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Financial Education and Financial Attitudes: Evidence from a High School Experiment

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Abstract

We surveyed high-school students in Southern California to investigate whether there is an improvement in financial attitudes from eight class periods of financial literacy intervention in a high-school economics course. We examine whether the money management (MM) and financial investing (FI) components of financial instruction influence attitudes differently and whether they each influence attitudes beyond a standard economics course. We find that the MM treatment influences being *thrifty* and delaying gratification. Both treatments increase risk-taking behavior, with neither treatment being more important than the other. Within the confines of our experiment, exposure to economics per se did not influence any of the financial attitudes, pointing to the need for financial education to inculcate healthy financial attitudes in high school children.

Keywords: exploratory factor analysis**,** financial attitudes, financial investing, high-school financial literacy intervention, money management.

With continued emphasis on the need to provide financial education in high schools (Lusardi, 2010; OECD, 2016), an increasing number of states are requiring personal finance in their school curriculum with the purpose of improving subsequent financial behavior of youth (NBC, 2019). Social behavioral theories (Bandura, 1977; Ajzen, 1991) provide the conceptual framework that identifies financial attitudes as a key factor in influencing financial behavior. Yet the impact of financial education on financial attitudes has not been analyzed adequately in the context of high school education in the U.S. Studies that question whether state mandates

change financial behaviors along with the reality that a mandatory personal finance course might replace some other valuable component of the high school curriculum imply that it is worth examining whether financial education can influence financial attitudes.

According to the Council for Economic Education's biennial survey of states (CEE, 2018), 12 of the 17 states that require personal finance to be taken in high school integrate personal finance into another course, typically an economics course as in California (CBS, 2019). In this context, we ask in this study, if integration of eight class periods of financial education in an economics course can influence financial attitudes. Faced with limited amount of time to teach personal finance, the wide breadth of personal finance topics, and the aptitude of teachers to teach certain topics versus others, we deem it necessary to investigate further if certain topics in personal finance are more effective than others in fetching gains in financial attitudes. To this end, we ask if a curriculum that is more intensive in money management topics — that teachers may be more comfortable in teaching (Way &Holden, 2009) — has a differential impact on financial attitudes as compared with a curriculum more intensive in financial investing topics.

Literature Review

Together with financial knowledge, financial attitudes have received increased attention in the literature explaining financial outcomes. The general consensus from this literature is that attitudes toward saving, attitudes toward taking risk, and the extent to which individuals discount future rewards can affect future financial outcomes and financial well being. Meier and Sprenger (2010), for example, have provided non-causal evidence of a strong correlation between measures of present bias generated from an experiment and a higher likelihood of incurring credit card debt and increased credit card balances. Hastings and Mitchel (2018),

likewise, have shown an association between experimentally derived present bias and smaller contributions to pension plans and smaller overall savings. Ammerman and MacDonald (2018) have found a negative association between future orientation and the proportion of financial assets held in cash. Dohmen, Falk, Huffman, and Sunde (2012) have shown that a willingness to take on risk was correlated with a higher likelihood of being self-employed and a higher likelihood of holding stocks. Gill and Bhattacharya (2017) have found that correlations between financial attitudes and financial behavior took increased importance when they were interacted with financial knowledge.

Another strand of research has examined factors that influence financial attitudes. In an extensive review of the salient literature, Britt (2016) noted that financial attitudes that ultimately shape financial decisions were influenced by ethnicity, gender, and socioeconomic status. Andreoni, Samek, Sokal, and Sprenger, C. (2019) conducted field experiments based on intertemporal decisions made by children 3 to 12 years of age. They found that younger children were more impatient and that the rate of time preference varied by race. However, causal estimates of the effect of randomly assigned educational opportunities found no effect of these programs on children's time preferences. Gill and Bhattacharya (2018) reported on a non-causal positive correlation between parents' and children's attitudes related to saving, risk aversion, and searching for the cheapest price.

An important question for policy makers is whether financial education can influence financial attitudes. For the U.S., such evidence is limited mostly to the elementary school level (Schug & Hagedorn, 2005; Batty, Collins, & Odders-White, 2015). Batty, Collins and Odders-White, in particular, provided causal estimates of the effect a randomly assigned financial education program on financial attitudes. The authors' experimental evidence indicated that

financial education can improve financial attitudes. For high school students, most of the literature on the impact of financial education on financial attitudes has been in the international context. Sohn, Joo, Grable, Lee, and Kim (2012) provided evidence that attitudes toward money were the most important correlates in explaining the financial literacy of high-school students in South Korea. These authors concluded that school-based financial education that does not explicitly include attitudinal elements along with opportunities to draw from experiences at home or in the context of a consumer will be inadequate. Bruhn, Leao, Legovini, Marchetti, and Zia. (2016) provided causal evidence on the effects of financial education in high schools from a randomized control trial in Brazil. They found that treated students showed a 9-12% of a standard deviation increase in intention to save. These authors stressed the importance of financial attitudes towards achieving financial capability.

The question of whether financial education influences financial attitudes assumes greater importance when we note that the debate on the impact of personal finance education in the U.S. on financial behavior has not been completely resolved. Stoddard and Urban (2018) reported causal effects of financial education graduation requirements that shifted students from high-cost to low-cost financing for incoming college freshmen. Causal effects were identified through a difference-in-differences strategy that used variation in the timing of financial education requirements across states. Average treatment effects of mandated financial education showed a 3.3 percentage point increase in the likelihood of applying for financial aid and a 5.3 percentage point increase in the likelihood of taking out a direct federal Stafford loan (Stoddard & Urban, 2018, p.4). Harvey (2019) reported causal evidence using a difference-in-differences strategy indicating a 4-percentage point smaller likelihood of borrowing via payday loans by young adults who were required to take personal finance courses in high school compared to peers who

were not. Urban, Schmeiser, Collins and Brown (2018) used synthetic controls combined with individual-level data in a difference-in-differences strategy and identified causal effects of financial education requirements on credit behaviors. They found that financial education requirements were associated with fewer defaults and higher credit scores among young adults. Brown, Grigsby, Van Der Klaauw, Wen, and Zafar (2016) identify positive causal effects of exposure to financial and quantitative education on debt outcomes of 19 to 29 year olds.

Notwithstanding evidence on the impact of financial education on financial behavior, critics have envisioned a smaller role for financial education in high schools. In a meta analysis examining links between financial literacy and financial education with financial outcomes, Fernandes, Lynch, and Netemeyer (2014) reported on a very small role for financial education in explaining variation in financial behaviors. Additionally, both Kaiser and Menkhoff (2019), who reported on a meta analysis of studies based on quasi-experiments and randomized experiments and Cole, Paulson, and Shastry (2016) who reported causal estimates from both difference-in-differences and event-study strategies, documented very little (0.05 of a standard deviation in Kaiser & Menkhoff) to no impact (in Cole, Paulson & Shastry) of personal finance education on financial behavior.

Financial attitudes are a key factor in influencing financial behavior. Xiao (2008) made this point by applying behavior theories to questions raised in financial behavior research. Hancock, Jorgensen, and Swanson (2013), in turn, showed that poor financial attitudes are associated with a college student's willingness to take on additional debt, while Heuring Horner, Solheim, Solis Zuiker, and Ballard (2016) provided evidence that buying impulsiveness is positively correlated with credit card misuse. Shim, Serido, and Tang (2012), using structural equation modeling procedures, considered four antecedent constructs—attitude, parental norms,

perceived behavioral control, and planned horizon – that predict behavior intentions to perform saving and similar future oriented financial behavior. Of these four constructs, they found that the individual's attitude was the most important, followed by parental norms in predicting financial behavior. Drever et al. (2015) in an extensive review, pointed out that attitudes such as "sense of frugality" and "lack of materialism" are important for managing money efficiently.

With financial attitudes being important in shaping financial behavior, the success of personal finance mandates in the U.S. hinges on their impact on financial attitudes. Our paper contributes to the existing literature on financial education by specifically asking if financial literacy intervention in high schools can influence students' financial attitudes. Negative financial attitudes are associated with poor financial behaviors and reduced financial satisfaction, leading authors such as Dowling, Corney, and Hoiles (2009) to recommend the use of financial education to achieve helpful money attitudes. Similarly, Van Campenhout (2015) has argued that evaluations of financial literacy instruction should address both financial knowledge gained and changes in financial attitudes.

Studies such as Walstad, Rebeck, and MacDonald (2010) and Gill and Bhattacharya (2019) have shown that financial education increases financial knowledge of high school students. Xiao and O'Neill (2016) note a positive association of financial education with financial capability and Xiao and Porto (2017) find that financial education improves financial satisfaction by improving financial capability. However, there is a lack of studies that examine the impact of financial education on the attitudes of high school students in the U.S. Our study fills this important gap in the literature. We also ask if different financial curriculum components have differential impacts on financial attitudes. A focus on high school students is valuable from a policy stand point because the formative years of developing financial attitudes

and habits tend to be between the ages of 17 and 21 (Meredith & Schewe, 1994). As discussed in Deenanath, Danes, and Jang (2019), these students will soon be transitioning into college or entering the worforce, where they will likely make financial decisions on their own.

Against the backdrop of the discussion above, in this paper we seek answers to two important questions that have not been adequately addressed in the literature. We first ask whether teaching a few (in our case eight) class periods of financial literacy in a high school economics class can improve financial attitudes of students compared to two groups of students—one group with exposure to economics but not to financial literacy and the other with exposure to neither economics nor financial literacy. Next, we ask whether the Money Management (MM) component of financial education impacts attitudes any differently compared to the Financial Investing (FI) component of financial education. The choice of curriculum is important because, with a limited amount of instruction time, it is plausible that teachers may have a preference for teaching certain topics in personal finance. For example, according to Way and Holden (2009), teachers reported greater competence in teaching money management topics rather than topics in investment, risk, and insurance.

Method

Experimental Design

The experimental design and setting with regard to the sample and curriculum used in this paper is based on Gill and Bhattacharya (2019). As in Gill and Bhattacharya (2015, 2019) we use two different financial literacy treatment groups and two different control groups. The first treatment emphasized Money Management (MM) skills and the other emphasized Financial Investing (FI) skills. We also used two control groups. The Economics Control Group (EC) has students who were enrolled in a standard high-school economics class, but did not receive our

financial literacy instruction. This control group serves an important purpose. It is conceivable that high-school students exposed to concepts taught in a standard economics course would develop healthier attitudes from this exposure and not from our intervention. Our second control group –the History Control Group (HC)—consisted of 11th grade students who did not receive our financial literacy instruction, nor had they taken their 16-week high-school economics class. These students comprised our baseline control group and served two important purposes. First, we want to measure the effect our treatment relative to a control group that has not received economics instruction because 28 states do not require an economics class to be taken in high-school (CEE 2018). Therefore, it is important to assess the efficacy of financial literacy instruction relative to a group of students who may never take a high-school economics class. Second, the HC baseline allows us to measure if the EC group had gains in financial attitudes from their exposure to Economics.

The Sample

In response to an announcement of our financial literacy program, six local area high schools in the Southern California area offered to participate in Spring 2014, constituting our sample of 1,128 students. In our sample, 291 students received the MM treatment, 185 received the FI treatment, 404 students were in the EC group, and 248 students were in the HC group. Our sample is non-random because the teachers volunteered to participate in our study. We attempted to minimize any bias arising from the self-selection by teachers into our study by not having the classroom teachers deliver the financial literacy instruction to their students, as explained below. As such, our sample is representative of schools where teachers respond to efforts to improve financial literacy of their students.

Allocation of economics classes into treatment and control groups was based on the time of day the classes were offered. The administration of the treatment type—FI versus MM—was decided on the basis of lab availability because the FI group needed computer labs for the Stock Market Game™ (SIFMA). Since these allocations were dictated by exogenously imposed logistical factors and constraints, we expect no a priori sample-selection bias with regard to the assignment of treatment and control groups. Our sample was drawn from a state where economics is required in the curriculum. Therefore, the History Control group students would be taking Economics in 12th grade and there should be no concern about selection into the History and Economics groups.

The Financial Literacy Curriculum

We agreed at the outset with the school administrators that we would take ten class periods for our financial literacy intervention, constituting eight class periods of instruction and a pretest and posttest, spread over the first ten weeks of the semester. We used the content standards and benchmarks specified in The *National Standards for Financial Literacy* (CEE 2013) to identify four broad components of learning. Accordingly, these learning components were: (1) basic economic literacy with applications to personal finance—consisting of an understanding of scarcity, decision making, opportunity cost, trade-offs, incentives, and impact of market forces on earning income; (2) asset protection, with a focus on understanding of identity theft and health, life, and automobile insurance; (3) the money management curriculum that included budgeting, borrowing, and saving; and (4) the financial investing curriculum consisting of the purchase of financial assets to increase income or wealth in the future.

In order to provide the framework for our financial literacy curriculum to both the MM and FI treatments, we taught basic economic literacy to both treatment groups in the first class

period. In the second class period, we taught mandatory and optional deductions in paychecks, purchase of automobile insurance, awareness of identity theft, and scams and schemes since we considered these topics to be of immediate relevance for students possibly entering the workforce.

The Treatment Groups

The MM intensive group was assigned four periods of MM topics and two periods FI topics. The FI intensive group was assigned two periods of MM topics and four periods of FI topics. The MM and FI groups covered identical topics. However, the MM group was involved in more MM-based classroom exercises, examples, and activities in the additional two class periods of MM instruction that it received. The FI group was involved in more FI-based activities and examples in the additional two class periods of FI instruction that it received. The FI group also played the Stock Market Game™ for eight weeks, consulted stock prices and tracked their portfolios, whereas the MM group did not partake in any of these activities. Two instructors from our institution taught the curriculum using identical examples, worksheets, and activities for each treatment group. Since the classroom teachers from the high schools did not provide the financial education, we expect self-selection bias to be minimal. Detailed information on the curriculum is available from the authors on request.

Financial Attitude Variables

We obtained information on students' attitudes toward six financial matters pre and post treatment for all students who participated in our study. The survey questions are available from the authors on request. The first attitude pertained to what a student would do with an extra $200, where the options were: Spend $200 now, spend $150 now, spend $100 now, spend $50 now, or spend $0 now. The next two attitudes were based on the strength of a student's agreement,

expressed in a Likert scale, with a statement about borrowing money, "I believe it is OK to borrow money to purchase things I want, but do not have the money to buy," and a statement on trying not to spend money that has been saved, "I try not to spend the money that I have saved." The last three attitudes were based on the strength of the student's agreement with being satisfied with older versions of smart phones, driving a used car, and purchasing items at yard sales. Frequency distributions for these financial attitudes, pre and post intervention, appear in Tables 1A and 1B.

For a smaller subset of participating teachers, we also collected student survey responses designed to elicit attitudes toward risk and delaying gratification (rates of discount). To elicit attitudes about risk, we asked students to imagine they had just won $1,000 in a game show. Students were told they could keep the $1,000 or they could play a game where a coin is flipped and they would receive $ 2,000 with probability one-half and $0 with probability one-half. Students were then asked if they preferred to keep the $1,000, preferred to play the game, or would take either option. Students were categorized as risk taking if they preferred to play the game, risk neutral if they would take either option, and risk averse if they preferred to keep the $1,000.

Discount rates were inferred by asking students to imagine they had won a $1,000 in a lottery with a 100% guarantee. Students were first asked if they preferred to receive the $1,000 now or $1,050 one year from now. If students indicated that they were willing to wait to receive the $1,050 one year from now, they were assigned a discount rate of less than 5 percent and were instructed to skip the remaining lottery questions. If students indicated that they would prefer the $1,000 now rather than $1,050 a year from now, they were instructed to answer a follow-up question where they were given the choice between $1,000 now or $1,100 a year from now.

Students who indicated that they were willing to wait to receive the $1,100 a year from now were assigned a discount rate between 5 percent and 10 percent. Students who indicated that they preferred $1,000 now rather than $1,100 one year from now were assigned a discount rate greater than 10 percent.

The questions in the survey of financial attitudes were designed by the authors. Several steps were taken to establish the validity of the survey. Focus groups of youth populations that attended several financial literacy programs run by the authors participated in a structured discussion of the survey topics that helped design the questions. An independent research center conducted cognitive interviews with ten members of the target group of youth to examine how the respondents understood the questions and arrived at their answers. In 2014 prior to the start of our study, the survey was pilot tested in a 12th grade economics class at a school that was not in the sample of the present study. Feedback from the respondents was used to refine the wording of the questions and confirm that the survey questions measured what they were purported to measure for high school students.

Our survey questions are similar to those used by other authors to measure financial attitudes. Our questions asking what a student would do with an extra $200 and the questions on the attitude toward borrowing money and on spending money that the student has saved are similar to the following questions used in the literature: “I usually buy only the things that I need” (Richins & Dawson,1992); “Are you good at saving your money rather than spending it straight away?” “Do you like to spend your money as soon as you get it?” (Ray & Najman, 1986); “There is no excuse for borrowing money,” “You should stay at home rather than borrow money to go out for an evening in the pub,” “It is better to have something now and pay it later,” and “Owing money is basically wrong” (Meier and Sprenger, 2010). Students’ attitudes toward

being satisfied with older versions of smart phones, driving a used car, and purchasing items at yard sales closely corresponded with the conscientiousness money attitude scale for high-school students developed by Beutler and Gudmunson (2012): "I help my parents save money by being thrifty and frugal" and "I am cautious, even when spending my parents' money." Our questions were modified to suit our purpose of measuring attitudes of high-school students and were uniformly constructed using a five-point scale.

Our questions on present bias are similar to Andreoni et al (2019). Whereas Andreoni et al. elicited time preference from children aged 3 to 12 years using an activity that involved choosing plates with varying amounts of candies, we used hypothetical dollar amounts since our respondents were high school children. Our question on risk is similar to what was used in the Risk Tolerance Quiz developed by Grable and Lytton (1999) and also used by authors such as Guillemette,Yao, and James (2015) that asked the respondent to choose between a sure gain of the expected value of a gamble and the option of a 50% chance of winning or losing the gamble.

Control Variables

The control variables in the regression analyses testing the relationship between financial attitudes and our financial-education treatment were the students' academic GPA from official records, students' scores from a 32-question financial literacy pretest covering MM and FI topics, basic economic literacy, and asset protection. Students provided survey responses to queries about their gender and working status. These latter variables were coded as a binary indicator for female and a binary indicator for students who indicated that they worked full or part time.

Exploratory Factor Analysis

To assess whether our treatment yielded a change toward more healthy financial attitudes, we first performed an exploratory factor analysis for the six attitude variables discussed previously. We combined correlated attitudes into a smaller number of factors that served as our dependent variables in the regression analyses that follow. We used the rotated factor loads for the attitude variables to classify the retained factors. As a preliminary step in the factor analysis, we recoded the attitude variables to assign a higher numerical score to responses we felt indicated a healthier financial attitude, though we recognize that we are imparting a value judgment in this regard. For the statements pertaining to trying not to spend money that has been saved and being satisfied with older versions of smart phones, driving a used car, and purchasing items at yard sales because these activities save money, we assigned a higher numerical value to strongly agree. For the statement about it being okay to borrowing money, we assigned a higher numerical value to strongly disagree. For the statement about what a student would do with an extra $200, we assigned a higher numerical value to spend $0 now.

We retained two factors for both the pre and post-treatment attitudes. For the pre-treatment attitude variables, the factor analysis returned eigenvalues of 1.672 and 1.176 for the first two factors. All remaining eigenvalues were less than one. For the post-treatment attitudes, the factor analysis returned eigenvalues of 1.747 and 1.145 for the first two factors. The remaining eigenvalues were less than one.

As shown for both pre and post-treatment attitudes in Table 2, higher factor loadings for the first factor appeared for the attitude statements about purchasing old phones, purchasing a used car, and purchasing items at a yard sale. We classified this factor as *thrifty* in the work that follows. Also shown are higher factor loadings for the second factor for the attitude statements

about saving an extra $200, borrowing money, and trying not to spend what has been saved. We classified this factor as *saver* in the work that follows.

We test for whether the treatment and control groups are the same pretreatment with respect to the financial attitudes that we measure. Table 3 indicates that the ANOVA test does not reject the null hypothesis that the population means of the *thrifty* factor score (p = .308) and the *saver* factor score (p = .458) are the same across all treatment groups and control groups. Table 4 reports the results of the chi squared test of independence where the null hypothesis for the upper panel is that there is no relationship between the risk aversion categories and the treatment and control groups and the null hypothesis for the lower panel is that there is no relationship between the discount rate categories and the treatment and control groups. The p values are .113 for the risk variable and .094 for the discount rate variable. Therefore, we do not reject the null hypothesis of no relationship for the risk variable, but do reject the null at the 0.10 level for the discount variable.

The lack of statistical significance of our ANOVA test in Table 3 notwithstanding, a look at this table indicates some differences in point estimates such as the *thrifty* factor score of Economics Control and the *saver* factor score of the FI Treatment group. Likewise, there are differences in point estimates in Table 4 in the risk averse category for the Economics Control Group and the discount rate greater than 10% for the FI Treatment Group. We do not consider this to be a serious problem for our methodology since our regression strategies employ a gain score model, which is in effect a difference-in-differences estimator, or we use post-treatment attitudes as the dependent variable, while controlling for any differences in pre-treatment attitudes.

Econometric Model

We begin with the regression models explaining the factor scores *thrifty and saver* that were obtained from the exploratory factor analyses. We take two approaches to analyzing these factor scores. The first approach, based on what is commonly called the gain score model, is in Equation (1) below.

$$GainScore_i = \beta_0 + \alpha_1 EC_i + \alpha_2 MM_i + \alpha_3 FI_i + \alpha_4 \mathbf{X}_i + \varepsilon_i \qquad (1)$$

GainScore represents the difference between a student's posttest factor score and pretest factor score. The HC group is the reference category for interpreting the coefficients for the three binary indicators, EC, MM, and FI. The vector **X** represents the set of control variables mentioned previously as well as binary indicators to capture school effects. The standard errors reported are robust to arbitrary forms of heteroscedasticity.

Additional hypotheses that we test are based on differences in our coefficient estimates: $(\alpha_2 - \alpha_3)$, $(\alpha_2 - \alpha_1)$, and $(\alpha_3 - \alpha_1)$. The first of these differences, $(\alpha_2 - \alpha_3)$, allows us to test whether the MM treatment yields different gains in financial attitudes relative to the FI treatment, while the differences given by $(\alpha_2 - \alpha_1)$, and $(\alpha_3 - \alpha_1)$ allow us to test whether our treatments show larger gains in financial attitude factor scores relative to the EC students who did not receive financial literacy instruction.

In the second econometric specification, we modify Equation (1) by using as the dependent variable a student's post-intervention factor score, and we explain this post-intervention factor scores with our treatment variables while controlling for a student's pre-intervention factor score. We again test for differences in our estimated treatment effects and differences between our two treatments and the EC group.

To explain risk aversion and discount rates, we use ordered probit methods to assess the impact of our treatment on these financial attitudes, since our categorical variables describing

these outcomes can be thought of as categories of underlying continuous risk tolerance and discount rate variables. In tables 6 and 7 that follow, we report marginal effects from the ordered probit model, which give changes in the response probabilities with respect to a change in our explanatory variables.

Results

Table 5 summarizes the regression results explaining the factor scores *thrifty* and *saver*. Columns 1 and 2 use the post-treatment factor scores as the dependent variables and include the pre-treatment factor score as a right-hand side variable. Columns 3 and 4 give the gain score results.

Columns 1 and 3 show that relative to the baseline HC group, neither the FI Treatment nor the EC group influence the *thrifty* attitude. In contrast, the coefficient of MM is statistically significant in Columns 1 and 3. In Column 1, the MM treatment is associated with a 0.235 standard deviation increase in the *thrifty* factor score relative to the HC students who did not receive the treatment. Column 3 shows an increase in the gain score for the *thrifty* attitude of 0.222 of a standard deviation arising from the MM curriculum. The p value of the test of the null hypothesis that there is no difference between the coefficients of MM and FI is .079 for the specification in Column 1 and is .062 for specification in Column 3, indicating that the impact from the MM curriculum on the *thrifty* attitude is statistically significantly different from that of the FI curriculum. The test of the null hypothesis that there is no difference between the coefficients of MM and EC fetched p values of .104 and .094 for Column 1 and 3, indicating although at higher significance levels, that MM students demonstrated improvement in the *thrifty* attitudes compared to the EC students.

Column 2 results show that both the MM and FI groups have higher *saver* factor scores than the HC group, while again the coefficient for the EC group is statistically insignificant. Relative to the HC group, students in the MM and FI groups show increases in the *saver* factor score of 0.262 and 0.213 of a standard deviation, respectively, but the differential impact is not statistically significant ($p = .600$). In Column 4, the coefficient of MM is statistically significant. We also find that females have higher *saver* factor scores relative to males.

Tables 6 and 7 summarize the marginal effects from the ordered probit models explaining discount rates and risk aversion. Table 6, Column 1 shows that the MM treatment reduces the probability of a discount rate greater than 10 percent by 11.8 percentage points relative to the HC and in Column 3 increases the probability of a discount rate less than 5 percent by 11.2 percentage points. In contrast, we find no effect of FI or EC on discount rates. The tests of differences in marginal effects indicate that the coefficient for the MM group is different than the coefficients for the FI group (p values are .000, .098, and .000 for discount rate greater than 10%, between 5 and 10%, and less than 5%.). The probability of a discount rate greater than 10 percent is 7.8 percentage points lower for females and a discount rate less than 5 percent is 7.1 percentage points higher. Our finding that females exhibit less present bias than males is also reported by OECD (2016).

As shown, in Table 7, Columns 1-3, both the MM and the FI treatment increase the probability that students will be categorized as risk taking and risk neutral and decrease the probability that the student will be categorized as risk averse. For example, as shown in Column 1, the MM treatment increases this probability of being categorized as risk taking by 9.5 percentage points, while the FI treatment increases this probability by 12.9 percentage points. There are no significant differences between our two treatments or between the treatments and

the EC. Our finding that the financial literacy treatment promotes a risk-taking attitude suggests a strong reduction in extremely prudent attitudes. A similar finding is reported by Becchetti, Caiazza, and Coviello (2013), who use an RCT to experimentally study the effect of financial education on investment attitudes in a large sample of high school students in Italy. We also find that females are less likely to be risk taking and more likely to be risk averse, relative to males, matching the findings of other authors with respect to older age groups, for example, Fisher (2010), Garrison and Gutter (2010) and Fehr-Duda, De Gennaro, and Schubert (2006).

Conclusion and Implications

Although many states across the country have instituted required financial education in the curriculum, there is currently limited research on U.S. high school students that examines specifically how financial education affects financial attitudes. Our paper is, to the best of our knowledge, one of the first to address this key deficiency in the literature. Our framework of introducing eight periods of financial literacy instruction in an economics course is ideally suited to examine whether a minimal financial literacy intervention can improve financial attitudes in youth.

Our sample is not random, limiting the generalization of our results. The framework of our study did not permit the investigation of whether the changes in financial attitudes of our study participants persisted after graduation from high school. We also faced limitations in obtaining control variables from school records for race and whether the student received reduced price free lunch. Additional variables capturing childhood financial socialization with parents as noted by Kim and Chatterjee (2013) would also have been ideal factors to serve as control variables in our regressions explaining financial attitudes, but we were limited in the amount of time we could use for testing and administering the survey. It is also possible that our estimates on the impact of our curriculum on financial attitudes represent an upper bound to the

extent that students were more motivated to learn and be involved in the program that was brought to their school from financial literacy professionals at a university.

Nevertheless, within the confines of our experiment, our results are informative for policy makers, teachers, and parents who play a role in the financial education of our youth. Our study suggests that male and female children have different attitudes toward saving, risk, and present bias. Authors like Van Campenout (2015) and Chambers, Asarta, and Farley-Ripple (2019) have pointed out the central role played by parents in the financial education of their children. Researchers in the field now believe that financial education of youth does not occur in separate categories at school and at home. An awareness of the gender differences in financial attitudes will help parents provide more effective financial socialization for their children.

Our result that the MM treatment can reduce the present bias of high school students is useful to policy makers since present bias has been linked to higher likelihoods of incurring credit card debt, increased credit card balances, smaller contributions to pension plans, and smaller overall savings (Meier & Sprenger, 2010; Norvilitis, 2014; Hastings & Mitchell, 2018). A broader implication of our result that MM reduces present bias arises from the finding of Tumataroa and O'Hare (forthcoming) that financial education, by improving self-control, can achieve positive cognitive outcomes.

We find that the MM curriculum inculcates the *thrifty* and *saver* attitudes. The value we find in the MM curriculum comports with the strategy of "just-in-time education," (Hathaway & Kathiwada, 2008) and suggests that the study of money management topics relates directly to high school students as they step out on their own into college. We find that both the MM and FI curricula increase the willingness to take on risk. Based on findings by authors such as Dohmen,

et al. (2012), our result of increased willingness to take on risk has implications for a higher likelihood of holding stocks and of being self-employed.

Personal finance is taught as part of another course in 12 states (CEE 2018). Our finding that a brief introduction of financial literacy in an economics course is beneficial in terms of improving financial attitudes of high school students, is relevant to planners and educators for assessing the success of policy initiatives, for example in California (CBS, 2019), that propose the teaching of personal finance within an economics course. Additionally, awareness that attitudes toward saving, borrowing, risk, and deferment of gratification can impact financial outcomes of individuals and that such attitudes can be influenced by financial counseling is useful to consumer financial planners who seek to increase the financial welfare of their clients. Knowledge that there are gender differences in financial attitudes, as suggested by our study, is useful to consumer financial planners as they try to improve the effectiveness of their financial counseling across diverse populations.

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TABLE 1A. Frequency Distribution (Percent) for Pre-and Post-Treatment Attitudes (N = 1,128)

Response	Okay to Borrow		Try Not to Spend		Old Phones		Used Car		Yard sale	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Strongly Agree	0.71	1.68	27.99	29.32	7.71	8.86	22.85	25.78	10.72	12.75
Agree	5.85	6.82	39.77	39.86	18.6	17.27	36.4	35.96	26.04	27.02
Neutral	23.47	21.26	16.83	13.82	32.68	31.09	22.85	19.57	24.89	25.42
Disagree	32.95	30.03	3.37	2.66	23.03	22.32	4.69	3.37	23.03	15.94
Strongly Disagree	25.24	26.40	0.53	0.53	6.29	6.64	1.59	1.51	3.81	5.05
Missing	11.78	13.82	11.51	13.82	11.69	13.82	11.6	13.82	11.51	13.82

TABLE 1B. Frequency Distribution (Percent) for Pre- and Post-Treatment Attitudes (N = 1,128)

Response	Extra 200	
	Pre	Post
Spend $200 now	3.45	4.43
Spend $150 now	1.77	2.48
Spend $100 now	17.09	17.63
Spend $50 now	32.42	34.19
Spend $0 now	33.57	27.55
Missing	11.69	13.73

TABLE 2. Rotated Factor Loadings Pre and Post Treatment Attitudes

Variable	**Pre-** ***Thrifty***	**Pre-** ***Saver***	**Post-** ***Thrifty***	**Post-** ***Saver***
Save Extra 200	0.016	0.795	0.019	0.728
Okay to Borrow	0.069	0.450	0.017	0.601
Try Not to Spend	0.060	0.623	0.177	0.599
Old Phones	0.631	0.240	0.724	0.168
Used Car	0.754	0.054	0.712	0.047
Yard Sale	0.763	-0.085	0.740	-0.043

TABLE 3. Analysis of Variance of Pretreatment Factor Scores Based on Pretreatment Attitudes: Thrifty and Saver

	***Thrifty* Factor Score**		
Treatment	Mean	Standard Deviation	Frequency
MM	-0.039	1.010	186
FI	-0.0004	0.972	145
Economics Control	0.092	1.023	256
History Control	-0.085	0.999	167
Total	0.003	1.005	754
F-Value from ANOVA	1.2		
P-Value	.308		
	***Saver* Factor Score**		
Treatment	Mean	Standard Deviation	Frequency
MM	-0.013	0.928	186
FI	0.154	1.006	145
Economics Control	0.068	1.018	256
History Control	0.028	0.911	167
Total	0.056	0.970	754
F-Value from ANOVA	0.87		
P-Value	.458		

Note. Sample size (N = 754) which is the number of observations used in the multivariate regression analyses.

TABLE 4. Pearson's Chi-Square Tests for Differences in Pretreatment Attitudes: Risk and Present Bias

	Risk Aversion (N=575)		
Treatment	**Risk Taking**	**Risk Neutral**	**Risk Averse**
MM	34	2	117
	22.22	1.31	76.47
FI	32	7	86
	25.6	5.6	68.8
Economics Control	21	3	116
	15	2.14	82.86
History Control	32	6	119
	20.38	3.82	75.8
Chi-Square Value	10.28		
P-Value	.113		

	Discount Rates (N=605)		
Treatment	**Greater than 10 Percent**	**Between 5 and 10 Percent**	**Less than 5 Percent**
MM	88	27	48
	53.99	16.56	29.45
FI	75	26	29
	57.69	20	22.31
Economics Control	66	29	53
	44.59	19.59	35.81
History Control	71	36	57
	43.29	21.95	34.76
Chi-Square Value	10.82		
P-Value	.094		

Note. Table entries give the frequency counts and below the frequency counts the relative row frequencies. Sample size is the number of observations used in the regression analyses.

TABLE 5. Results Explaining Post-Treatment Financial Attitudes from Factor Scores and Differences in Post and Pre-Treatment Attitudes (N=754)

	(1) Post Attitude *Thrifty*	(2) Post Attitude *Saver*	(3) Gain Score *Thrifty*	(4) Gain Score *Saver*
Pre-Treatment Attitude	0.569***	0.480***		
	(0.034)	(0.035)		
Financial Literacy Pretest	0.0060***	0.0005	0.0018	0.0002
	(0.0022)	(0.0024)	(0.0026)	(0.0029)
MM Treatment	0.235***	0.262**	0.222**	0.302***
	(0.090)	(0.102)	(0.102)	(0.116)
FI Treatment	0.082	0.213**	0.032	0.153
	(0.094)	(0.109)	(0.108)	(0.121)
Economics Control	0.095	0.116	0.055	0.146
	(0.088)	(0.096)	(0.100)	(0.110)
Academic GPA	0.005	0.016	0.034	-0.079
	(0.049)	(0.052)	(0.054)	(0.060)
Female	-0.056	0.048	-0.058	0.134*
	(0.059)	(0.069)	(0.068)	(0.079)
Currently Working	-0.002	-0.033	0.006	-0.078
	(0.068)	(0.073)	(0.077)	(0.083)
Constant	-0.300	-0.208	-0.076	0.0027
	(0.191)	(0.219)	(0.217)	(0.265)
R^2	0.379	0.240	0.016	0.026
P-Values for Tests of Equality of Treatment Effects				
MM vs. FI	0.079*	0.600	0.062*	0.184
MM vs. EC	0.104	0.128	0.094*	0.174
FI vs. EC	0.891	0.343	0.827	0.958

Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

TABLE 6. Marginal Effects for Variables Explaining Discount Rates (N=605)

	(1) Discount Rate greater than 10 Percent	(2) Discount Rate between 5 and 10 percent	(3) Discount Rate less than 5 percent
Pre-Treatment Discount Rate between 5 and 10 percent	-0.297*** (0.043)	0.045*** (0.011)	0.252*** (0.039)
Pre-Treatment Discount Rate less than 5 percent	-0.409*** (0.039)	0.023* (0.013)	0.386*** (0.040)
Financial Literacy Pretest	-0.0002 (0.0013)	0.00002 (0.0001)	0.0002 (0.0012)
MM Treatment	-0.118** (0.049)	0.005** (0.002)	0.112** (0.048)
FI Treatment	0.087 (0.057)	-0.010 (0.008)	-0.078 (0.048)
Economics Control	-0.052 (0.057)	0.003 (0.003)	0.048 (0.054)
Academic GPA	0.013 (0.029)	-0.001 (0.002)	-0.012 (0.027)
Female	-0.078** (0.0361)	0.007* (0.004)	0.071** (0.033)
Currently Working	0.043 (0.035)	-0.004 (0.003)	-0.040 (0.032)
P-Values for Tests of Equality of Treatment Effects			
MM vs. FI	0.000**	0.098*	0.000**
MM vs. EC	0.244	0.484	0.243
FI vs. EC	0.028**	0.110	0.028**

Delta Method Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01

TABLE 7. Marginal Effects for Variables Explaining Attitudes toward Risk (N=575)

	(1) Risk Taking	(2) Risk Neutral	(3) Risk Averse
Pre-Treatment Risk Neutral	-0.119	-0.001	0.120
	(0.121)	(0.005)	(0.125)
Pre-Treatment Risk Averse	-0.338***	-0.026***	0.364***
	(0.048)	(0.006)	(0.048)
Financial Literacy Pretest	0.0004	0.00005	-0.0004
	(0.0012)	(0.00015)	(0.0014)
MM Treatment	0.095*	0.0109**	-0.106*
	(0.050)	(0.005)	(0.055)
FI Treatment	0.129**	0.0137***	-0.143**
	(0.055)	(0.005)	(0.059)
Economics Control	0.074	0.008	-0.082
	(0.058)	(0.006)	(0.063)
Academic GPA	-0.011	-0.0015	0.013
	(0.028)	(0.004)	(0.032)
Female	-0.058*	-0.007*	0.065*
	(0.034)	(0.004)	(0.038)
Currently Working	0.043	0.005	-0.050
	(0.034)	(0.004)	(0.038)
P-Values for Tests of Equality of Treatment Effects			
MM vs. FI	0.489	0.540	0.492
MM vs. EC	0.729	0.674	0.724
FI vs. EC	0.392	0.374	0.390

Delta Method Standard errors in parentheses
* p<.10, ** p<.05, *** p<.01