & Critical Illness only - Integrated Shieldplans & Savings plan only - Critical Illness & Savings plan

only - All 3 mentioned of the above - None of the mentioned above - To be honest, I'm not sure what I have or what I don't.

13. Do you know the various sums you are insured from your policies?
    - Yes - No - Not Sure
14. Do you know how much are your annual/monthly premiums of your policies?
    - Yes - No - Not sure
15. Do you own any of the following: - Stocks - Funds - Options - Blue Chips
    - Have but am not very sure - Have and I manage it myself - Have but a fund manager/broker manages it for me - Don't know - No, do not own any
16. Which of the following do you currently own?
    - Stocks - Funds - Options - Blue Chips - Do not own any - Not sure
17. I have an existing house loan.
    - Yes & I know the interest rates on my housing loan from HDB. - Yes & I know the interest rates on my housing loan from banks. - No I do not know the interest rates of my housing loan - I do not have an existing house loan.
18. I have started saving money to buy a house.
    - Yes - No - Already financing a housing loan
19. My current age is...
20. Gender
    - Female - Male
21. I am currently…
    -Married -Single & not in a relationship - In a relationship - Divorce
22. Highest level of education obtained:
    - O' Levels - A' Levels - Diploma - Degree (Bachelors) - Masters - PhD (Doctorate)
23. I am currently...
    - Employed (Full time: at least 35 hours a week) - Employed (Part time: less than 35 hours a week) - Self-Employed - Not Employed
24. My current income level is... (per annum)
    - Less than $20,000 - $20,000 to $34,999 - $35,000 to $49,999 - $50,000 to $74,999 - $75,000 to $99,999 - Over $100,000
25. Select one that resembles you the most.
    - Always pays credit card in full - Never makes late credit card payment - Never bounces a check - Has savings and investment adequate for needs - Never worries about debt
26. Industry/ Scope of my work/ Specialisation envolves around...
    - Audit & Taxation/ Accounting - Banking/ Financial - Corporate finance/ Investment - Property/ Real Estate - Sales & Marketing - Business Development - Highly-Skilled Professionals (e.g. Doctor, Optometrist, Scientist etc) - None of the above
27. Which industry/ scope of work/ specialisation your parents are or used to be in?
    - Audit & Taxation/ Accounting - Banking/ Financial - Corporate finance/ Investment - Property/ Real Estate - Sales & Marketing - Business Development - Highly-Skilled Professionals (e.g. Doctor, Optometrist, Scientist etc) - None of the above
28. Have you attended Money Sense program before during school days?
    - Yes - No - Not Sure